Kulturen des Entscheidens

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Politisches Entscheiden im Kalten Krieg

Orte, Praktiken und Ressourcen in Ost und West

Herausgegeben von
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ständige thematisierte und reflektierte die aufgeworfene Frage nämlich immer auch die bis in die Gegenwart virulente Grundspannung zwischen Bund und Ländern, zwischen Zentralismus und Föderalismus, zwischen Einheitlichkeit und Vielfalt des Bildungswesens.

S. M. Amadae

Worst-Case Planning

Political Decision Making in the West

> "On the whole, however, there is too little concern for the fact that strategic dominance, decisions to develop new weapons technologies, and arms races are typically Prisoner's Dilemma games, in which minimax is a notoriously bad strategy. The deeply pessimistic *Weltanschauung* of this work is characterized most vividly by [Albert] Wohlstetter's assertion that the Soviets' 'fondest desires' include launching a successful surprise nuclear attack against the United States. No one can prove such pessimism is wholly unwarranted, but the expected value of the world's survival game almost certainly suffers if we continue pursuing a minimax approach to the problems of deterrence, arms control, and disarmament. All might benefit if military systems analysts spent less time worrying how we can make the best of the worst our rivals may do, and more time inventing ways of cooperating to avoid new self-defeating steps in the perfection and spread of mass-destructive weapons."[1]

The goal of this conference is to explore "the highly contested nature of [decision-making through adopting] a historically comparative and interdisciplinary perspective to treat decision-making as a form of social action that is by no means self-evident and transhistorical, but rather one that is highly pre-conditioned and varies through history."[2] "Rationalizing Capitalist Democracy" (2003) and "Prisoners of Reason: Game Theory and Neoliberal Political Economy" (2016) fit squarely into this method of analysis.[3] These books historicize rationality in the attempt to discover the context and purposes that gave rise to the new decision technology of game theory, also referred to as strategic rationality, decision theory, and rational choice. It is an interesting phenomenon that contributors to this enormous interdisciplinary body of work tend to dismiss that decision theory is any more than a science of making choices to maximize expected

1 Edward S. Quade, Review of Analysis for Military Decisions, in: American Economic Review 55 (1965), pp. 1191–1192, p. 1192.

2 Summary: "SFB/Collaborative Research Center 1150. Cultures of Decision-Making"—Research Programme (2017).

3 S. M. Amadae, Rationalizing Capitalist Democracy. The Cold War Origins of Rational Choice Liberalism, Chicago 2003; S. M. Amadae, Prisoners of Reason. Game Theory and Neoliberal Political Economy, Chicago 2016.

gain. Game theory is applied to nuclear deterrence and military strategy, building markets and designing institutions, analyzing collective action, developing jurisprudence, and addressing crime and punishment. Proponents hold that effective decision-making is a timeless, culturally independent enterprise that should be perfected and applied to the fullest extent possible in order to achieve the best individual and collective decisions. Yet one real value of the paradigm came from normalizing strategic rational action such that other actors' choices could be better anticipated and countered. Thus, one strategic analyst hoped that the Soviet Union could learn to be a rational actor so that the US strategists' models of potential conflict could be more accurate and thus helpful.[4]

This essay draws on recent historiography of Cold War decision-making to draw into focus the constructive aspects of decision theory to argue that the perceived need to avoid worst-case scenarios has instead contributed to a world in which the worst outcome is probabilistically assured to occur over a *long durée* timeframe. It is structured in the following sections: (1) Making the Best Choice: Innocence of Rational Action; (2) Shaping Reality: Game Theory as World Construction; (3) Rationality as Computable and Hence Mindless; (4) Algorithmic Governance: Encompassing the Exception; and (5) Worst-Case Planning as Self-Fulfilling Prophecy. In responding to these recent histories of rational decision theory, I turn to Hans Blumenberg.[5] I hypothesize that the modern initiative to seek secure foundations to knowledge set the stage for John von Neumann's acceptance of finitism, worst-case planning, and mindless rationality.[6] Certainty within the context of the atomic *Entscheidungsproblem* meant mindlessly accepting that security lies in preparing to destroy all human life.

1. Making the Best Choice: Innocence of Rational Action

William Thomas' "Rational Action" offers a nuanced contribution to both the historiography of early Cold War policy science and to our understanding of the development of operations research and systems analysis in the US and UK contexts.[7] The book is thoroughly researched and directly engages the rich literature this topic has already received. Thomas places his own work in opposition to what he observes to be the mainstream and simplistic, even inaccurate, position that early contributors to policy science were overly besotted with

4 Jack L. Snyder, The Soviet Strategic Culture. Implications for Limited Nuclear Options Operations. A Project Air Force Report Prepared for the United States Air Force, Santa Monica 1977.

5 Hans Blumenberg, The Legitimacy of the Modern Age, Baskerville 1985.

6 Finitism in mathematics and logic refers to limiting the domain of knowledge to finite, and hence knowable, spheres with particular instantiations.

7 William Thomas, Rational Action. The Sciences of Policy in Britain and America, 1940–1960, Cambridge 2015.

the power of scientific analysis to solve big problems with objective precision. Instead he defends the self-understanding of protagonists in his history insofar as their methods were limited and multi-faceted, and that they were acting to do the best with the resources available to solve existing problems of military logistics and procurement. Thomas does not identify a unique signature to his title topic, and instead devotes chapters to operations research, war planning, and decision making. Yet he concludes, "I hope that this book has shown that, in fact, we share many of our ideas with those who pursued this project, that, for all the extraordinary changes that the sciences of policy wrought on the landscape of expertise, the basic idea of what it means to act rationally has remained essentially constant throughout"[8]. Rational action, then is acting out of careful analysis as opposed to superstition or impulse. Making this point in the words of scientist and administrator Warren Weaver, Thomas argues that contributors to policy science adopted the conciliatory position that every decision "has to be made either by analysis, or magic, or blind guess"[9].

There is much to appreciate in Thomas' study of the new post-World War II policy sciences. I find its most attractive feature to be the author's cool detachment from becoming too infatuated or impassioned by any of the figures, ideas, or organizations he discusses. Thus, his textured treatment of this topic enables readers to simultaneously track his historiographical argument while at the same time they may mentally experiment with alternative readings of this history. Thomas is indubitably correct in questioning the now well-known historical treatment of this topic in terms of the over-enchantment of policy analysts with their new scientific decision tools. His neutral reconstruction of key figures' objectives enables readers to appreciate their vocational attempts to ground policy on sound reasons. Still it is possible to question whether leaving our understanding at this is sufficient. All commentators agree that the fraught strategic setting of the 1940s presents the crucible for the initial development of operations research, systems analysis and game theory. Thomas focuses on the problems that needed to be solved, instead of assessing how these particular problems within the military environment may have played a role in normalizing policy tools best suited for conflictual and logistical challenges. Thus, it is not clear that the military strategic context itself is a neutral venue for generating budgeting instruments, decision technologies, or planning methods. Potentially if decision tools are developed within the military venue and then are applied more broadly to all conceivable policy concerns throughout society, and if they therefore convey a signature combative approach, then perhaps this could be transferred into civilian settings. It is not clear that this is the case, but Thomas' account leaves open this possibility. Thus, perhaps the very real concerns confronting operations researchers and systems analysts in the 1940s

8 Thomas, Rational Action (as in note 7), p. 299.

9 Ibid., p. 129.

and 1950s could relay a mental framework for identifying and responding to challenges in domestic policy areas in the 1960s, 1970s, and beyond.

