BOOK REVIEW

In a series of intertwining chapters, Tarik Tazdaït provides a nuanced and intriguing account of the reception of game theory in France in the 1950s, following the publication of John von Neumann and Oskar Morgenstern's *Theory of Games and Economic Behavior* (*TGEB*, 1944). It is a tale not of the development of new theorems but, rather, of the insinuation of game-theoretic ideas, and more generally of the metaphor of the "game," into French academic and intellectual life. Running from the wartime New York of the French exiles to the academic modernization of the 1960s, the account is a heroic one, with prescient minority figures battling bravely against the dominant academic interests. The reader is confronted with several narrative threads and much institutional detail but is rewarded with a thoroughly engaging story of the filiation of ideas.

The three main heroes all stand at some distance from the Law faculty, the traditional academic home of French economics: Georges-Théodule Guilbaud, a mathematician intent on promoting applied mathematics via the use of game theory in economics and the social sciences; Claude Lévi-Strauss, the rising star of anthropology, who saw von Neumann's game theory as valuable for understanding cultural encounter and civilization; and the psychoanalyst Jacques Lacan, who was intrigued by the psychological aspects of interdependent decision making. Beyond that, there is a broader cast of mathematicians, psychologists, sociologists, and economists, whose lively interaction testifies to the vigor of French intellectual life. The resulting story reveals two important things: first, amongst the European countries, France showed the greatest receptivity to the theory of games; second, while American postwar mathematicians at RAND and Princeton were concerned mainly with the import of game theory for problems of military interaction, to the neglect of von Neumann's broader theory of social organization, the French, and Lévi-Strauss in particular, were interested in precisely this social dimension.

Permeating the entire story is the fact of cultural interconnectedness, best illustrated, perhaps, by a few anecdotes. Thus, one of the early reviews of the *TGEB* was by French Bourbaki School algebraist Claude Chevalley, writing not in a mathematics journal but in *View*: *The Modern Magazine*, organ of the French Surrealists. Or, again, Lévi-Strauss, who, having met poet André Breton on the boat to New York, fell in with Max Ernst, Marcel Duchamp, Yves Tanguy, and other Surrealists in that city, against which background he became interested in anthropological structures. Or those same Surrealists who, under chessmaster Duchamp, were fascinated by the "game" in general, seeing it as an opportunity for flashes of irrational brilliance and escape from the predictable and the routine.

The book opens with the mundane fact of the lack of prestige attaching to both the social sciences and applied mathematics in the French academy in the mid-twentieth century. In that setting, the starting points for this story were several. One was Oskar Morgenstern's visit to Paris in 1947, where he presented an outline of game theory. Greatly taken by this talk, Guilbaud wrote a forty-five-page review of the *Theory of Games*, which was later translated into English, and he began to proselytize its ideas, all with the help of Henri Guitton, an economist unusual in his interest in mathematics. In 1951, with the aid of his mathematics mentor, Georges Darmois, Guilbaud established a seminar on game theory at the Institut Henri Poincaré, with an audience of mathematics and engineering students, and guests such as Harold Kuhn, Maurice Allais, and Edmond Malinvaud. By publicizing the doctoral thesis of Swede Göran Nyblen, which linked macroeconomics to game theory, Guilbaud and Guitton catalyzed the interest of Hubert Brochier, who developed Nyblen's approach further and gained an economics appointment at the Faculty of Law—and, incidentally, became an influential teacher of several contemporary historians of economics.

Guilbaud also forged links with Lévi-Strauss and Jacques Lacan, the first of whom provides another beginning to the story. During his wartime stay in New York at the New School and the École Libre des Hautes Études, he became interested in the mathematics of structure. Thanks to the fifth of the Macy Conferences on cybernetics (1948), to which linguist Roman Jakobson had invited him, Lévi-Strauss encountered Wiener's cybernetics, Shannon's communication theory, and game theory. In his *Structures élémentaires de la parenté* (1949), he included an appendix, created with the help of Bourbakist André Weil, describing the application of group theory to the kinship systems of the Murngin tribe of North Australia. Returning to Paris, he participated in Guilbaud's seminar and wrote *Race et histoire* (1952), which he described as being in a structuralist and "von Neumannian" spirit. Inspired by the *TGEB*'s description of how the social order depended on the formation of stable coalitional arrangements, Lévi-Strauss argued that civilization was no more than the result of the chance encounter of cultures, flourishing for a while and then declining as homogeneity invaded those cultures. This relativistic interpretation of Western civilization attracted the criticism of sociologist Roger Caillois, who was also interested in the place of games in culture but, instead, saw Western progress as a kind of steady culmination, the result of our having cracked a "puzzle," so to speak. Funded by UNESCO, Rockefeller, and MIT's Center for International Studies, Lévi-Strauss began an interdisciplinary seminar in 1953–54, which attracted, amongst others, Guilbaud, Benoît Mandelbrot, Jean Piaget, Jacques Lacan, mathematicians Claude Berge and Jean Riguet, and the medical doctor-turned-mathematician Marc-Paul Schützenberger, who had also written a review of the *TGEB*. Although Lévi-Strauss himself largely failed to personally attract the collaboration of mathematicians, the seminar participants worked with each other.

