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**Some Like it Cold:**  
**Thomas Schelling as a Cold Warrior**

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Version 1.0

13 November 2006

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## 1. Introduction

In 2005, Thomas Schelling shared the Nobel Prize in Economics "for having enhanced our understanding of conflict and cooperation through game-theory analysis" with Robert Aumann. Schelling is certainly not a typical game theorist and has himself observed that he retails game theory without the mathematics (Mirowski 2002, p. 367). Indeed, game theorists such as Martin Shubik have criticized Schelling for inadequately understanding and applying the central theorems of game theory (Ayson 2004, p. 131). Others have countered that "Schelling's work shows that it is possible to be clear, precise, and logically rigorous without being overtly mathematical" (Dixit 2006, p. 228).

At the time of the Nobel announcement, Schelling was Professor of Economics at the University of Maryland. Even before completing his Ph.D. at Harvard University in 1951, he had worked for the U.S. Bureau of the Budget and the Economic Cooperation Administration in Europe. The latter involved negotiating for the European Payments Union as part of the Marshall Plan. Schelling worked on implementing the Marshall Plan with John McNaughton and U.S. ambassador Averell Harriman, who was later appointed Secretary of Trade by President Truman. Upon obtaining his Ph.D., he served two years at the White House and the Executive Office of the President, following Harriman. Here he moved from the foreign aid plan to the Mutual Security Program. While involved with foreign aid bureaus and working on negotiations, Schelling's attention became focused on the prevalence of bargaining situations. His governmental tour of duty was followed by five years at Yale University and thirty-two at Harvard University. While there, he served as a mentor to students who would later become very well-known, such as

Richard Nelson, Daniel Ellsberg, and Michael Spence. During this period, he also became an adjunct fellow of the RAND Corporation in 1956 and full-time senior staff member there in 1958-1959. He had been recruited by RAND to work on new strategic thinking, with intellectuals such as Herman Khan and Albert Wohstetter. Schelling's impressive curriculum vitae, including *The Strategy of Conflict* (Schelling 1960), *Micromotives and Macrobehavior* (Schelling 1978), and *Choice and Consequence* (Schelling 1984a), earned him a fellowship of the American Association of Arts and Sciences and a membership of the National Academy of Sciences, the latter of which granted him the National Academy of Sciences Award for Behavioral Research Relevant to the Prevention of Nuclear War. He further served as president of the American Economic Association as well as the Eastern Economic Association.

Schelling began in "traditional economist fashion" (Zeckhauser 1989, p. 156), focusing on central problems, advancing simple formulations, and describing his results in lucid and vivid language. Indeed, his academic career began in the area of international economics, and especially trade and tariffs. Yet, "[o]nce the vital game of survival in a nuclear age challenged Schelling's attention, mere economics could no longer contain him" (Samuelson in Zeckhauser 1989, p. 157). Along the way, he developed novel insights on a dazzling range of topics, stressing the applicability of his analysis to a broad set of actors and problems, including military strategy and arms control, energy and environmental policy, climate change, nuclear proliferation, terrorism, organized crime, foreign aid and international trade, conflict and bargaining theory, racial segregation and integration, the military draft, health policy, tobacco and drugs policy, child rearing, taxi driving, investing in the stock market, tax collecting, house buying and selling, voting,

playing charades, striking, price wars, traffic jams, kidnapping, daylight savings, etiquette, Lot's wife, selecting Miss Rheingold, as well as a variety of ethical issues in public policy and business, to name just "a few." In the process, he brought game theory to life through the use of lively and memorable examples and appeals to their relevance for the political, social, economic, and personal lives of people (Dixit 2006).

The Nobel Prize citation praised Schelling for showing that many familiar social interactions could be viewed as non-cooperative games that involve both common and conflicting interests. And it highlighted his efforts, dating mostly from the 1950s and 1960s, to apply game theoretic insights to an understanding of global security and the (nuclear) arms race. It further singled out *The Strategy of Conflict* (Schelling 1960), *Strategy and Arms Control* (Schelling and Halperin 1961), and *Arms and Influence* (Schelling 1966), and noted that the first of these has influenced generations of strategic thinkers.