Thomas anticipates, again through the economists, operations researchers and engineers that he discusses, that abstract methods were applied to pressing practical problems arising in the military, industry, and politics but often published in professional journals that permitted theoretical work to "move unfiltered into practical work and [subsequently to] sour relations with finicky clients and employers"[10]. Thus, while the analysts themselves were aware of and worried about this miscarriage of abstract decision tools applied to concrete problems, it is the larger pragmatic context into which their findings were injected that sustained protagonists' optimism for the potential for scientific decision-making. They sought to make constructive contributions to rational choices in policy and management.

Operations research, systems analysis, and game theory do seem, and not surprisingly so from Thomas' investigation of the multiple uses of these methods in aerial, naval, and land warfare, aptly suited to military planning which spans from procurement to deployment and engagement. Even more so in the nuclear era, in which speculative analyses must replace empirical studies because war fighting capability far outpaces the real world's ability to absorb the catastrophic devastation from not only all hypothetical attacks and simulations, but also the actual accumulated capacity for mass destruction, theorists felt an imperative to engage in simulated studies of warfare. This means that imagined scenarios built on rational planning projected technological development and procurement into a future that then could but resemble the world that analysts conceived. Thomas observes that "new technologies made wartime experience obsolete" and required speculative theoretical research in the absence of theatres of war to provide empirical data.[11]

2. Shaping Reality: Game Theory as World Construction

Thomas effectively weaves together a narrative that is sympathetic to the aims of those whom he studies. He adopts an "underlying sympathy" for his subjects in the hope of thus attaining a "devastatingly effective"[12] commentary. Insofar as many of his protagonists are less well-known, it is possible to be charitable in viewing their contributions as promoting sound decision-making, first within military venues, and by extension throughout all spheres of society. By focusing on pivotal actors rather than rank and file developers of this system of thought, Paul Erickson reaches a countervailing conclusion observing that "it is hard not to be struck by the sense of glamor, power, and prestige that has attached

10 Ibid., p. 227.
11 Ibid., p. 208.
12 Ibid., p. 275.

itself to game theory during the high years of the Cold War and beyond"[13]. He focuses on John von Neumann, Oskar Morgenstern, Thomas Schelling and John Harsanyi, who "imagined themselves [...] as revivers of the great enlightenment tradition of moral philosophy, diving with flair into the great problems of ethics and philosophy of science, into the study of how one ought to think and act"[14]. Not only did they exude an air of scientific expertise, but they "sport[ed] an ultramodern mathematical idiom, [were] fluent in the language of computers, man-made machine systems, ICBMs [interncontinental ballistic missiles], and other manifestations of Cold War high technology"[15]. Thus, although many contributors to policy science were dedicated to detailed analyses, the visionaries who pioneered and promoted game theory actively participated in laying the groundwork for a postwar political and economic order. Whereas my research has investigated how one dominant position on rationality and choice was consolidated,[16] Erickson provides an account of the "internal *diversity* of the game-theoretic corpus"[17] as it developed in the 1950s and 1960s. This examination of the lack of internal coherence to the rationality project, made clear for Erickson by the ultimate ascendance of non-cooperative game theory over cooperative game theory, sets into stark relief the question of how a relatively monolithic paradigm did emerge by the 1980s. While Erickson notes that leading game theorists, who include Nobel Prize winning economist Roger B. Myerson, continue to herald the importance of game theory for unifying the field of economics and potentially also the social and behavioral sciences broadly construed, he concludes that this optimism walks in the same footprints of past failed attempts at a comprehensive approach such as that of the logical positivists articulated in their Vienna Circle.[18]

"The World the Game Theorists Made" equivocates between acknowledging the phenomenal generative power of game theory to transform fields of industrial organization and financial economics while simultaneously asserting that there is no monolithic statement or expression of the theory.[19] Here his book title is puzzling on two counts insofar as not only does it seem that game theorists made numerous worlds, but moreover none of them is ultimately fixed or persistent. What, then, is the "world that the game theorists made"? Erickson's final words read, "game theory, as it has been bequeathed to its latter-day practitioners, provides a heterogeneous collection of tools for notating, speaking, and reasoning within the human sciences"[20]. Whereas Thomas follows develop-

13 Paul Erickson, The World the Game Theorists Made, Chicago 2015, p. 2.
14 Ibid.
15 Ibid.
16 Amadae, Prisoners of Reason (as in note 3).
17 Erickson, The World the Game Theorists Made (as in note 13), p. 9.
18 Herbert Gintis, Bounds of Reason. Game Theory and the Unification of the Behavioral Sciences, Princeton 2009, p. 279.
19 Erickson, The World the Game Theorists Made (as in note 13), p. 241.
20 Ibid., p. 271.

ments of rationality at the intersection of abstract theory and application to concrete contexts, Erickson instead focuses on salient theorists and recounts the intricate moves by which their arguments were delineated. Both authors excel at providing evidence to support their overarching historiographical positions, the former granting that decision theory assists in making better decisions, and the latter in showing there is no single rationality paradigm that can be pinned on von Neumann's "Theory of Games and Economic Behavior" and the subsequent theoretical products it inspired. Thomas offers a view of decision theorists as modest and impeccant. Erickson reports of his figures that they are ambitious, yet ultimately unsuccessful in promoting an overarching science of choice.

Game theorists' ambition is apparent in their tackling of big themes, including nuclear deterrence and arms control, bargaining, providing naturalistic accounts of the evolution of organisms and human sociability, and designing market institutions. For example, Erickson notes that, public debates in the 1950s over the future of humanity, which confronted the invention of nuclear weapons, "form the context in which the idea became widespread that the Cold War between the two superpowers was a *game* in the technical sense of game theory, and in which the problem of how to choose rationally in this situation became perhaps *the* central problem of the age"[21]. Here he acknowledges a crucial point in the history of Cold War rationality that it was "the challenges of nuclear strategy, the possibility of arms control, and the resolution of international conflicts" that provided the context for the future Nobel Prize winning economist Thomas Schelling to treat nuclear deterrence as a problem of bargaining using game theory. Bargaining theory took a step away from von Neumann and Morgenstern's original concentration on games with pure conflict in order to examine decision problems classified as having elements of both conflict and coordination. This is a major point in the consolidation of an orthodox position on game theory underlying its 1980s domination of the Anglo-American social sciences. Yet all cooperation takes place granted the permanent and underlying menace of a breakdown into coercive threats.

Erickson's account is valuable for demonstrating the pluralism underlying what can with retrospect appear to be a straightforward path from two-person zero-sum decision theory to non-zero sum multi-agent decision problems standard in much contemporary economic analysis.[22] He concurs with other researchers' appraisal that von Neumann and Morgenstern's "Theory of Games" "was less a secure achievement than a promissory note"[23]. This suggests two important points. First, it alerts us to the importance of the military context in which game theory was inscribed as the context that gave the theory life when

21 Ibid., p. 164.
22 See Nicholas Stern, The Economics of Climate Change, Cambridge 2007.
23 Ibid., p. 73.

it may have succumbed to a premature death in irrelevance.[24] And, second, that promise, I argue, lay precisely in the deep structure it offered for a theory of rationality that was the product of von Neumann's mathematical acumen. Von Neumann postulated an approach to formalizing rationality that acknowledged the collapse of ultimate mathematical foundations due to Kurt Gödel's incompleteness theorems.[25] Despite, as Erickson amply notes in the case of Schelling, that strategic rationality can be a mindset without an exacting mathematical formalism to substantiate arguments based on it, in fact game theory is a purely analytic body of mathematics.[26] Thus, game theory's role in world construction must not be underestimated.

