1. About Rationality, Delusion, Theory, and Life

At midnight on December 20–21, 1954, the world was on the verge of destruction. So believed the homemaker Dorothy Martin of Chicago and so, to the very bottom of their hearts, did the supporters and admirers who packed her home. These cultists had forgone property, jobs, careers, and family ties to confront the ghastly fate that awaited the world at that moment. A flying saucer from the imaginary planet Clarion was about to extricate these cultists, and them alone, from Planet Earth.

The famous social psychologist Leon Festinger and his colleagues Henry Riecken and Stanley Schachter managed to infiltrate the group of these believers in the “end time.” Their purpose was to see how the cult members would respond after their faith collapsed. The response gave rise to the concept of “cognitive dissonance,” a fundamental in modern social science ever since. As it transpired, the group members’ faith only grew stronger after their prophecy failed. They found an explanation at once: the fervor of their belief had triggered “divine intervention” that had saved the world’s population. In their book *When Prophecy Fails,* Festinger and his associates gave Dorothy Martin the alias “Marian Keech.” Until then, Ms. Keech had avoided all contact with the media. Immediately after the prophecy flopped, however, she initiated countless interviews in which she brought the gospel of the salvation to the masses: the world had been saved by the divine light that her coterie of admirers had spread.

In 1959, Leon Festinger and James Carlsmith reported a relevant experiment on the topic. A number of students took part—each separately—in a particularly boring experiment. After it was over, its supervisor turned to one experimenter and asked him to explain to another potential experimenter how interesting it had been. Namely, he was asked to tell a bare-faced lie. Twenty students were promised $20 for carrying out the mission of dissimulation; twenty others were offered one dollar only. The cognitive dissonance stemmed from the contradiction between the students’ values (“It’s not nice to lie”) and their conduct (lying for pay). After fibbing as instructed, the students were interviewed. Those who had received the larger payment tended to admit that the experiment had not been interesting and the worse-paid were predisposed to say the opposite. The latter also tended to affirm their willingness to participate in a similar experiment in the future. The tension between values and behavior was attenuated among the better-paid. A twenty-dollar payoff ostensibly justified the falsehood. Among the poorly recompensed, in contrast, the dissonance persisted; they convinced themselves of the falsehood and told additional lies. Symbolically, Festinger and Carlsmith’s article was first published in the *Journal of Abnormal and Social Psychology*.

The phenomenon of denying and repressing reality when it clashes with a firmly held belief is typical not only of oddball homemakers. It seems to typify humankind at large (and, perhaps, the inhabitants of Clarion as well). One of the great philosophers of science, Karl Popper, coined the term “the falsification principle.” A body of knowledge that cannot be refuted no matter what is not a science, Popper argued, citing religion, Marxism, and psychoanalysis as examples. Adherents of these theories, Popper claims. will never accept evidence that disproves their belief.

Many political prophets in our environs never cease for a moment to put forward their visions. For safety’s sake, they accompany their cocksure pronouncements with an ostensibly modest admission: “Since the day the Temple fell, prophecy has been given to fools.” Seemingly, however, the most common preface that experts utter is “As I said...,” because, of course, “Who are wise? Those who have foresight!”

Dorothy Martin, pseudo-scientists, and political pundits have two alternatives: to retreat into silence and plunge into the depths of oblivion or to take the risk of disseminating their teachings in order to earn a chance to achieve of everlasting glory. They may perceive the expected utility of spreading their word as greater, particularly if they really believe their prophecies. But even if they entertain gnawing doubts, the failure of their predictions will spawn two new alternatives—to admit that they were wrong or to lie. The latter option has more expected utility, especially if the liar manages to fool him/herself as well. This is what happened, for example, to some of Festinger’s and Carlsmith’s students, who were inadequately remunerated for spreading their falsities. And if fooling oneself fails, the option of wallowing in delusion is always there. John Nash often explained that even when he was in his professional prime, he always struggled to avoid conventional thinking as best he could. In other words, unconventional thinking is more hazardous than taking the straight and narrow line but its expected utility is sometimes much greater.