Schelling is very much a product of the so-called Cold War regime of science organization and funding, as related in the second part of this paper. The story of Schelling's success in the area of military strategy and arms control is related in the third part of this paper. This prompted some to suggest that the Nobel Prize in Economics that Schelling received for his work on game theory in the 1950s and 1960s could have easily been the Nobel Peace Prize (e.g., Wright 2005). Yet, little is known about the crucial role he played in formulating the strategies of "controlled escalation" and "punitive bombing" that plunged the United States into war with Vietnam, which is the focus of the fourth part of this paper. Indeed, this has led some to argue that the dark side of Schelling

disqualified him for the Peace Prize, upon which he received the Nobel in Economics as a consolation prize (e.g., Kaplan 2005).

## **2. Cold War Regime**

A quick glance at science during the twentieth century, focusing mostly on the United States, allows one to identify three regimes (Mirowski and Sent 2002, pp. 10-32): (1) the proto-industrial regime from the start of the century until 1940; (2) the Cold War regime from World War II through the Cold War; and (3) the globalized privatization regime from 1980 until the present. During the first regime, colleges and universities were mostly focused on education and liberal arts. With most research and development taking place at a few large corporations, science was largely defined by the captains of industry and their managers. Science received little to no support from the government, reflecting the fact that Americans had great trouble coming to terms with the nascent idea of public funding for science. The Cold War regime on the other hand was characterized by a massive government presence in the planning and funding of science. More specifically, most federal funding for research and development was channeled through private corporations, thereby skewing the technological exploration in selected industries. At the same time, the government defended a “communal” approach to the appropriation of the fruits of subsidized research, as evidenced by its weak property protection and active antitrust policy. These arrangements came to an end due to the continued political and economic obstacles faced by government subsidies, the universities acting more and more like corporations, the globalization of science, and the collapse of the Soviet Union.

These developments ushered in what may be labeled the globalized privatization regime, characterized by increased privatization of not only research but also the teaching functions of the university. At the same time, corporations have been scrambling to reinvent contract research, supported by a more lenient antitrust policy as well as more stringent legal strictures on intellectual property.

As noted before, Schelling's contributions fit squarely within the Cold War regime. World War II stimulated the move in economics towards monism about beliefs, ideology, theories, models, and policy advice. During the war, heavy demands had been placed on economists to develop tools for solving policy problems. Sharing in the glory of the subsequent victory, economists emerged with a firm belief in the formalism that characterized neoclassical economics. While economics became associated with a certain tool-kit as opposed to a particular area of study, the formalism further supported economists' efforts to gain identity as a "national science," to achieve professional status. As Mary Morgan and Malcolm Rutherford (1998b, p. 19) note: "[T]he transformation into formal economics involved changes in language, form, and tools. This new style became a set of mores that reduced in itself the possibility of pluralism in economics."

To fully understand the transformation that took place, one must not only appreciate the changing nature of mathematics and mathematical economics, but also the multiple dimensions of the process that ushered in the Cold War regime. While there had been a focus on personal qualities and attitudes of economists during the interwar period, objectivity came to be associated with a particular set of methods, namely mathematics and statistics, after World War II. At the same time, economists gradually moved away from advocacy. The success of the new set of methods with which neoclassical

economists came out of World War II instilled in them a belief in the ideas behind them. Simultaneously, American society moved from a desire for economic intervention towards support for free markets and open competition.

During the Cold War period, the technical turn in economics was intensified as a result of a continued narrowing in the range of beliefs, an additional tightening of acceptable ways of expressing them, and open prosecution during the McCarthy period. Morgan and Rutherford (1998b, p. 24) conclude that the rise of the Cold War regime took place “within structures involving patrons and hierarchies operating within the context of a political and economic society that supported calls for economic intervention in the interwar period and for free markets in the postwar period.”