Game theory lies at the crossroads of computation, cognitive science, strategic conflict, treatments of social games and rule-following systems, and pure mathematics. Its major progenitor, von Neumann, axiomatized quantum thermodynamics, played a leading role in the Manhattan Project, contributed to WWII strategic planning, and sat on the committee that selected Hiroshima and Nagasaki to be the targets for the introduction of the atomic bomb onto the world's geopolitical stage. Creating a purely abstract formal system by itself is a type of world creation. But as Erickson notes, von Neumann and Morgenstern take the step of building a bridge between a purely conceptual mathematical theory of rational choice in abstract games to providing a means to measure the strength of individuals' preferences over certain or chance outcomes. This is arguably where their breakthrough lay: in providing a means to navigate between the conceptual world they created, and the actual reality humans inhabit with the artifice of expected utility theory.[27] This is the juncture at which their purely analytic structure took on proportions of shaping the social world that individuals experience.

"Theory of Games" continues to loom over the social world, much as does the iconic mushroom cloud harboring the possibility of immanent nuclear destruction. It deftly both circumnavigated the crisis of confidence in formal mathematical systems thereby securing a theoretical ground work for pure strategic rationality, and accommodated the worst-case planning that is perpetually warranted in view of the interminable threat of thermonuclear war.

24 E.g. Robert J. Leonard, Creating a Context for Game Theory, in: History of Political Economy 24 (1992), pp. 29–76, p. 29; Robert J. Leonard, From Parlor Games to Social Science. Von Neumann, Morgenstern, and the Creation of Game Theory 1928–1944, in: Journal of Economic Literature 33 (1995), pp. 730–761.
25 Kurt Gödel, The Present Situation in the Foundations of Mathematics, in: Collected Works, Vol. 3, Unpublished Essays and Lectures, New York 1933, pp. 45–53; Kurt Gödel, On Undecidable Propositions of Formal Mathematical Systems. Introductory Note to 1934 by Stephen C. Kleene, in: Collected Works, Vol. 1, Publications 1929–1936, New York 1986, pp. 346–372.
26 E.g. Ken Binmore, Natural Justice, Oxford 2005.
27 John von Neumann/Oskar Morgenstern, Theory of Games and Economic Decisions, Princeton ²2007.

Von Neumann developed his "minimax" approach to decision-making which accepts that individuals must make decisions in isolation and thus should make choices that secure their best-possible worst-case outcome, regardless of others' choices. Perhaps the fact that by the 1980s, mainstream game theory moved beyond minimax to emphasize mutual-best-reply thinking instead makes it seem possible to lose sight of the origins of deterrence theory as the solution to the Cold War viewed as a 'game'.[28] Yet nuclear deterrence theory and game theory's prestige developed hand-in-hand such that still today there is no superior way of rationalizing nuclear strategy other than this 1940s decision technology originally postulated to be useful for absolute conflict and worst-case planning.[29]

3. Rationality as Computable and Hence Mindless

Without knowledge of rational decision theory, which is also known as rational deterrence theory, and its merging into simulated computerized war-gaming, it is difficult to contribute to or influence debates over nuclear strategy. By the 1970s, nuclear deterrence was synonymous with strategic rationality which included the calculated use of probabilistic decision-making.[30] The concept of action proposed by game theory, that is mandatory individualistic strategic competition, became the widely accepted standard for purposive action throughout American social science and the professional programs of law, public policy, and business by the 1980s.[31] There is no widely accepted alternative for formalizing instrumental rationality, and strategic rationality is notorious for not leaving room for other approaches such as the deliberative approach of Jürgen Habermas, or various forms of collective intention.[32] Theories of markets

28 Erickson, The World the Game Theorists Made (as in note 13), p. 165.

29 See Amadae, Prisoners of Reason (as in note 3).

30 See Thomas Schelling, Strategy of Conflict, Cambridge 2005.

31 Daniel Ellsberg, Theory of the Reluctant Duelist, in: The American Economic Review 46 (1956); Philip Mirowski, Machine Dreams. Economics Becomes a Cyborg Science, Cambridge 2002, pp. 114–115; Amadae, Rationalizing Capitalist Democracy (as in note 3); in Mirowski's close reading of the development of game theory within the context of military purpose and purview, game theory—along the lines of what would become the orthodox Nash equilibrium approach of mutual-best-reply which postulated a calculable (machine representable) agent with hallmark consistent preferences—increasingly yielded ground to John von Neumann's post-1940s view of mechanism design as itself a form of algorithmic governance that spans from military command and control to markets.

32 Jürgen Habermas, The Theory of Communicative Action, 2 Vol., Boston 1984/1987; on Habermas see Joseph Heath, Communicative Action and Rational Choice, Cambridge 2001; Margaret Gilbert, How We Together Make the Social World, New York 2013; John R. Searle, Making the Social World. The Structure of Human Civilization, New York 2010; Raimo Tuomela, Social Ontology. Collective Intentionality and Group Agents, New York 2013; alternatives within the rationality paradigm may include Herbert Simon's bounded rationality: Mirowski, Machine Dreams (as in note 31), pp. 529–532; Hunter Crowther-Heyck, Herbert A. Simon. The Bounds of Reason in Modern America, Baltimore 2005; as well as: Norbert Wiener, Cybernetics. Or Control and Communication in the Animal and the Machine, Cambridge ²1961; but Mirowski makes clear that not only were these programs similarly inspired by military aims, but that moreover they share with game theory the view of agency as programmable or algorithmic.

33 Amadae, Rationalizing Capitalist Democracy (as in note 3); Richard Tuck, Free Riding, Cambridge 2008.

34 Joseph S. Nye, Nuclear Ethics, New York 1988; Herman Kahn, Thinking the Unthinkable, 1962, in: Herman Kahn (ed.), On Escalation. Metaphors and Scenarios, New York 1965.

35 Daniel Deudney, Whole Earth Security. A Geopolitics of Peace, in: Worldwatch Paper 55 (1983).

36 On command and control, see Erik Gartzke/Jon R. Lindsay, Thermonuclear Cyberwar, in: Journal of Cyber Security 1–2 (2017), pp. 37–48. For comment see S. M. Amadae, Computable Rationality, NUTS, and the Nuclear Leviathan, in : Daniel Bessner/Nicolas Guilhot (ed.), The Decisionist Imagination: Democracy, Sovereignty and Social Science in the 20th Century, New York 2018, pp. 173–216.