Truth to tell, the interpretation that game theory appears to derive from Dorothy Martin’s apocalyptic tale, Festinger’s and Carlsmith’s experiment, and the mobilization of John Nash’s explanations in favor of this interpretation is rather dubious. Game theory is a branch of mathematics, a pronouncedly empirical-behavioral-inductive form of investigation. The great philosophers of science invested much discussion in the *problematique* of bridging these two worlds. Some, like Karl Popper, reasoned that the theory, like the hypotheses derived from it, was doomed to precede its examination. Some, like Thomas Kuhn, believed that empirical findings not only corroborate or revise theories but may trigger scientific revolutions. Caution in breaching the boundaries between the domains is desired, but a total disconnect is tantamount to blocking creativity.

Many consider game theory the spearhead of “rational thinking.” After all, it centers on our craving for maximum utility under given conditions. As we have seen, game theory is very liberal in defining utility. A “measure of utility” is subjective, accurate at a given moment, inured to problems flowing from pretensions to “objectivity” that originate, for example, in comparing different players’ utilities, and even flexible in its definition of “zero utility” (since this, after all, is the meaning of “indifference to positive linear transformations”). Just the same, on several occasions when asked about his illness, John Nash explained that rational thinking “imposes a limit.” In his biographical statement for the Nobel Prize site, he says:

[Some] could think of Zarathustra as simply a madman who led millions of naive followers [...].But without his “madness” Zarathustra would necessarily have been only another of the millions or billions of human individuals who have lived and then been forgotten.

For better or worse, adherence to the “rational frame” of game theory does seem to raise several problems.

* Absolute freedom and flexibility in measuring utility may impart a rational overlay to priorities that a “reasonable person” may see as verging on madness. Any of us can offer a detailed review of other people’s weird priorities. It is hoped that many of us can subject our own “utility measurement” to critical inspection. Who among us has never preferred a “rotten and inedible apple” over an “exalted work of art”? We regularly identify with “irrational” decisions.
* Matters that game theory considers irrational can often be understood by ordinary people. Should we really and constantly render harsh judgment on a player who holds most dear something that allows him or her to trounce a rival in an “at-any-price” game even though it does not maximize his or her utility? Are we really unable to understand someone who stalks out of negotiations empty-handed after turning down $20 as against $80 given to the other because she was sure she was entitled to at least half of the $100 in the pot? Generations of eminent authors have secured our full empathy with “vengeance stories.” The unequivocal answer in game theory is that aspirations to revenge and the like may definitely be central in calculating utility.
* Basic rules for the mathematical treatment of decision problems do not always seem reasonable to the average person. One person may accept a utility point that offers certainty or may gamble by tossing a coin for no utility points or for two. Another may accept 101 certain utility points or gamble on 100 or 102 points by tossing a coin. Are the problems the same? In terms of game theory, the answer is yes. Ordinary people, however, do not seem to accept the “indifference to positive linear transformations” condition. Most of us yearn to grasp the “zero point,” above which values are positive and under which they are negative. It is the distance from the zero point that influences us. The binary of positive values and negative values is critical for most of us. It demonstrates one of the reasons for the difference between game theory and Tversky’s and Kahneman’s prospect theory. All the more is this the case for the many of us who dabble at lotteries and the many others who avoid such games even if tempted by their “expected utility.”
* There is no way of determining priorities and measuring the utility of the “axioms” that form the mathematical proofs of game theory, such as Van Neumann’s minimax theorem, Nash’s solution of the “bargaining problem,” or Arrow’s theorem. On the one hand, too many axioms may render any problem unsolvable. On the other, some axioms have established themselves as unchallengeable; examples are “transitivity,” “indifference to irrelevant alternatives,” and “indifference to positive linear transformations.” The axioms that we use are up or down, yes or no. There is no “maybe,” “more than,” “less than,” and so on.
* Most “decisions” made by the high-and-mighty and by simple folk do not emerge from exacting calculations of utility—and that’s a good thing. The title of Dan Ariely’s bestseller, *Predictably Irrational,* attempts to make this point*.* Would we want a driver who spots a child jumping in front of her car to calculate “expected utility” before slamming on the brakes? Would we want a maiden, offered an engagement ring by a knight, to weigh her available alternatives with painstaking care as the genuflecting knight impatiently awaits her response? ... In such cases, one gains more utility by refraining from calculating expected utility than by doing the calculation. Below we elaborate on Robert Aumann’s important reference to this matter.