Schelling was very much witness to the massive government presence in the planning and funding of science that occurred during the Cold War regime as a result of his close ties with the RAND Corporation and the Department of Defense, as elaborated in the following section. He further very much benefited from the transformation into formal economics that occurred at the same time. Indeed, he employed the new insights when formulating advice concerning strategic policy problems, to which we now turn.

### **3. Success Story**

Sharing in the postwar glory of rational choice theory, Schelling became a key contributor to rational defense strategy. Indeed, postwar international economic policy and military questions were intertwined. Schelling had learned about bargaining as a trade negotiator in international conferences dealing with U.S. foreign aid. This inspired



him to see war as an especially violent form of bargaining. According to Schelling (1960, p. 8) strategy's theoretical development had been retarded because "the military services, in contrast to almost any other sizable and respectable profession, have no identifiable academic counterpart." This changed in large part due to Schelling's efforts. As a result, he played a defining role in shaping the ideas underpinning the "golden age" of security studies, stretching from 1955 until 1965 (Ayson 2004; Baldwin 1996). This period was dominated by nuclear weaponry and related concerns, such as arms control and limited war. The central question was how states could use weapons of mass destruction as an instrument of policymaking, given the risk of any nuclear exchange. At the time, inspired by a need to address the nuclear challenge and a concern about the erosion of the advantage of the United States, a replacement was needed for the Eisenhower Administration strategy of "massive retaliation." And this was found in Schelling's focus on "limited war".<sup>1</sup> This concept was later adopted by President Johnson and Defense Secretary Robert McNamara during the early years of the Vietnam War, as discussed in the next section.

Schelling's insights became known as rigorous, innovative, and clever. As a result, he had a profound, pervasive, and enduring influence over strategic discourse. Indeed, he was a leading figure among the American "defense intellectuals" during this so-called golden age. At the same time, he was criticized for developing ideas that were perilously lacking in the mud, blood, and local political determinants of real history. Indeed, he rarely considered specific weapons or historical battles. As we will see in the

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<sup>1</sup> See Philip Mirowski (2002, p. 368): "[R]ejecting the previous Air Force doctrine of massive nuclear retaliation, [Schelling] rendered the concept of 'limited war' palatable, and the pursuit of 'arms control' just another strategic move in a game of threats and counterthreats."

next section, this came to haunt him during the Vietnam War. For now, let us stick to the story of Schelling's success. Schelling studied war at the RAND Corporation, where he spent some time in the late 1950s. Specifically, in 1956 he joined a discussion group of RAND on the East Coast. As a result of spending the summer of 1957 at RAND, he became increasingly drawn into the study of military problems. And he considered his year at RAND in 1958-1959 the most productive and instrumental single year of his career, inspired by the company of other strategic thinkers. In Philip Mirowski's (2002) opinion, Schelling is "the most successful popularizer of the RAND doctrine that game theory was chock full of perceptive insights about military and social organizations" (p. 330).

RAND, which stands for **R**esearch **A**nd **D**evelopment (or, as some insiders would have it, **R**esearch **A**nd **N**o **D**evelopment),<sup>2</sup> became operational in 1946 as a subsidiary of Douglas Aircraft under contract with the Air Force. Amidst concerns on the part of Douglas Aircraft regarding conflicts of interest in procuring contracts, the RAND Corporation became independent in 1948, though it continued to be funded largely by the Air Force until 1962 (Hounshell 1997, p. 265).<sup>3</sup> According to Hounshell (1997), "RAND sought to build a 'science of warfare,' whereby the overall performance of the Air Force could be optimized" (p. 244). Moreover, the Air Force's strategy to donate large sums of money for this endeavor was not without results, as suggested by head of the RAND computer science department Paul Armer: "I think a good deal of RAND's success in the

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<sup>2</sup> See Richard Bellman (1984, p. 134): "A common joke is that it really stands for 'Research and No Development'." Bellman (1984, p. 134) actually writes that the letters stand for "Research and New Development" and Simon (1991, p. 115) believes RAND is the acronym for "Research and National Development."