37 Mirowski, Machine Dreams (as in note 31), p. 532.

and governance were revisited using game theory with the dramatic implication that former pieces of conventional wisdom such as the rationality of voting and voluntary collective action, were thoroughly undermined.[33] Rational deterrence theory, which is at best amoral, and potentially even immoral, provided the means to "think the unthinkable"[34], to use the phrase of Herman Kahn. This meant matter-of-factly and routinely contemplating exercising nuclear threats either in the form of flexible response or second-strike counterforce without any nostalgia for the intrinsic value of any particular human life form, or its phenotype more generally.[35] The sense of urgency which rationalizes nuclear deterrence and the command and control structure it necessitates, generated a theory of agency and intelligence that leaves no distinction between human beings and artificial intelligences.[36] Philip Mirowski makes this point repeatedly:

"Because the computer so readily trespasses upon the self-image of man as the thinking animal, it has become equally commonplace to believe that the mind is nothing more than a machine; that is, it operates like a computer."[37]

This latter point regarding the manner in which game theory places rationality on par with algorithmic computation, and thus its particular poignancy with respect to nuclear deterrence, remains unexplored.

The oblivious character of rational choice permeates the nuclear security state at all levels of function from justifying nuclear doctrine and theories of collective choice, to normalizing a specific form of rational action, and rendering politics the unintended outcome of individuals' preference satisfaction. Hence, blind steering predicated on formulaic maximization of expected utility rationalizes nuclear strategy despite its unintelligibility to the population it allegedly secures from harm.

Game theorists pursue "the quest for algorithmic rationality [...] the complete and consistent calculation of the strategies of the opponent"[38]. The benefit of this seamless transition from human to machine actors is that the maintenance of command and control could be decentralized, and in principle could be distilled down "a complete set of instructions that tells every individual what to do in every conceivable circumstance"[39] that could be executed independently from the need of a consciously present human decision-maker. Thus, in erasing the line demarcating a consciously present decider with Kantian autonomy, and in postulating that insofar as people think, strategize, and calculate, so can computers, it then became possible to build a complex diversified and extended command and control network that would carry the burden of prosecuting modern warfare.[40] The newly minted strategic actor obeys a structure of agency limited by the consistency conditions characterizing rational choice theory.[41] Rationality becomes algorithmic. Computer simulations of action and causal implications replaced experimentation, and military command and control needs led to the "diffusion of the computer throughout all levels of military command structure"[42].

Despite the plethora of research on the entanglement of game theory with Cold War nuclear strategy, mainstream economics and social science more broadly continue to rely on rational choice theory without examining this potent intellectual and contextual heritage.[43] This oversight neglects the potential synergy between game theory and conflict, thus possibly proliferating a model for action that is best suited to antagonistic encounters. The development of and fascination with strategic rationality is inseparable from the continued US embrace of nuclear weapons at the apex of its military strategy of full-spectrum dominance.[44] Here I share ground with Erickson et al.'s recent assessment that nuclear security and other military concerns set the stage for economizing decision-making using game theory, and other means of algorithmic calculation, during the early Cold War.[45]

Crucially, strategic rationality loses the quality of *mind*, or the characteristic of intelligible grasp of the problem it is harnessed to solve. In specific, the very

38 Ibid., p. 512.

39 Von Neumann/Morgenstern, Theory of Games (as in note 27), p. 31.

40 Desmond Ball, US Strategic Forces. How Would They Be Used?, in: International Security 7/3 (1982–1983), pp. 56–58.

41 Mirowski, Machine Dreams (as in note 31), p. 440.

42 Ibid., p. 190; see also Gartzke/Lindsay, Thermonuclear Cyberwar (as in note 36).

43 E.g. Binmore, Natural justice (as in note 26); Herbert Gintis, The Bounds of Reason. Game Theory and the Unification of the Behavioral Sciences, Princeton 2009; Daniel H. Hausman, Preference, Value, Choice and Welfare, Cambridge 2011; Francesco Guala, Understanding Institutions. The Science and Philosophy of Living Together, Princeton 2016.

44 U.S. Department of Defense, Joint Vision 2020, https://web.archive.org/web/20011129104507/http://www.dtic.mil:80/jv2020/jv2020a.pdf (Retrieved: 19 April 2017).

45 Paul Erickson et al., How Reason Almost Lost its Mind, Chicago 2013.

credibility of nuclear deterrence depends on demonstrating the intention and capability to fight and win a nuclear war among superpowers, even though such victory is impossible due to the cataclysmic destructive power of these weapons. The United States and Russian Federation have thousands of thermonuclear bombs when a war fought with only hundred or even much less is likely to end known civilization. This provocative stance furthermore entails privileging preparing for, and hence rendering more plausible, nuclear war rather than countering the risks of accidental or intentional nuclear war and pursing means to rescind the use of thermonuclear bombs.[46] Game theory helps to normalize a nuclear security state in which a 'nuclear eternity' is preferable to actively negating the historically demonstrated tendency to, sooner or later, employ deadly technologies on hand. Hence, rational choice rationalizes that we all live under, and strategists contribute to, a regime that permanently equates security to living with the doomsday clock at under three minutes to midnight.[47] Thousands of nuclear weapons remain on unceasing alert status that will only be abrogated by either the launching of these weapons, or a comprehensive rethinking of the logic underlying this exercise of national power.[48]

Given the general lack of introspection concerning the demonstrable relationship between pursuing game theory and addressing conflict, Erickson et al. are timely in revisiting the significance of Cold War concerns for inspiring the development of algorithmic decision technologies. What we miss today in discounting the anxiety ridden nuclear nightmares as a primary background to, and motive underlying strategic rationality, is coming to terms with how profoundly the practice of nuclear deterrence, informed by and justifying game theory, continues to shape the cognitive terra-form of human geopolitical and economic systems. Thus, with every passing year we further embrace a concept of intelligence that accepts mindless computation and automating social interactions alongside the pedestrian normalization of nuclear weapons with unfathomable destructive yield.[49] Accommodating nuclear weapons relies on algorithmic decision technologies for rationalizing deterrence, and on hybrid

46 Ken Berry et al., Delegitimizing Nuclear Weapons. Examining the Validity of Nuclear Deterrence, Monterey 2010; Benoît Pelopidas, The Oracles of Proliferation. How Experts Maintain a Biased Historical Reading that Limits Policy Innovation, in: Nonproliferation Review 18 (2011), pp. 297–314; Benoît Pelopidas, A Bet Portrayed as A Certainty. Reassessing the Added Deterrent Value of Nuclear Weapons, in: G. John Goodby/P. Shultz (ed.), The War that Must Never Be Fought. Dilemmas of Nuclear Deterrence, Stanford 2015, pp. 5–57; Benoît Pelopidas, The Unbearable Lightness of Luck. Three Sources of Overconfidence in the Manageability of Nuclear Crises, in: European Journal of International Security 2 (2017), pp. 240–262.

