

R. Leonard, *Von Neumann, Morgenstern, and the Creation of Game Theory – From Chess to Social Science, 1900-1960*, Cambridge University Press, 2010, 390pp., ISBN: 978 0 521 56266 9, £60.00 (hbk).

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Game theory has by now become a staple of economists, political scientists, as well as other academics, and has had far-reaching impacts on the way we understand the world and on the way in which strategic decisions are being made. How did this discipline come into existence? What led von Neumann and Morgenstern to write the founding document of this discipline, their 1944 *Theory of Games and Economic Behavior*? Drawing on a wealth of archival material, Robert Leonard constructs a fascinating account of the development and rise of game theory.

Part I begins by investigating the role of chess in Europe around the turn of the century and the rise in interest in mathematical treatments of this game, focusing in particular on the dominant chess player at that time, Emanuel Lasker, and his project of developing a ‘science of struggle’, as well as on Zermelo’s attempt in 1912 to apply the tools of mathematics to analyse chess. It then moves on to describe von Neumann’s upbringing and the training he received in the Hungarian mathematical community, which in turn is followed by an account of the time he spent in Göttingen, where he came under the influence of Hilbert and came to embrace the importance of the axiomatic approach in understanding and characterising physical as well as non-physical sciences. It is within this distinctive context that von Neumann’s first foray into the study of games is to be understood, namely his seminal 1928 paper “Zur Theorie der Gesellschaftsspiele” in which he proves the minimax theorem, which states that there exist optimal mixed strategies for all finite two-person zero-sum games. In particular, this paper turns out to be of a piece with the attempts offered by other thinkers, such as Borel, to mathematically characterise parlor games, differing only in its complete exclusion of psychological factors and in the abstractness with which games are being characterised.

Part II turns to the second protagonist, Oskar Morgenstern and the different influences that shaped his view of economics, in particular the dominant figures of economics in inter-war Vienna, namely Spann, Mayer, and von Mises. Each of them at some point or another strongly influenced Morgenstern. At the beginning it was Spann with whose approach Morgenstern identified himself, but he then shifted to Mayer and von Mises, the key Austrian thinkers at the time. Yet Morgenstern’s adherence to the Austrian approach turned out to be equally short-lived, primarily due to the impact of the mathematician Karl Menger (son of the economist Carl Menger). His discussions with Menger, as well as his study of Menger’s 1934 book on the logic of social compatibility relations, led him to

reject the anti-mathematical tendency of the Austrian school and strengthened his view that economics should take the form of a non-ideological analysis. That economics could be value-free was something that he thought could be achieved by means of the formal tools of logic and mathematics, with which he had begun to familiarise himself. Whilst distancing himself from the Austrian school, he nonetheless retained certain elements characteristic of this approach, in particular an emphasis on the importance of questions relating to time, uncertainty, and expectations. All of this left Morgenstern highly critical of existing theories, yet at the same time optimistic about the prospects for a new approach that would be more rigorous by extensively drawing on logic and mathematics.

Part III leaves Europe behind and the focus of the narrative switches to Princeton, where the collaboration of von Neumann and Morgenstern was to result in 1944 in the publication of *Theory of Games and Economic Behavior*, which was the first systematic and comprehensive treatment of game theory. Leonard explains the motivation for von Neumann's return to the study of games in 1940 in terms of his sense of despair deriving from seeing the breakdown of social structures in Europe. While his early work on the minimax theorem was concerned with parlor games, trying to characterise the strategies that maximize an individual's pay-off, when he came to develop the formal material to be found in the 1944 book his focus had shifted to the social realm and questions relating to the role of social norms in making stable equilibria possible had come to take centre-stage. While von Neumann's main concern consisted in using the notion of a stable set to understand the role of coalitions in the formation of social equilibria, the theory ended up primarily being a tool for modeling individual behaviour insofar as, in the short run, the main impact of the book turned out not to be found in the field of economics or the social sciences more generally but in operations research and military strategy. This impact on military strategy is described in the final chapters of the book which focus, on the one hand, on the role of mathematical research in the Second World War, and, on the other, on the creation and development of RAND, as well as the game-theoretical research that took place under its auspices, where the next generation of game theorists, including Nash, Shapley, and Aumann, would be active.

As Leonard notes in the conclusion, the account that he provides is only in part a history of economics. Rather than being exclusively focused on economics, it is a much broader project that encompasses a significantly greater range of disciplines and historical events and is in this sense much more than a history of game theory. A consequence of this is that those purely interested in game theory will at times be bewildered by Leonard's choice of topics and will be likely to consider his detailed discussions of, for instance, chess and meta-mathematics to be at best tangential. Yet, anyone not suffering from this kind of narrow-mindedness will welcome and learn a great deal from the intriguing and insightful discussions of the scientific, social, cultural and political developments that provided the context

within which von Neumann and Morgenstern created game theory. Von Neumann, Morgenstern, and the Creation of Game Theory is a wonderfully written, incredibly well-researched, and fascinating book. In short, this is an outstanding piece of work.