<sup>3</sup> Starting in 1956, RAND began diversifying its sponsorship mostly with contracts from defense and defense-related agencies (Edwards 1996, p. 115).

early days was due to the research philosophy of the Air Force, which said to RAND management, ‘Here’s a bag of money, go off and spend it in the best interests of the Air Force’” (Armer in McCorduck 1979, p. 117). This bountiful budget enabled RAND to attract the top of the research crop.<sup>4</sup> For its researchers, RAND had “the advantages of a university, namely freedom of choice in research and smart colleagues to do it with, and none of the disadvantages of straitened budgets or burdensome teaching” (Newell in McCorduck 1979, pp. 118-119).

Jardini (1996) notes that “RAND’s situation within the national security complex and its military sponsorship had profound effects on the nature of its intellectual products” (p. 6). The independent and interdisciplinary research at the RAND “think tank” contributed to cyborg fields such as computer and software design, materials science, space systems, and systems analysis (Jardini 1996, p. iv). It concentrated on such problems as launching and orbiting artificial satellites, using atomic fission in airplane propulsion, maximizing the performance of airplanes, developing titanium and other advanced materials, and evaluating the damaging effects of nuclear bombs (Hounshell 1997, p. 242).

Alain Enthoven joined RAND at the same time as Schelling, in 1956, and participated in continuing studies on U.S. and NATO defense strategies. In 1960, he moved to the Department of Defense, where he held several positions leading to appointment, by President Johnson, to the position of Assistant Secretary of Defense for Systems Analysis in 1965. About Schelling, Enthoven noted: “He contributed many insights about the logic of threats, what makes them credible and effective versus

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<sup>4</sup> In fact, the salaries at RAND were roughly fifty percent higher than their equivalents at universities (Edwards 1996, p. 116).

incredible and ineffective. I associate him with an emphasis on the importance of such qualitative distinctions as nuclear versus non-nuclear weapons, our territory versus their territory, and the like” (Enthoven in Zeckhauser 1989, p. 159).

Like Enthoven, Schelling also had close ties with the Department of Defense, as elaborated further in the next section. Beginning in 1958 and continuing for the next thirteen years, Schelling and others ran at least a dozen so-called political exercises (Allen 1987, pp. 151-153). In 1961, for instance, he ran political exercise-style games in the basement of the Pentagon under sponsorship of the Cold War Division of the Joint War Games Agency of the Joint Chiefs of Staff, which became SAGA and then today’s JAD (Mirowski 2002, p. 369). Also in 1961, the Pentagon sponsored several huge war simulation games at Camp David that were run by Schelling, known as “the Berlin games” (Allen 1987, p. 241; Kaplan 1983). Participants included John McNaughton, Henry Kissinger, Alain Enthoven, and national security advisor McGeorge Bundy, some of whom we encounter again in the next section. Though Schelling created provocative scenarios, he could not get a war started and could not get either side to consider seriously the use of nuclear weapons.

The foundations for a general theory of strategy developed by Schelling, as alluded to before, consisted of nuclear deterrence, crisis management, limited war, arms control, and coercion and compellence. His unique contribution involved viewing strategic situations as bargaining processes. Let us explain. Focusing on the stand-off between the United States and the Soviet Union, Schelling observed that the two super-powers had both shared and opposing interests. Their shared interests involved avoiding a nuclear war, while their opposing interests concerned dominating the other. As a result,

conflict and cooperation became inseparable. While the essence of crisis is its unpredictability, Schelling's theory of "salience" explained that settlements will tend to occur at certain prominent points that focus the expectations of both parties, known as focal points. In game theory, these are used as a device for equilibrium selection.