47 Benoît Pelopidas, The Birth of Nuclear Eternity. The Future of Interdisciplinary Perspectives, Oxford 2019.

48 Daniel Deudney, Bounding Power. Republican Security Theory from the Polis to the Global Village, Princeton 2006.

49 Mark Coeckelbergh, The Automation of the Social. What Robots can Teach us About the Social, in: Johanna Seibt/Marco Nørskov (ed.), Robo-Philosophy. Philosophy of, for, and

AI-human agency to maintain national sovereignty through command and control systems during nuclear war wherein casualties likely will interrupt human command chains and communication channels.[50] Both computable rationality and hybrid AI-human decision-making systems deviate from privileging a sovereign human subject, instead turning to algorithmic rule-following punctuated by randomized number generation to ground strategy and carry out commands. So important did defense analysts estimate the significance of command and control to be that it received an additional ninety billion US dollars over and above the hundred billion that were spent on military hardware throughout the Cold War years.[51]

Erickson et al.'s volume documents the far-reaching transformation during the Cold War of what had formerly been human reason that connoted a seat of consciousness and possibly a soul animating decision-maker. The authors observe,

"In the two decades following World War II, human reason was reconceptualized as rationality. Philosophers, mathematicians, economists, political scientists, military strategists, computer scientists, and psychologists sought, defined, and debated new norms for 'rational actors', a deliberately capacious category that included business firms, chess players, the mafia, computers, parents and children, and nuclear superpowers."[52]

The key insight is that rationality becomes synonymous with what had formerly been deemed the lowest level of cognition: routine calculation. Whereas during the Enlightenment and up until the Cold War reason had referred to evaluative judgments and the formation of ideas, with the innovation of game theory, rationality merely comes to connote calculation subject to rules.[53] These rules, also referred to as algorithms, could be followed by low level human workers or by machines. Initially it seemed to 1940s contemporaries that even permitting calculation to be conducted by low-paid laborers denigrated "calculation from a mindful to a mindless exercise"[54]. Following a rule, with definitive and predictable machine-like exactness, came to exemplify rationality. There is no subject with intelligible grasp of the significance of the instructions or their legitimacy. Moreover the instructions are self-executing in the sense that

by Social Robotics, Cambridge 2018, pp. 7–8; Elaine Scarry, Thermonuclear Monarchy. Choosing Between Democracy and Doom, New York 2014.

50 Desmond Ball/Robert C. Toth, Revising the SIOP. Taking War-fighting to Dangerous Extremes, in: International Security 14 (1990), pp. 65–92; Gartzke/Lindsay, Thermonuclear Cyberwar (as in note 36).

51 Daniel Volmar, The Power of the Atom. US Command Control and Communications, 1945–1965, Harvard 2016.

52 Erickson et al., How Reason Almost Lost its Mind (as in note 45), p. 29.

53 Ibid., p. 37; S. M. Amadae, The Computability of Rational Choice, in: Johanna Seibt et al. (ed.), What Robots Can and Should Do, Amsterdam 2016, pp. 257–267.

54 Erickson et al., How Reason Almost Lost its Mind (as in note 45), p. 43.

they ideally specify a singular (or randomized) outcome independent of the faculties of computor.[55] Unaccounted for and rendered obsolete is the sense of cognizance that could invent rules, understand them, and apply them to diverse and yet unknown circumstances. This ingenuity typified, for example, Immanuel Kant's attempt to establish rules to differentiate between art and technique, or Isaac Newton's discovery of the rules of motion that then could serve as models for understanding mass, momentum and energy.[56] Thus, rule following becomes the mindless and exacting execution of a set of instructions and the rule itself is reduced to being an algorithm.[57]

Rationality loses mindfulness, or a conscious subject with intelligible and existential grasp of problems it solves. Rationality itself is postulated to have been programmed via evolution into living beings so that they can survive and propagate.[58] This foreclosure on the merits of understanding represents one side of a philosophical divide that not only remains extant into the present, but further reflects the state of the art debate over whether mind and intelligibility play any causal role in actualizing behavior. Whereas some theorists argue that rational choice is underdetermined by rational beliefs and desires, and further suggest that humans exhibit freedom of will in making deliberate choices, game theorists put forward a theory of rationality that is wholly determined by a set of instructions, or algorithm, that is enacted as causal process.[59] The rationality characteristic of rational choice renders intelligence, or purposive agency, in principle subject to automated computation in carbon or silicon-based systems. This has the added benefit, as game theory textbook authors Duncan Luce and Howard Raiffa observe, of making rational decision-making achievable by human or artificial intelligence.[60] The definitive aspect of such algorithmic rule-following is its exacting production, over and again, of precisely the same outcome for identical sets of input data. This is the opposite of Ludwig

55 Although it is a fictionalized account of the historical book Hidden Figures, by Margot Lee Shetterly, the film by the same name (2016) accurately captures the difference between a computerized calculation without the demand of intelligibility on the part of a computing machine and a human 'computor' who understands and can vouch for the meaning, purpose, and validity of a calculation, in this case astronaut John Glenn's reentry trajectory and landing coordinates.

56 Erickson et al., How Reason Almost Lost its Mind (as in note 45), pp. 40–41.

57 Ibid., p. 39.

58 Robert L. Trivers, The Evolution of Reciprocal Altruism, in: The Quarterly Review of Biology 46 (1971), pp. 35–57; John Maynard Smith, Evolution and the Theory of Games, Cambridge 1982; Philip Pettit, Rules, Reasons, and Norms, Oxford 2002.

59 For discussion, see: John R. Searle, Rationality in Action, Cambridge 2001; Alfred R. Mele, Motivation and Agency, Oxford 2003; Amadae, The Computability of Rational Choice (as in note 53); Brendan Markey-Towler, I, Roboticus Oeconomicus. The Philosophy of Mind in Economics, and Why it Matters, in: Cambridge Journal of Economics 41 (2017), pp. 203–237.

60 Luce, R. Duncan/Howard Raiffa, Games and Decisions. Introduction and Critical Survey, New York 1967, p. 6.

Wittgenstein's approach to rule following in which the hallmark characteristic is that rules do not by themselves specify the outcome of their application.[61] John Searle, who explicitly acknowledges his philosophical affinity to Wittgenstein, challenges both the classical model of rationality encompassing game theory and the view that AI performs intelligence on par with human agents.[62] In differentiating between human and machine intelligence, he sides with Wittgenstein in pointing out the importance of mindful judgment, based on understanding in intelligibility and recognition of veracity. In contrast, promoters of rational choice and game theory view rationality as one concept, whether exhibited by a human, a non-human organism, or a machine. Insofar as game theory represents the orthodox statement of instrumental rationality, Alan Turing's conceptualization of intelligence has prevailed.[63] According to the Church-Turing thesis there are four discursively stated criteria characterizing programmable rationality.[64] It can be stipulated by a finite set of precise instructions stated in a finite set of symbols. If executed without error, it always produces the same result in a limited number of steps. It can be completed by a human without machine assistance. Most significantly, no intelligible grasp or understanding of the instructions is necessary for the one who calculates.[65] Procedures meeting these criteria are deemed to be logically and mechanically computable.[66]

Erickson et al. conclude that, "reason almost lost its mind," and end their book with the chapter entitled, "The Collapse of Cold War Rationality"[67]. In part their conclusion is based on the invention of behavioral economics which uses pure theoretical rationality as the benchmark against which to demonstrate that actual people deviate in systematic patterns because they use heuristics and have biases.[68] However, they also loftily surmise that although game theory was useful as a stripped down theory of action well-suited to "an age of high drama: for anyone knew, the world might end tomorrow with a very big bang." Hence, "calculable moves and countermoves would safeguard a dangerously precarious balance"[69]. Their final observation is that "in retrospect, from a comfortable

61 Ludwig Wittgenstein, Philosophical Investigations, Oxford 1958.

62 See John Searle, Minds, Brains and Programs, in: Behavioral and Brain Sciences 3 (1980), pp. 417–457; John Searle, Rationality in Action (as in note 59); John Searle, Wittgenstein and the Background, in: American Philosophical Quarterly 48 (2011), pp. 119–128; John Searle, Insight and Error in Wittgenstein, in: Philosophy of the Social Sciences 46 (2016), pp. 527–547.