Thus Jacques Lacan turned to Guilbaud and Riguet. As a medical student, Lacan had been close to Breton and the Surrealists. Stimulated by the writer Raymond Queneau, who was very interested in mathematics, he became particularly interested in the relationship between logic and psychoanalysis. In 1945, he wrote a paper concerning a logical puzzle involving three prisoners, which implicitly involved the concept of "common knowledge." In 1949, he befriended Lévi-Strauss, with whom he attended the Guilbaud seminar. Equipped with his earlier note, he was able to attract mathematicians, such as Riguet, and he went on to write papers and establish his own seminar, both of

which featured game theory significantly, including Lacan's game-theoretic exploration of Edgar Allen Poe's short story "The Purloined Letter." Besides that, Piaget brought Mandelbrot to Geneva for several years, where they collaborated on the application of mathematics to psychology. Schützenberger would later go on to collaborate with the MIT's Noam Chomsky on the algebra of language.

Tazdaït sheds light on another group of economists, trained at the École Polytechnique and at Ponts et Chaussées, who stood apart from their brethren in the Law faculty. These were the economist-engineers, such as Maurice Allais, Edmond Malinvaud, Pierre Massé, and Marcel Boiteux, who ran an econometrics seminar at the CNRS (Centre national de la recherche scientifique) as of 1947. While they might have been plausibly expected to show an active interest in game theory, as a new field of mathematical economics, they did not, preferring instead to remain loyal to the general equilibrium theory criticized intensely by von Neumann and Morgenstern. In 1954, at a congress of French-speaking economists, Allais finally revealed his skepticism of game theory, saying that it was excessively abstract and based on weak axioms. He was particularly critical of its reliance on expected utility theory, which his own Allais Paradox of 1953 had called into question. So vehement was Allais's condemnation that Tazdaït concludes it can have been sparked only by professional envy of the growing interest in the theory of games, especially amongst those sociologically inclined economists who remained immune to the charms of general equilibrium theory.

Tazdaït provides valuable historical nuance in other places. One concerns the reception of John Nash's work in France, about which this reviewer wrote in the *Economic Journal* in 1994. There, I expressed surprise that Guilbaud, in his 1954 presentation to his seminar students of the Nash equilibrium, should be so keen to tie it conceptually to the earlier work of his compatriot Antoine Augustin Cournot, of whom Nash knew nothing (see Leonard 1994). Acknowledging the nationalistic shrillness of Guilbaud's presentation, Tazdaït nonetheless points out that he was primarily making a case for this new *applied* mathematics among students raised in a climate of Bourbaki purity, and doing so by appealing to their nationalism. The point is well taken. Tazdaït also discusses the infamous debate instigated in 1953 by a seventy-five-year-old Maurice Fréchet, who claimed that his mentor and colleague Emile Borel deserved priority over von Neumann as the founder of game theory. Fréchet pointed to several exploratory notes by Borel in the period from 1921 to 1927, which showed him to be groping towards the idea of the minimax equilibrium. Although von Neumann rejected Fréchet's claim—insisting that until his minimax existence proof of 1928, the whole question was unresolved—Tazdaït again provides useful nuance: Fréchet's efforts must be seen in the French context of the mid-1950s, as a domestic bid to rehabilitate a neglected Borel, whose devotion to probability had seen him deemed insufficiently "pure" by Bourbakists, such as Henri Lebesgue. Tazdaït also points out that an effect of the priority spat was to see Borel mentioned in subsequent books on game theory, to which I would add the recent Nobel Symposium "One Hundred Years of Game Theory," held in Stockholm in 2021, a century after Borel's first note (see Voorneveld et al., forthcoming).

There is much more in this ramified account than can be embraced in a short review. An example is the story of Claude Berge, the brilliant French game theorist whose 1957 *Théorie générale des jeux à n personnes* with its sixty-five theorems in 109 pages of text was so dry and abstract as to cause it to be overlooked, and which was then

overshadowed by his highly successful 1958 book on the theory of graphs. Or Alain Resnais's 1961 film, *l'Année dernière à Marienbad*, which told of a love triangle in which two men compete against each other to form a "coalition" with the desired woman, and which prominently featured *Nim*, the sequential game of drawing matches. (Apparently *Nim* became very popular in Paris that year.) Or the musical compositions of Franco-Greek Iannis Xenakis, an engineer with Le Corbusier, whose pieces *Duel* (1959) and *Stratégie* (1962) involved two "halves" of an orchestra playing "against" each other under different conductors—and which met with the reaction one might have expected from the Parisian audience. Or the dim view of game theory taken by *politologues* Raymond Aron and Stanley Hoffman, who thought that it ignored matters that were essential in the field of diplomacy, such as case-specific contextual detail and the complexity of motivations. And, amidst all of that, the prosaic matter of the reform of the French economics curriculum, spearheaded in part by Guilbaud and encouraged by Lévi-Strauss, with the appearance of a bachelor's degree in 1959, quickly fortified with a substantial mathematics requirement; and, in 1968, the abolition of what had become the Faculté de droit et de sciences économiques and its replacement by the independent Unité d'Enseignement et de Recherche, including many in economics. Will this variegated marvel of a book find its English translator, one wonders. And if so, how many will read it?

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COMPETING INTERESTS

The author declares no competing interests exist.

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