Schelling focused in particular on how the United States and Soviet Union could arrive at and stick to bargains by means of deterrence and compellence. The former involved dissuading the other from doing something, while the latter referred to persuading the other to do something. With deterrence, the opponent must be persuaded that the costs outweigh the benefits of an action, while with compellence, the opponent must be convinced of the reverse. Deterrence and compellence are supported by means of threats and promises. Threats are costly when they fail and successful when they are not carried out. Promises are costly when they succeed and successful when they are carried out. Since the exploitation of potential force is better than the application of force, it is key to use threats and promises while avoiding to act upon these.

The challenge is to communicate threats and promises in a credible manner. Indeed, the credibility of threats and promises, Schelling argued, is central to nuclear deterrence and control of the arms race. And here he developed some counter-intuitive results. For instance, apparent irrationality, recklessness, or unreliability turn out to be a good way to achieve credibility and can therefore be strategically rational. For instance, when a country makes a threat that would be irrational to carry out, Schelling argued, its credibility could be enhanced if the country appears to be irrational. In addition, a country may be better off by limiting its choices in advance, known as precommitment. The tactic of physical irrevocable commitment shifts the burden of initiating violence to the

opponent. Moreover, a country needs a credible second-strike capacity to deter a pre-emptive first strike. In other words, a country needs its missiles to survive such an attack. Hence, populations are better protected by protecting missiles. In other words, the ability to hurt people is conducive to peace, while the ability to destroy weapons increases the risk of war. Such counter-intuitive insights became known as the paradox of deterrence. Since deterrence is never fully credible, the best deterrent might involve precommitment, some element of randomness, or a partly crazy leader. Indeed, Schelling briefly served as an advisor to the filmmaker Stanley Kubrick, the director of *Dr. Strangelove*.

Schelling devoted the better part of two decades to understanding the great power confrontation between the United States and the Soviet Union in terms of deterrence, stability, and the like. He interpreted stability as a balance of deterrence. And his insights on the stability of a system fit right in with the systems analysis approach for which RAND became so well known. A strong critic of the doctrine of massive retaliation, Schelling appealed to game theory to make limited war appear almost casual. His insights cast a new light on crises in the early 1960s such as Berlin and Cuba and further inspired the United States approach to conducting the limited war in Vietnam, as elaborated in the next section.

Schelling has been criticized on at least four points (Williams 1991). First, he appears insensitive to ethical considerations. Second, he lacked deep historical knowledge. Third, he was more concerned with maximizing coercive impact than with minimizing risk. Finally, the assumptions of artificial “strategic man” have been found to be problematic. Some of these criticisms had serious repercussions, to which we now turn.

#### **4. Glory Gone**

Schelling's role in the Vietnam War casts a dark shadow over the success story related in the previous section. In fact, some hold him responsible for plunging the United States into war with Vietnam (Ayson 2004; Freedman 1996; Kaplan 1983; Kuklick 2006). The story starts with the Gulf of Tonkin Incident in August 1964, during the first year of Lyndon B. Johnson's administration. The Tonkin Incident was an alleged pair of attacks by North Vietnamese gunboats on two American destroyers. It resulted in the passage of the Gulf of Tonkin Resolution, which granted the President authority to assist any Southeast Asian country whose governments were in jeopardy. For Johnson, it served as a legal justification for introducing American troops into the Vietnam War, which had begun in the late 1950s. The Gulf of Tonkin Incident, then, defined the beginning of large-scale involvement of U.S. armed forces in Vietnam. Johnson ordered a series of "retaliatory" air strikes against North Vietnamese installations for the stated purpose of discouraging further "Communist aggression." The Tonkin Gulf bombing executed by the President was a prime example of rational signaling. This returns us to Schelling, who is best known for his conception of limited war as a form of signaling and who had many ties to the Department of Defense.