63 Erickson et al., How Reason Almost Lost its Mind (as in note 45), p. 30.

64 Amadae, The Computability of Rational Choice (as in note 53).

65 Alfred Church, A Set of Postulates for the Foundation of Logic, in: Annals of Mathematics 33 (1936), pp. 346–366.

66 Alan Turing, Intelligent Machinery. National Physical Laboratory Report (1948), in: Bernard Meltzer/Donald Michie (ed.), Machine Intelligence, Vol. 5, Edinburgh 1969, p. 7.

67 Erickson et al., How Reason Almost Lost its Mind (as in note 45), p. 159.

68 See Daniel Kahneman, Thinking, Fast and Slow, New York 2011.

69 Erickson et al., How Reason Almost Lost its Mind (as in note 45), p. 188.

distance and safe in the knowledge that the Cold War did not in fact erupt into the hottest war in human history, the drama looks more like a melodrama," and now we again have the "luxury" of "mindful reason"[70].

However, the Bulletin of Atomic Scientists has moved their countdown to midnight warning of precipitous danger nuclear war to 2.5 minutes, less time than ever during the Cold War. The threat of nuclear destruction is more worrisome than any time since the invention of thermonuclear weapons. Nuclear deterrence theory and strategic rationality remain as current as any time during the Cold War. Moreover, there is a renewed push to synthesize social science under the single umbrella of noncooperative game theory that would offer a "unified social ontology"[71]. All that exists in this social world is that which can be accounted for by game theory. Not only does this world creating endeavor reduce all normativity to the unintended 'solution' to interactions, *all* viewed games, but it also accepts the view that organized mental activity is no more than algorithmic computation. As nuclear command and control relies on hybrid systems of human and non-human actors, and artificial intelligence takes on an increasing role in mediating social relationships and even grounding human subjectivity, we are at risk of automating the social.[72]

4. Algorithmic Governance: Encompassing the Exception

Where Thomas, Erickson and Erickson et al. discuss game theory as a body of thought consistent unto itself, embodied by theorists, articulated in texts, and applied to specific concrete problems, Nicolas Guilhot and Alain Marciano examine this body of work as the invention of a science of decision-making crucial to the art of governing.[73] They pose the question, "why did decision-making become the central focus of political science and economics from the mid-1940s onwards?"[74] They offer the answer that "the initial context of the preoccupation with decision-making was a diffuse fear that liberal institutions and liberalism were not capable of meeting the challenges of the post war period"[75]. Here they draw on "Rationalizing Capitalist Democracy" to argue that mass politics run amuck, giving unrestrained voice to the demos, could have resulted in the twentieth-century version of the Enlightenment's terror, and sub-

70 Ibid.

71 Francesco Guala/Frank Hindriks, A Unified Social Ontology, in: The Philosophical Quarterly 65 (2014), pp. 177–201; Francesco Guala, Understanding Institutions. The Science and Philosophy of Living Together, Princeton 2016.

72 Coeckelbergh, The Automation of the Social (as in note 49).

73 Nicolas Guilhot/Alain Marciano, Rational Choice as Neo-Decisionism. Decision-Making in Political Science and Economics after 1945, in: Uskali Mäki et al. (ed.), Scientific Imperialism. Exploring the Boundaries of Interdisciplinarity, London 2018, pp. 117–140.

74 Ibid., p. 118.

75 Ibid., p. 119.

sequent anxieties over democratic will formation.[76] They put forward the bold argument that decision theory best reflects a meeting between Carl Schmitt's "decisionism" as the authority to address exceptional states beyond constitutional rules, and the Cold War invention of scientific and political rationalism. They argue that "rational choice [...] is better understood as a form of 'neo-decisionism' that thrived on the crisis of the traditional modes of legitimation of political decisions in liberal democracies"[77]. Contrasting with the appraisal of Thomas of modest innocence, and of Erickson along the lines of pluralism without a fixed orthodoxy, Guilhot and Marciano find that "rational choice was thus part of a wider attempt in the social sciences at not giving up completely on rationalism as the entire Enlightenment tradition was under attack"[78]. Thus, they concur with "Rationalizing Capitalist Democracy" that game theory, which is anchored by individual strategic choice, was useful for theorists seeking to "re-legitimate democracy and liberal institutions"[79], especially those of the free market.

Their innovation is to assess how game theory enables this by permitting that actors may have any preferences over outcomes that are only admissible as data to be aggregated into public policies. Where previously any exceptional decision that transcended the rule of law implied a constitutional crisis, game theory provided a means to ground a new approach to maintaining a constitutional order. Following the works of Nobel prize winning economists Kenneth J. Arrow and James M. Buchanan, the authors show how game theory provided a means of insisting that free choice must obey the constraints of economic rationality codified in game theory.[80] Citizens' sovereignty becomes consumers' sovereignty. Uncertainty is circumscribed by expected utility theory which permits that "acting decisively in uncertain situations is just as rational as acting according to existing laws in normal situations"[81]. Since one way of avoiding the paradox of a mass political constituency unable to form a coherent collective choice is to defer to an authority, a convenient dictatorship of expertise could be introduced as the means to maintain liberal democracies. To this end they observe that, "the result was a constitutional theory that was entirely built upon individualistic foundations, yet which included the decisionist figures of the dictator or of the general will, now justified in terms of economic rationality"[82].

76 See also S. M. Amadae, Arrow's Impossibility Theorem and the National Security State, in: Studies in History and Philosophy of Science 36 (2005), pp. 734–743.

77 Guilhot/Marciano, Rational Choice as Neo-Decisionism (as in note 73), p. 120.

78 Ibid., p. 125.

79 Ibid., p. 126. See also Amadae, Arrow's Impossibility Theorem and the National Security State, (as in note 76), pp. 734–743.

80 Ibid., p. 130.

81 Ibid., p. 131.

82 Ibid., p. 132.

Guilhot and Marciano help us to appreciate how game theory, and its application to law and public policy by the 1970s, moved far beyond the domains of pure mathematics, operations research, logistics, and military strategy to begin shaping individuals' lives through citizens' exposure to governance. Thus, their exploration resonates with "Prisoners of Reason" which argues that the world-constructing property of game theory that we should be most concerned about it its ability to shape institutions and laws through the active interventions of the legions of social and behavioral scientists employing its techniques. Game theory and technocracy fit comfortably together, and uncertainty is routinely transformed into quantifiable risk in order to generate regulative policies. Analysts tidily disarm exceptions using Bayesian statistics and simply updating our understanding of frequencies. Thus, if flooding occurs in a five-fold multiple beyond the single incidence predicted in a fixed, say one-hundred year, period then the probabilities of future such events can be recalculated to become a suitably lesser timeframe. This technocratic approach to public will formation respecting individualistic strategic preference satisfaction has by the dawn of the twenty-first century made accepting staunchly anti-liberal paternalism consistent with libertarianism in the new rational choice policy intervention referred to as either nudge or neopaternalism.[83]

In focusing on the problem of decision-making, possibly Guilhot and Marciano are not aware of just how closely they have hit the nail on the head in identifying a key feature of game theory. In its mathematical formalism von Neumann tacitly proposed a solution to the nagging *Entscheidungsproblem* that plagued early twentieth-century logicians and mathematicians. The problem was, given an axiomatic system of rules, how can one prove that it is complete and consistent in the sense that any well-formed proposition in accordance with the axioms can be decided to be true or false? David Hilbert, von Neumann and others worked on this problem, until Kurt Gödel proved that no axiomatic system sufficient to ground the mathematical system of real numbers can be demonstrated to be complete and consistent. More jarringly, he showed in fact that axiomatic systems are capable of generating well-formed statements that are formally undecidable, and hence exceptional. Given that game theory axiomatizes rationality, it is a testimony to von Neumann's ability to circumvent Gödel's incompleteness theorems that his formalism does not weigh into any theoretical imponderables. This is because decisions are over closed systems that have only a finite number of possible states over which actors express preferences. Rational choice demands that rational actors' preferences over finite sets of outcomes are complete and consistent.