The controversies over the essence and value of game theory remind us of disputes that have accompanied humankind and science since time immemorial. How valuable are theories and models? Theories, after all, do not accommodate “all factors.” Even if a theory identifies cause and effect accurately and even if it can predict an outcome down to the last detail, the question remains: What “caused the cause” that yielded the effect? Such questions will always touch upon philosophical or creedal ruminations about “ultimate causes.” The use of models is even more problematic. A successful model is one that amazes us with its simplicity (its “algorithm”) and gets to “the root of it.” To a large extent, game theory may be construed as an orderly and exacting collection of mathematical models. The brilliant analyses of the heroes of game theory defy all argument. These models, however, deal not with a “relatively simple” reality such as one in the natural sciences but with human reality and relations among decision-making units, each carrying nearly a hundred billion multiconnected nerve cells in its brain. We question the importance of game theory due to the yawning gap that exists between the precision of mathematics and the infinite complexity of the human reality with which game theory deals. “Formalists” arch their eyebrows as they observe the pretentions of “behavioral economists” who closely track, by means of sage empirical studies, the regularity of the gap between the behavior of mortal beings and the rational recommendations of game theory.

In 2015, George Akerlof and Robert Shiller, Nobel laureates in economics in 2001 and 2013, respectively, co-published a challenging book in which they claimed that the modern market economy is based foremost on marketing and advertising maneuvers that deliberately and very successfully exploit biases—identified by behavioral economists—in consumers’ rational considerations. The subtitle of their book, “The Economics of Manipulation and Deception,” reflects its contents. The book is packed with examples both amusing and depressing. Milk and eggs, the most prosaic of commodities, are placed at the far end of the supermarket. You have to walk a long way to get to them and pass enticingly stocked shelves as you advance. The consumer isn’t you but rather someone whom the authors call “the monkey on your shoulder.” The monkey who dictates your imagined needs is the creation of marketers and advertisers who exploit the findings of behavioral economics. As the late comedian George Carlin once stated, America has become “a big [...] shopping mall,” where people run around clutching little plastic cards and “buying things [...] spending money they don’t have on things they don’t need.” The laissez faire economy is an optimal mechanism but the market is composed not of consumers but of monkeys.

In 2019, Robert Aumann published a highly important book that proposes a synthesis between the behavioral economics of the Daniel Kahneman and Amos Tversky school and traditional conventional economics, of which game theory has become a fundament. Aumann—a formalist mathematician—reviews the findings of those in the behavioral camp empathetically. Conventional economics, he claims, is underpinned by the assumption that actions are taken rationally. Namely, in any given situation, decision-makers choose to do things that maximize their utility. The findings of behavioral economics appear to challenge this assumption, demonstrating by means of surveys and experiments that decision-makers do not calculate utility but rather act by rules of thumb—“biases” or “heuristics”—that sometimes lead to blatantly bad outcomes. Aumann, however, claims that even though decision-makers do act by rules of thumb and not utility calculus, these rules almost always lead to desired outcomes. The exceptions emerge from unusual or artificial scenarios. In other words, the *rules* are rational even though, on rare occasions, they can induce irrational *actions.* Hence we obtain the term “*rationality of rules,*” which embodies the synthesis that Aumann proposes.