When Paul Nitze became Assistant Secretary of Defense for International Security Affairs in the winter of 1960-1961, he made Schelling a job offer as his arms control deputy in the Department of Defense (Kaplan 1983; Kuklick 2006). Averell Harriman, whom we encountered earlier as a colleague of Schelling during the Marshall

Plan implementation, already worked as Nitze's assistant. Schelling declined, however, but recommended his colleague and friend John McNaughton, who was professor of law at Harvard University, instead, promising to advise the latter on weapons and strategy. Schelling and McNaughton had been friends from the late 1940s when both were helping with the administration of the Marshall Plan in Paris. McNaughton subsequently became Defense Secretary Robert McNamara's general counsel and chief aide on arms control. He later succeeded Paul Nitze as Assistant Secretary of Defense. Indeed, he was one of McNamara's closest advisors on the Vietnam strategy. As noted by Sonja Amadae (2003, p. 60): "McNamara found in Thomas Schelling a likeminded individual, similarly committed to rational analysis, who could provide him with the counsel and methods he required to run the defense department." In addition, Schelling's former student Daniel Ellsberg, a bargaining expert like his mentor, was on duty in the Pentagon during the Tonkin Incident. He further noted that he "hadn't realized how close Kissinger and Schelling were too" (Ellsberg 2002, p. 234). Ellsberg, of course, later became famous for making the so-called Pentagon Papers public (Ellsberg 2002).

Planning to step up military action against North Vietnam in response to the Tonkin Incident, Schelling's concept of coercive warfare shaped the resulting strategy of "controlled escalation" and "punitive bombing" (Kaplan 1983). Especially John McNaughton wanted to control force rationally. There was a great interest in the Department of Defense to intimidate the North by means of an escalation of the conflict. Afraid of a repetition of North Korean errors in Vietnam, national security advisor McGeorge Bundy asked McNaughton and Schelling to develop a gradual strategy. McNaughton was aware that air power was the logical instrument for prompt results.



However, he struggled with the question as to what kind of bombing campaign would best ensure that the North Vietnamese picked up the proper signals and responded accordingly. It was with this question that he approached his friend and former colleague Schelling. The latter reasoned that a bombing campaign should not last more than a few weeks. Yet, in the end, he had difficulty coming up with a single plausible answer to the most basic of questions with which McNaughton confronted him. In Robert Kalpan's (1983, p. 335) opinion: "Thomas Schelling, when faced with a real-life 'limited war' was stumped, had no idea where to begin."

Operation Rolling Thunder was the code name for the U.S. military campaign inspired by Schelling. Started in March 1965, it was the first of three sustained bombing campaigns against North Vietnam, followed in 1972 by Operation Linebacker and Operation Linebacker II. By then, however, Schelling had backed off from the Vietnam War. The objectives of Operation Rolling Thunder were to destroy the will of the North Vietnamese to fight, to destroy their industrial base and air defenses, and to stop the flow of men and supplies down the Ho Chi Minh Trail. Afraid the war might escalate out of hand, Johnson and McNamara micromanaged the bombing campaign from Washington. However, the Schelling-inspired policy of "graduated response" meant that more targets were incrementally authorized for attack. Yet, whereas Schelling had told McNamara that the campaign should be given three weeks to produce results, the situation was bad and deteriorating. Still, Schelling testified on behalf of the administration in the U.S. Senate about the development and use of rational policy tools throughout the U.S. Department of Defense in 1968. Convinced that airpower could not win the war, Johnson ended Operation Rolling Thunder on October 31, 1968, just prior to the 1968 Presidential

election. And Robert McNamara left his post as a result of the failure of the bombing campaign.

Unfortunately, Schelling had postulated a purity about war that it does not have. Hence, in addition to the limitations of the theory, he misconceived the factual substance of the affair in the Tonkin Gulf and the intricacies involved in the subsequent Operation Rolling Thunder. Disillusioned, he turned his attention away from war. During the mid-1960s, interest in national security matters faded, partly due to the United States disaster in Vietnam. Also, the urgency of the situation was tempered. And researchers had nearly exhausted the possibilities for developing the theory from the problems of the nuclear age. Indeed, in 1970 Schelling joined a group of Harvard scholars who resigned as consultants in protest against the United States invading Cambodia. When he ceased to be a government consultant, his access to classified information and to an always interested audience was cut off. Though now a critic of the invasion in Cambodia, Schelling had been crucial in the development of the policy. Moreover, unlike Ellsberg and McNamara, Schelling never apologized for not reflected on his role in the Vietnam War.