Von Neumann's treatment of rationality has the additional feature of making rationality equivalent to computation, as both Erickson et al. and Amadae

83 Richard H. Thaler/Cass Sunstein, Nudge. Improving Decisions About Health, Wealth, and Happiness, New Haven 2008.

argue.[84] Thus, from individual choice to collective decision-making consistent with a technocratic means of forming public policies, rational choice can be captured by mathematical terms. In terms of the philosophy of language, symbols displace semantic meaning as the location of rationality.[85] As Erickson makes clear in his chapter "Rationality without Mind", about the application of game theory to evolutionary biology, von Neumann's view of rationality eviscerates the need for a conscious deliberating subject. Collective bodies are no different. Their decisions are not so much a matter of legitimacy and validity as they are of equilibria: procedures that result in stable social orders will be sustained into the next period of social reproduction, while those that are unstable will decay into chaos from which a new equilibrium may emerge.

Guilhot and Marciano provide a historical treatment that lays the groundwork for anticipating the present invention of algorithmic forms of governance. Decisions that formerly would have been in the hands of public officials with responsibility to the obligations of office and a political constituency are being outsourced to algorithms.[86] These are typically proprietary, and hence operate as a black box which only consultants can open. And, even then, many contemporary algorithmic decision processes use machine learning, so their programming evolves in unpredictable ways that is not fully understood by their human operators.[87] As they are produced by private and commercial service providers, they are created on a for-profit basis and there is no mechanism of accountability that is usual for public offices.[88] The two best-known cases to date are the use of credit scores to grant individuals access to loans, and of predictive software packages to make judicial decisions in criminal law.[89] Both are used actively in the United States, and have impact globally. Moreover as individuals increasingly procure goods and services over the internet which determines their relationship to corporations, the use of algorithmic decision

84 Amadae, The Computability of Rational Choice (as in note 53).

85 S. M. Amadae, Game Theory, Cheap Talk and Post-Truth Politics. David Lewis vs. John Searle on Reasons for Truth-Telling, in: Journal for the Theory of Social Behavior 48 (2018), pp. 306–329.

86 John Danaher, The Threat of Algocracy. Reality, Resistance and Accommodation, in: Philosophy & Technology 29 (2016), pp. 245–268.

87 Tal Zarsky, The Trouble with Algorithmic Decisions. An Analytic Road Map to Examine Efficiency and Fairness in Automated and Opaque Decision Making, in: Science, Technology, & Human Values 41 (2016), pp. 118–132.

88 Iyad Rahwan, Society-in-the-Loop. Programming the Algorithmic Social Contract, in: Ethics and Information Technology (2017), pp. 1–10.

89 Malcolm Campbell-Verduyn/Marcel Goguen/Tony Porter, Big Data and Algorithmic Governance. The Case of Financial Practices, in: New Political Economy 22 (2017), pp. 219–236; Peter Mantello, The Machine that Ate Bad People. The Ontopolitics of the Precrime Assemblage, in: Big Data & Society 3 (2016), pp. 1–11.

procedures with opaque accountability becomes a daily feature of human existence in developed countries.[90]

Algorithmic governance provides an exemplar of the ability of technocratic expertise to address the exception. Before computer learning had been invented, programmable systems were only capable of addressing cases that were predelineated by their source codes. Hence, an exceptional incident would necessarily bring the program to a halt, requiring human intervention. Whereas on the one hand it may simply seem like requiring a step in technological development to augment computational powers to address a novel, unprecedented occurrence, instead this problem resides deep in the history of decision theory, computer science, and the philosophy of logic that extends back to the early twentieth-century.

Alan Turing argued in the 1940s that "digital computers could reproduce human thinking", and he used the expressions "intelligence" and "thinking"[91] interchangeably. It is within the framework of the *Entscheidungsproblem* at the core of mathematics, that is how to decide the truth value of an axiomatically generated proposition, that Turing defended the position that if a computer could manipulate its own instruction set, then it would be capable of addressing exceptional, unanticipated eventualities. Given this malleability of the programming instructions that now characterizes some of the software used in algorithmic governance, "there [is] no limit to what the machine could 'learn' by changing its instruction tables"[92]. The take away point is that whereas prior to the invention of advanced machine learning, the ability to meet the challenge of the exceptional case was viewed as a unique feature of human agency, now that programmable systems seem capable of this, the line between human and computerized judgment erodes—or even permits artificial intelligence to surpass human judgment reduced to rational choice. As a result, experts with unique skills sets and knowledge bases make plausible arguments that outsourcing judicial decisions with ponderous impact on individuals' lives to automated processes will yield a superior outcome. Given the growing momentum behind a perspective on agency that by 1944 had already viewed rationality on par with computation, potential voices of critical scrutiny and possible resistance are relatively impoverished in comparison with the vast influx of resources into the sphere of hybrid human-AI networks and big data used to populate algorithmic governance tools.

90 Ben Wagner, Algorithmic Regulation and the Global Default. Shifting Norms in Internet Technology, in: Etikk i praksis-Nordic Journal of Applied Ethics 10 (2016), pp. 5–13.

91 Gualtiero Piccinini, Alan Turing and the Mathematical Objection, in: Minds and Machines 13 (2003), pp. 23–48.

92 Ibid., p. 38.

5. Conclusion: Worst-Case Planning as Self-Fulfilling Prophecy

It is marvelous to have four new sources addressing the advent of Cold War rationality to revisit the field covered by "Rationalizing Capitalist Democracy: The Cold War Origins of Rational Choice Liberalism". In touching on each of their historiographical strategies, the one I promote becomes clearer. Thomas reads his protagonists and their intellectual products charitably, and yet downplays that some of the rationality program's staunchest supporters had transformative visions of individual and collective decision-making. The rationality project extends from justifying nuclear deterrence to underpinning a theory of evolution in selfish gene theory.[93] Erickson grants game theorists the power of world creation, but suggests that their aspirations for a unified theory will fail now as before. Yet there is an orthodox position of noncooperative game theory and, despite nuanced disagreements among connoisseurs, this program has been vital to regulatory regimes, communication, drafting laws, and designing institutions around the world. Erickson et al. urge us not to worry because the Cold War and its nuclear threats are comfortable retrospective nostalgia, and we now have the leisure time to partake in more fully fleshed rational judgment than that demanded by expected utility theory and strategic competition. Yet nuclear threats exceed their former Cold War levels, and computational rationality is far more the norm now than ever before. Guilhot and Marciano point out that rational choice makes possible uniting Carl Schmitt's philosophy of the exceptional case , which routinely surpasses the constitutional order, with technocratic governance. Their analysis is on the right path, but may not fully realize just how far this unification has gone so as to render even the human technocrat a servant to the algorithmic judgments now routinely impacting citizens' livelihoods.