For example, causing a negotiating session to collapse after receiving a humiliating ultimatum is definitely rational even though it results in an immediate loss of utility. This is because it deters others from invoking humiliating behavior in the future, thus yielding maximum utility in the long run. The negotiations topple not due to a conscious intention to deter but as the product of insult, vengeance, self-respect, and so on. These ostensibly irrational feelings yield a rule of thumb, expressed as “Don’t let others humiliate you,” that almost always delivers utility over time. In a famous trial, experimenters seated two subjects in different rooms and let them negotiate (by means of computers). Unlike real negotiations, however, each subject was totally anonymous. It is obvious that, in such a situation, one cannot create deterrence by torpedoing the negotiations because no one knows who fired the torpedo and the game has no continuation. Therefore, the collapse of the negotiations inflicts only an immediate loss on the party responsible for the collapse. Nevertheless, nearly all subjects who received the humiliating ultimatum responded by calling off the negotiations. It turns out that instead of calculating utility, they behaved by a rule of thumb: “Don’t let others humiliate you.” Such a rule is almost always optimal—but not in the contrived environment of this experiment.

Aumann reviews several classic experiments in behavioral economics in which the subjects acted irrationally. He shows that in each of these experiments, the environment was artificial and the subjects acted under the impetus of a rational rule. His explanation is that rules of behavior do not emerge *ex nihilo*. Like physiological traits, they are products of evolutionary, biological, or social development. Evolution is based on the principle of “survival of the fittest,” fitness being determined in a practical world that artificial or aberrant scenarios do not mirror.

Aumann’s basic conclusion is that the behavioral economists are right in claiming that people act in accordance with rules of behavior and do not weigh one action against another in terms of maximizing utility. Mostly, however, these rules do yield maximum utility. Therefore, practical behavior is largely rational—exactly in accordance with the basic assumption of traditional economics. Behavioral and traditional economics do not contradict each other; on the contrary, the latter is based on the former.

Aumann’s article has additional importance that is at least as great as its analytic contributions. It explains our foregoing examples of the child who jumps in front of the car and the maiden who contemplates the kneeling knight. Plainly, the rational response in these cases is to refrain from calculus and put a rule of thumb to work. Is the situation significantly different when we decide what to order in the restaurant when the waiter comes around? Using rules of thumb is more rational than painstakingly calculating utility in most decisions that mortal beings—human and other—make. By presenting such an argument, I do not, of course, belittle the meaningful contribution that game theory has made in century that has passed since it first flickered.

We now return to where this book began: the winners of the 1994 Nobel Prize in Economics.

One of those who favored John Nash’s candidacy for the prize, Ariel Rubinstein, has been an acquaintance of mine since my youth. Since then, we have met in the corridors of various academic institutions once every dozen years or so for a few minutes of conversation. More than once I have expressed my appreciation of Rubinstein’s “formal” command of the theory whose models have accompanied me all my life. In these talks, my interlocutor has emphasized the limits of mathematics and disapproved of invoking game theory to generate a superficial explanation of life. Today he engages, among other things, in experiments that definitely belong to the empirical field of behavioral economics while tying into the formal models.

The life of John Harsanyi, Nash’s co-winner of the 1994 Nobel Prize in Economics, demonstrates how a game-theory expert can apply his personal and emotional capacity to cope with the games of life. Many details about Harsanyi’s life appear in a lengthy interview that he and his wife gave for an oral history project at the University of California at Berkeley. Harsanyi summed up his life in a biographical statement that appears on the Nobel Prize site.

