

BOOK REVIEWS

Theory of games and economic behavior. By John von Neumann and Oskar Morgenstern. Princeton University Press, 1944. 18+625 pp. \$10.00.

Posterity may regard this book as one of the major scientific achievements of the first half of the twentieth century. This will undoubtedly be the case if the authors have succeeded in establishing a new exact science—the science of economics. The foundation which they have laid is extremely promising. Since both mathematicians and economists will be needed for the further development of the theory it is in order to comment on the background necessary for reading the book. The mathematics required beyond algebra and analytic geometry is developed in the book. On the other hand the non-mathematically trained reader will be called upon to exercise a high degree of patience if he is to comprehend the theory. The mathematically trained reader will find the reasoning stimulating and challenging. As to economics, a limited background is sufficient.

The authors observe that the give-and-take of business has many of the aspects of a game and they make an extensive study of the strategy of games with this similarity in mind (hence the title of this book). In the game of life the stakes are not necessarily monetary; they may be merely *utilities*. In discussing utilities the authors find it advisable to replace the questionable marginal utility theory by a new theory which is more suitable to their analysis. They note that in the game of life as well as in social games the players are frequently called upon to choose between alternatives to which probabilities rather than certainties are attached. The authors show that *if a player can always arrange such fortuitous alternatives in the order of his preferences, then it is possible to assign to each alternative a number or numerical utility expressing the degree of the player's preference for that alternative. The assignment is not unique but two such assignments must be related by a linear transformation.*

The concept of a game is formalized by a set of postulates. Even the status of information of each player on each move is accounted for and is characterized by a partition of a certain set. *The amount which player k receives at the conclusion of the play is a function $\mathfrak{F}_k(\sigma_1, \sigma_2, \dots, \sigma_r)$ of the moves $\sigma_1, \sigma_2, \dots, \sigma_r$, where some of the σ 's may be the moves of chance* (dealing cards, throwing dice, and so on).

The concept of a game admits of a rather drastic simplification which practically relieves the players of the necessity of playing.