Without drawing too stark a conclusion about the Cold War legacy of decision technologies that are here to stay in company with the nuclear warheads they were originally developed to deploy, I view the implications of the rationality project as the product of a generation of mathematicians and social scientists who tackled the problems of their age to the best of their abilities. In this sense, as Thomas argues, their efforts were innocent, although, arguably, the invention of the nuclear warheads is not similarly blameless. These death technologies signify that given the orthodoxy of strategic rationality, we now live in a nuclear eternity: these weapons will either be used, or we must rethink the theoretical basis of nuclear deterrence. Erickson is correct that there is more diversity than unification underlying the first four decades of game theory. Yet a particular orthodoxy emerged privileging individual competition, exhaustive monetary valuation, norms as regular patterns of incentive-driven conduct, and rationality as computation rather than deliberation. Not even game theory's most fervent

93 Richard Dawkins, Selfish Gene, Oxford 1989.

supporters could have imagined the world creating power of this constellation of theoretical commitments underlying the reigning orthodoxy.[94]

To make sense of this historical outcome, I turn to Hans Blumenberg, possibly the greatest twentieth-century historian of ideas. In "The Legitimacy of the Modern Age", Blumenberg comfortably accommodates both historical context and the logical integrity of argumentation. He develops the novel thesis that cultural epochs are anchored by the organization of the theoretical commitments structuring agents' beliefs, and hence their possibilities for acting. He suggests that these epochs, such as medieval scholasticism and early modernity, are separated by a threshold, which he figuratively refers to as an *epochal threshold*. Living at the point of this threshold, one generation of intellectual leaders reacts to its predecessor, and yet moves into an intellectual, world-generating realm that is sufficiently distinctive to pass into a new era. Blumenberg concentrates on René Descartes and the secularization of modern philosophy as decisively differentiated from scholastic theology that pivoted on maintaining God's omnipotence. In short, scholastic theorists could only defend knowledge, *scientia*, insofar as God still was granted the total license to arrange existence according to God's every inclination. Thus, for early modern science to develop, it was necessary to construct an epistemological argument that avoided the charge of limiting God's ability to direct worldly affairs by human knowledge of the present and future. Science, that is predictive knowledge, entailed limiting God's power to act. Blumenberg argues that Cartesian doubt offered the basis for anchoring scientific knowledge because the premise of withholding judgment in a state of utter skepticism does not interfere with God's agency. The modern era hangs in the balance on the ability to sustain knowledge production capable of predicting the future without challenging God's omnipotence.

Blumenberg's method, and postulation of the epochal threshold, is nowhere more relevant than to the 1944 invention of the atomic bomb, and its division of history into the time when no single human action could destroy humanity, and our current period in which we live with the nuclear blade of Damocles as a clear and ever-present danger. Blumenberg's project is to understand how the legacy of Descartes and western Enlightenment science continues to govern modern theories and practices, notwithstanding the fact that its epochal threshold had already receded centuries into the past. He proposes that a dilemma from the past could subsequently be set into stone *even though the former preoccupation no longer poses a concern in contemporary theorists' lives*. Thus, the modern attempt to answer Cartesian doubt with a quest for certain knowledge was the legacy of the past concern to protect knowledge from the charge that humans were challenging God's role as omnipotent creator. Similarly, I argue that the 1940s trisection of computation, rational decision technologies, and worst-case planning to mobilize weapons of total destruction with the aim of achieving security, is precisely such a momentous threshold.

94 See Amadae, Prisoners of Reason (as in note 3).

Where Cartesian doubt is the Archmedian point between the medieval and modern era, the Prisoner's Dilemma marks the movement from Enlightenment science and knowledge production occurring in well-formed communities to post-modern equation of computation with intelligence and human freedom as consumption according to individuals' ability to pay. As Erickson observes, "The Prisoner's Dilemma game—initially dramatized by the mathematicians as a story of cops and robbers—came to stand in for the arms race, with superpowers deciding between whether to arm themselves further (confess) or to disarm (not confess)"[95]. Von Neumann is the Descartes of our time who replaced the question over how to have knowledge yet respect God's free will with that of how to achieve epistemic and ontological security. He turned to finitism as a solution to the collapse of mathematical foundations by rejecting the infinite openness of choice. And he proposed harnessing humans' destructive capability to the fullest extent possible finding security in worst-case planning. The embrace of the atomic bomb, the computational systems necessary to control it, and algorithmic governance, demonstrate a step beyond Friedrich Nietzsche's death of God to heralding humanity as its own deity of execution. Upon witnessing the unleashed power of the atom, referencing the God of the Bhagavad-Gita, Manhattan Project physicist Robert J. Oppenheimer uttered, "Now, I am become Death, the destroyer of worlds."

The nuclear threshold of immanent apocalyptic destruction stands in a narrower time band than that of the gradual Renaissance transition to modernity. It depended on mathematical genius riveted by the foundational questions of mathematics and logic in the early twentieth-century. These questions followed Descartes' footsteps in his the quest for certainty as the antidote for his extreme doubt. Signaling the end of the modern quest for certainty, Gödel's forever dismissed mathematicians' dreams of a secure foundation for pure reason. Von Neumann stepped into this fray unfazed, and he formalized a treatment of rationality that, by circumventing any questions of infinity, gave us a pure theory of rationality upon which to pin our hopes for geopolitical security that relied more on algorithmic judgment that on human discretion. The universe may be infinitely mysterious, but uncertainty leading to insecurity can be overcome by only considering limited possibilities and by securing for oneself the best-possible outcome in the worst possible world.

The finitism of von Neumann's solution to radical epistemic insecurity lingers on, past its 1940s solution to mathematicians' quest for axiomatic certainty, which was itself a legacy of the Cartesian Enlightenment project of modernity. While human imagination and higher mathematics can contemplate, and even formalize, infinities, the new breed of rationality consistent with computation is content with asserting the potential existence only of combinatorics of that which has already been experienced. Thus, rather than sailing on the sea of the

95 Erickson et al., How Reason Almost Lost its Mind (as in note 45), p. 164; Amadae, Prisoners of Reason (as in note 3), pp. 24–61.

infinite, von Neumann's tack from modernity to post-modernity built epistemic security on closed systems with limited possibilities. Ontological security is derived from worst-case planning, that accepts endless competition over fixed resources and threats of violence to make the best of a bad situation. This solution to achieving epistemic certainty and ontic security reduces human rationality to computation and accepts as permissible total annihilation.

We have crossed an epochal threshold from modernity to post-modernity. Yet I suspect that, as for the main figures in Blumenberg's history of modernity, few contributors to the rationality project themselves are aware that the conciliatory acceptance of forever living under the shadow of the mushroom cloud is a compromise. It was only made attractive as a settlement that rescued the Enlightenment project of modernity at the price of reducing humanity to computation and acquiescing to advanced civilizations' interminable and imponderable willingness to commit omniscide. Thus, Immanuel Kant's perpetual peace cedes to incessant strife, and Descartes' quest for certainty yields to satisfaction with the certainty that no one can dominate us without inviting everyone's destruction.