generalized to the case of n colours. As balls continue to be added, the proportion of each colour must settle down to a 'fixed point' of the probability function, a set of values where the probability of adding each colour is equal to the proportion of that colour in the urn. Not all fixed points can emerge as eventual outcomes, however, since some are unstable. Arthur particularly focuses on the case where the only stable equilibria are complete dominance by one colour. This can be seen as corresponding to the VCR example discussed earlier, where VHS drove out Beta. Other well-known examples of dominance by a single standard include the QWERTY keyboard, the petrol engine for the motor car (driving out the 'Stanley steamer') and AC electricity supply (after the notorious 'battle of the systems'). The Arthur, Ermoliev and Kaniovski results are reprinted here as Chapter 3, together with a more rigorous version in Chapter 10.

In addition to the applications to competing technologies, Arthur also considers a number of applications to location. Thus, if the balls are seen as companies and the colours as regions where they decide to settle, industrial location can be studied using this framework. If there are external economies associated with clustering, then a region that has no decisive advantage, but where a number of firms happen to settle early on, may come to form a 'Marshallian region'. This aspect of industrial location, studied in Chapter 4, is complemented by a more general study of the historical evolution of cities in Chapter 6.

Chapters 5 and 8 can be seen as explorations of the reasons for the nonlinearity of the probability function, focusing on information and learning. If agents lack full information, one way in which they can learn about a new product is to talk to other agents who have already made a purchase. But this will inevitably bias their purchase decision since they are unlikely to meet purchasers of brands that have only a small market share. In such a situation, which Arthur calls 'information contagion', random adoptions early on may play an important role in bringing about the dominance of a particular brand or standard.

The basic idea is undoubtedly very impressive. Nevertheless, I came away with the feeling that Arthur must shoulder some of the blame for the delay in recognition. Despite the ten separate attempts reprinted here, there is still very little that really makes contact with orthodox economic modelling. And yet, the work of Romer, Lucas, Krugman, David, North and others suggests that this does not have to be the case. Also, I found it rather disappointing that an author who preaches the importance of history through path dependence is apparently unwilling to study history seriously, and contents himself with occasional references to stylized facts.

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A Course in Game Theory. By MARTIN J. OSBORNE and ARIEL RUBINSTEIN. MIT Press, Cambridge, Mass. 1994. xv+352 pp. £35.95. Paperback £15.95.

Over the past fifteen years or so, the methods and tools of game theory have been increasingly and fruitfully applied to the study of a variety of phenomena. This appetite for constructing and analysing a game-theoretic model of a particular phenomenon is due to the (long overdue) realization of the relevance and explanatory power of this method of analysis.

However, from the many applications of game theory, and from the recent work on the foundations of the subject, it has become clear that there are serious problems with the theory itself and that often it is quite difficult to judge the appropriate way to apply it. This state of affairs is due partly to past emphasis on the technical and mathematical aspects of the theory, and to the neglect of debating the proper interpretation of its main concepts. It is only recently that attention has been devoted to addressing this serious gap, with Ariel Rubinstein being a pioneer on this issue (see e.g. his 1991 *Econometrica* paper, 'Comments on the Interpretation of Game Theory').

A major feature that distinguishes the book under review from the dozen or so (recently written) game theory texts is precisely that it discusses, in detail, the foundations of the theory and the interpretation of its main concepts. For example, the authors convincingly argue that, in sequential games, a player's pure strategy should be interpreted as encompassing not only his plan of action but also his opponents' beliefs in

the event that he does not follow that plan. This interpretation, however, would make it problematic to speak of a player *choosing* a pure strategy; for a player cannot choose his opponents' beliefs. Consequently, a re-examination of many existing solution concepts, including the much used subgame-perfect equilibrium concept, would be required.

The book under review, of course, covers all the main concepts and results of game theory. In fact, unlike many other texts on the subject, it also contains chapters on implementation theory and coalitional games. As the authors provide precise definitions and full proofs of the key results, one obtains a thorough understanding of the main ideas. Toy examples are often used to motivate and illustrate the concepts and results. Although there are very few economic and political applications, the thought-provoking discussions of the meaning and interpretation of the main concepts should provide one with a deep appreciation of the strengths and limitations of the theory and, at the same time, equip one to pose the right kind of questions when conducting a game-theoretic analysis of some real phenomenon.

A fundamental issue that one faces when applying the game-theoretic methodology is to, precisely, specify the rules of the game (i.e. the *game form*). As we all know, the rules of most real-world game situations are ambiguous. According to the classical interpretation of the game form, all (and only) physically feasible moves available in a game situation should be modelled into the rules of the game. In contrast, according to the *perceptive* interpretation (originally put forward in Rubinstein's 1991 *Econometrica* paper, and illustrated at several places in the book under review) the game form should represent the rules as perceived by the players. This latter interpretation is far more plausible given that we are interested in understanding the behaviour of the players. To illustrate this point, consider the choice between the infinitely and the finitely repeated game models. Of course, it is not physically feasible to live for ever, and hence (on the basis of the classical interpretation) the former model would be inappropriate. But the players often perceive that, with some probability, after each play there is going to be room for playing the stage game one more time. Hence, the infinitely repeated game model (with discounting) is a better representation of the rules as perceived by the players.

Another feature that distinguishes the book under review is its concern with issues that are related to the notion of *bounded rationality*. For example, one full chapter takes the reader through the important topic of complexity in the context of repeated games. If you were to ask an economic or game theorist what is the main type of result that one gets from an infinitely repeated game model, he would immediately mention some kind of folk theorem, which essentially says that in such a game almost any outcome can be sustained by an equilibrium. This is an appalling state of affairs. And the blame lies entirely with the game theorists, who for years have been (and most still are) concerned only with investigating whether or not a folk theorem type result can be obtained. They often seem to be not interested in exploring the nature of the equilibrium strategies that sustain a particular repeated game outcome. But if we seek to understand behaviour, the structure of the equilibrium strategies must be studied. The chapter on complexity should stimulate further research in this direction.

Martin Osborne and Ariel Rubinstein have written a brilliant book on game theory. I expect it to stimulate important and interesting new developments in the theory of games. At the same time, I expect it to influence the way game theory is applied.

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The International Regulation of Extinction. By TIMOTHY M. SWANSON. Macmillan, Basingstoke. 1994. xiv + 289 pp. £40.

This book is one of an increasing number concerned with the application of economics to the causes of biodiversity loss, and the problem of halting this decline. Other recent examples from this literature include D. Pearce and D. Moran's *The Economic Value of Diversity* (Earthscan, London, 1994) and E. Barbier, J. Burgess and C. Folke's *Paradise Lost? The Ecological Economics of Biodiversity* (Earthscan, London, 1994). 'Biodiversity' is usually interpreted as the sum of genetic variation within a species,