minants, as well as the rational, if game theory is to become as descriptively appealing as it is normatively.

Experience and decisions

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Abstract: Game-theoretic rationality is not generally observed in human behavior. One important reason is that subjects do not perceive the tasks in the same way as the experimenters do. Moreover, the rich history of cooperation that participants bring into the laboratory affects the decisions they make.

Colman reviews many instances of game playing in which human players behave much more cooperatively and receive larger payoffs than permitted by conceptions of strict rationality. Specifically, he points out that although "Game-theoretic rationality requires rational players to defect in one-shot social dilemmas" (sect. 6.11), experimental evidence shows widespread cooperation. We agree that strict rationality does not accurately portray or predict human behavior in interactive decision-making situations. Particularly problematic are predictions made on the basis of backward induction. The Chain-store and Centipede games are good examples. In each case, backward induction makes it appear that the likely last move is inevitable, rather than one of a number of possible outcomes, as it must appear to the participant. In any case, it is unlikely that participants would reason backwards from the conclusion, even if such reasoning made sense. For example, Stolarz-Fantino et al. (2003) found that students were more likely to demonstrate the conjunction effect (in which the conjunction of two statements is judged more likely than at least one of the component statements) when the conjunction was judged before the components, than when it was judged after them. Further, if people easily reasoned backward from likely end-states, they should be more adept at demonstrating self-control (preferring a larger, delayed reward to a smaller, more immediate reward) than in fact they are (see discussion in Logue 1988).

Colman proposes "Psychological game theory" as a general approach that can be argued to account for these deviations. We agree that this is a promising approach, although it is a fairly broad and nonspecific approach as presented in the target article. We would add a component to Psychological game theory that appears to be relevant to the types of problems discussed: the pre-experimental behavioral history of the game participants. We are studying various types of irrational and nonoptimal behavior in the laboratory (e.g., Case et al. 1999; Fantino 1998a; 1998b; Fantino & Stolarz-Fantino 2002a; Goodie & Fantino 1995; 1996; 1999; Stolarz-Fantino et al. 1996; 2003) and are finding a pronounced effect of past history on decision-making (a conclusion also supported by Goltz' research on the sunk-cost effect, e.g., Goltz 1993; 1999). One example will suffice.

A case of illogical decision-making is base-rate neglect, first developed by Kahneman and Tversky (1973) and discussed often in this journal (e.g., Koehler 1996). Base-rate neglect refers to a robust phenomenon in which people ignore or undervalue background information in favor of case-specific information. Although many studies have reported such neglect, most have used a single "paper-and-pencil" question with no special care taken to insure attentive and motivated subjects. Goodie and Fantino wondered if base-rate neglect would occur in a behavioral task in which subjects were motivated and in which they were exposed to repeated trials. We employed a matching-to-sample procedure (MTS), which allowed us to mimic the base-rate problem quite precisely (Goodie & Fantino 1995; 1996; 1999; Stolarz-Fantino & Fantino 1990). The sample in the MTS task was either a blue or green light. After sample termination, two comparison stimuli appeared: these were always a blue and a green light. Subjects were instructed to choose either. We could present subjects with repeated trials rapidly (from 150 to 400 trials in less than a one-hour session, depending on the experiment) and could readily manipulate the probability of reinforcement for selecting either color after a blue sample and after a green sample. Consider the following condition (from Goodie & Fantino 1995): Following either a blue sample or a green sample, selection of the blue comparison stimulus is rewarded on 67% of trials, and selection of the green comparison stimulus is rewarded on 33% of trials; thus, in this situation the sample has no informative or predictive function. If participants responded optimally, they should have come to always select blue, regardless of the color of the sample; instead they focused on sample accuracy. Thus, after a green sample, instead of always choosing blue (for reward on 67% of trials) they chose the (matching) green comparison stimulus on 56% of trials (for a 48% rate of reward). This continued for several hundred trials. In contrast, Hartl and Fantino (1996) found that pigeons performed optimally, ignoring the sample stimulus when it served no predictive function. They did not neglect base-rate information.

What accounts for pigeons' and people's differing responses to this simple task? We have speculated that people have acquired strategies for dealing with matching problems that are misapplied in our MTS problem (e.g., Stolarz-Fantino & Fantino 1995). For example, from early childhood, we learn to match like shapes and colors at home, in school, and at play (e.g., in picture books and in playing with blocks and puzzles). Perhaps, this learned tendency to match accounts for base-rate neglect in our MTS procedure. If so, Goodie and Fantino (1996) reasoned that base-rate neglect would be eliminated by using sample and comparison stimuli unrelated to one another (line orientation and color). In this case, base-rate neglect was indeed eliminated. To further assess the learning hypothesis, Goodie and Fantino (1996) next introduced an MTS task in which the sample and comparison stimuli were physically different but related by an extensive history. The samples were the words "blue" and "green"; the comparison stimuli were the colors blue and green. A robust base-rate neglect was reinstated. Ongoing research in our laboratory is showing that pigeons with sufficient matching experience (where matching is required for reward) can be induced to commit base-rate neglect. These and other studies have led us to conclude that base-rate neglect results from preexisting learned associations.

How might learned associations account for nonoptimal decisions in the Prisoner's Dilemma Game (PDG)? Rationality theory argues that the selfish response is optimal. But we have been taught since childhood to be unselfish and cooperative. For many of us, these behaviors have been rewarded with praise throughout our lives (see the discussion of altruism in Fantino & Stolarz-Fantino 2002b; Rachlin 2002). Moreover, actual deeds of unselfish and cooperative behavior are often reciprocated. Why then should these behaviors not "intrude" on the decisions subjects make in the laboratory? Viewed from this perspective, there is nothing surprising about the kinds of behavior displayed in PDG. Indeed, such behavior is variable (many subjects cooperate, many defect), as one would expect from the variable behavioral histories of the participants.

A critique of team and Stackelberg reasoning

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Abstract: Colman's critique of classical game theory is correct, but it is well known. Colman's proposed mechanisms are not plausible. Insufficient reason does what "team reasoning" is supposed to handle, and it applies to a broader set of coordination games. There is little evidence ruling out more traditional alternatives to Stackelberg reasoning, and the latter is implausible when applied to coordination games in general.