THE CALCULUS OF SELFISHNESS

By Karl Sigmund. Princeton University Press, Princeton, 2010. 173 pp., illus., $35.00 (ISBN 9780691142753 hardcover).

In this excellent new book, mathematician Karl Sigmund gives an account of some of his recent and influential contributions in the field of evolutionary game theory -- the study of strategic interactions in animal and human populations via methods drawn from evolutionary biology. Unlike the approach of classical economic game theory, these methods do not assume that individuals act rationally, but rather that individuals who receive the highest payoffs will reproduce or be imitated more than others. Evolutionarily stable strategies -- the analogue of traditional Nash equilibria -- are then identified as the stable restpoints of such "replicator dynamics".

Throughout the book, Sigmund applies this powerful approach to the analysis of a series of classic games, such as the Prisoner's dilemma, the ultimating game and public good games, and considers processes such as reciprocity, reputation and punishment in promoting cooperation in each of these settings. The role of close family ties in favouring cooperation is not considered, since models based on such "kin selection" are well known by now and have been extensively dealt with by others before. The models are built incrementally, and gradually add more realism, such as repeated interactions, direct and indirect (reputation-based) reciprocity, better memory of previous interactions, second-order defection, noise and spatially explicit settings. Along the way, social concepts are expanded to include fairness, trust, incentives, sanctions and moral sentiments. In doing so, the author makes a convincing case that simple mathematical ideas can illuminate complex psychological and social phenomena.

Although the book is written in a clear and straightforward way, a full appreciation of most of the chapters will require quite a bit more than the “modicum of elementary mathematics” indicated to be mandatory in the Preface. In this respect, it will probably appeal most to people with a relatively good mathematic background, such as economists or theoretical evolutionary biologists. Another slight criticism, more of game theory as a whole than of this specific book, is that the number of variations of strategic games that one could construct litterally seems endless and that rather few unifying principles seem to emerge out of it all. In fact, when general principles are suggested, as in Nowak and

Sigmund's claim that there are five basic rules for the evolution of cooperation, they seem rather arbitrary and were critised by others, who showed some of the rules to be merely special cases of Hamilton's rule, with cooperation ultimately being driven by relatedness. This criticism aside, however, *The Calculus of Selfishness* offers a valuable review of recent progress in evolutionary approaches to prosocial behaviour, and should be of great value to scholars working in the field.

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