## **5. Concluding Thoughts**

Wars have winners and losers. Though this insight hardly requires an academic analysis, the fact that science has been on the winning side of the (cold) wars during the past century, does offer plenty of food for academic thought. As World War I approached, the military commenced funding scientific research aimed at advancing military inventions.

During World War II, the development of radar and nuclear weapons produced an unparalleled position of prestige and power for the sciences. During the Cold War period, these developments were extended and intensified through a massive growth of military funding for the sciences.

The twentieth century (cold) wars have influenced not only the context of science but also the content of research. For instance, the emergence of a military-university and military-industry complex may be observed in the aftermath of World War II. In the context of this so-called Cold War regime, the goals of scientific research included the winning of the Cold War and the administration of high profits to defense and defense-related industries.

And it was within this context that Schelling rose to prominence as one of the leading strategy experts. In developing his insights, he relied heavily on game theory. As a result, he became one of the main players in efforts to use game theory to tackle real-world problems. Yet, Schelling struggled with the fact that the fit between theory and practice was not as good as it may at first have seemed. While theory may observe an unambiguous pattern, practice evidenced a confusing chain of events. Whereas Schelling had laid bare the inherent logic of coercive bargaining, he discovered that the real world cannot be expected to conform closely to deductive logic. In the opinion of Phil Williams (1991, p. 120): “Schelling engaged in cerebral exercises in violence that were so elaborate that they overlooked practical constraints.” At the same time, he was certainly not unusual in his efforts, as noted by Fred Kaplan (2005): “The dark side of Thomas Schelling is also the dark side of social science — the brash assumption that neat theories not only reflect the real world but can change it as well, and in ways that can be precisely

measured.” Indeed, the social sciences continually struggle to find a balance between offering precise predictions and capturing the complexity of social interactions. And during the Cold War period the balance often tipped in favor of theory as opposed to practice. However, problems loomed large on the theory side of the scale as well.

As elaborated by Abu Rizvi (1994, 1998), there were many frictions within the Nash program. First, the folk theorem illustrates the (very real) possibility of encountering multiple equilibria in repeated games. Second, intuitively unreasonable equilibria may be selected in the finitely repeated prisoner's dilemma game, the chain store paradox, and the centipede game. In these games, the standard game-theoretic solutions yield results that are considered quite unintuitive. This fact has prompted game theorists to consider the appropriateness of the basic solution concepts. Finally, under certain conditions, theorems concerning the non-existence of trade and the impossibility of "agreeing to disagree" about an event have been proved for Nash equilibria. Moreover, speculative trade cannot be explained as an outcome of different information structures.

It could be argued that one response of game theorists to these problems has been to incorporate bounded rationality. First, bounded rationality functioned as a dynamic for selection among multiple equilibria by promising to “refine” equilibria. Moreover, the evolutionary stable strategy concept of evolutionary game theory may be viewed as a further refinement of perfect equilibrium, one of the most common notions used to refine the Nash equilibrium. Second, bounded rationality has been used to rule out unintuitive equilibria in the prisoner’s dilemma game, the chain store paradox, and the centipede game.

The responses to the problems associated with game theory have led Schelling's fellow Nobel Laureate Robert Aumann (1997, p. 8) to note: "You must be super-rational to deal with my irrationalities ... Thus, a more refined concept of rationality cannot feed on itself only; it can only be defined in the context of irrationality". And with his co-author Sylvain Sorin, Aumann further commented that "rationality in games depends critically on irrationality" (Aumann and Sorin 1989, p. 37). And this reminds us of Schelling's observation that apparent irrationality turns out to be a good way to achieve credibility and can therefore be strategically rational. Perhaps he should have been aware of his own irrationality when attempting to apply use game theory to tackle the intricacies of the Vietnam War.

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