Harsanyi (1920–2000) was born to a Jewish family in Budapest that converted to Catholicism. His parents enrolled him in the Lutheran Gymnasium in that city—“one of the best schools in Hungary”—that turned out graduates such as John von Neumann and Eugene Wigner (a Nobel Prize laureate in physics). Under the influence of his parents, who owned a drugstore, he studied pharmacy. In 1944, he was inducted into a labor unit by the Germans who had invaded Hungary. The unit was transferred to a concentration camp in November of that year, but Harsanyi managed to escape and survived the war by hiding in the cellar of a Jesuit monastery. After the war, he earned a doctoral degree in philosophy. After briefly teaching at the university where he met his future wife, Anne Klauber, he was forced to stop working due to his anti-Marxist views. Anne, a student of psychology, was also persecuted for her connections with an opponent of the regime. The couple escaped from Hungary by crossing a marshy border area that was somewhat less strictly guarded. “Even so, we were very lucky not to be stopped or shot at by the Hungarian border guards,” Harsanyi recalls. He and Anne emigrated to Australia, where they wed. To make a living, Harsanyi took on a factory job because his Hungarian degrees were not recognized. Re-educating himself by attending night school, he earned a Master’s degree in economics in 1953. He switched to Stanford University, where he completed a Ph.D. in economics with Kenneth Arrow as his advisor. After returning to Australia, he went back to the United States, where the University of California at Berkeley hired him in 1964. There Harsanyi made major contributions to diverse areas of game theory including threat strategies, game-solving with incomplete information, converting mixed-strategy equilibria into pure-strategy equilibria, and utilitarian ethics. In 1988, he co-published *A General Theory of Equilibrium Selection in Games* with Reinhard Selten. “Its title,” he attests, “indicates its content.” It was not their only collaboration.

On the connection and the difference between theory and life, between game theory and real behavior, Reinhard Selten, the third co-laureate of the 1994 Nobel Prize in Economics, attested in a 2004 interview:

Maybe predicting human actions is also a goal of game theory, but it is more the question what would rational players do in a game? Maybe players are not always rational. I mean, we know now that they are far from rational very often. [...] Game theory [is] concerned with the definition of rationality. Regardless of whether people follow rationality or not you have to know what it is, yes? [...] I had done early experimental work and I knew that game theory would not … I mean, sometimes would be predictive certain, other cases it would not predict correctly human behavior [...].

Selten explained that although convinced early on of the necessity of explaining what rationality is, he always took an interest in the implications of the matter for the “real world.” He explained the criticism of mathematicians who distanced themselves from research and empirical application but did not agree with them. Thus he recounted his collaboration with scientists in other disciplines, including political science and biology. “It’s important [...] to be able to follow your own ideas. [...] If you take an oppositional point of view, people look at it with interest even if they don’t accept it completely. [...] The scientific world is not the enemy of young imaginative people.”

Selten (1930–2016) was also of Jewish origin (on his father’s side) but received a Protestant upbringing. He lost his father, who was blind, when he was eleven. He spent World War II with his family as a refugee. He worked for some time as a farm boy, not finishing high school until 1951. Selten, like his father, spoke Esperanto. That’s how he met his wife, Elisabeth Langreiner, who was also proficient in Esperanto. They married in 1959. In his biographical statement for the Nobel Prize site, he relates that they were childless despite their wishes. Both suffered from acute diabetes; the illness cost Elisabeth both of her legs and left her severely vision-impaired. “We have learnt to adjust to our situation,” he states in conclusion.

In his own brief autobiography, John Nash recalls his lengthy period of illness and his slow recovery:

[...] At the present time I seem to be thinking rationally again in the style that is characteristic of scientists. However, this is not entirely a matter of joy as if someone returned from physical disability to good physical health. One aspect of this is that rationality of thought imposes a limit on a person’s concept of his relation to the cosmos.

At the Budapest railroad station in November 1944, the Nazi guard who watched over John (János) Harsanyi was distracted for a moment, giving young Harsanyi an opportunity to escape. For a moment, Harsanyi considered the possibility of going home to pick up a rucksack in which he kept a beautiful sweater that his mother had knitted for him. He decided to let it go, and thus he survived.

John Nash, John Harsanyi, and Reinhard Selten—winners of the 1994 Nobel Prize in Economics. At first glance, experts in game theory, which sanctifies rational thinking. Did they apply their expertise in their lives? Did they game life, or did life game their fate?