# INTERPERSONAL RELATIONS:
## Mixed-Motive Interaction

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## INTRODUCTION

The concept of mixed-motive conflict was first introduced by economist Thomas Schelling (1960) to refer to a situation in which two or more parties are faced with a conflict between the motives to cooperate and to compete with each other. Two-person bargaining is a classic example of a mixed-motive relationship in which the bargainers must make concessions to reach a compromise agreement, but at the same time, they must compete to achieve a good bargain. Although mixed-motive interactions are involved in several research areas, this review covers only bargaining and social dilemmas [i.e. situations in which payoffs to the participants (rewards and costs) are specified, and it is assumed that all parties are motivated to maximize their payoffs]. Excluded are studies of social loafing, which has been interpreted as a special case of a social dilemma (Kerr & Bruun 1983), as well as group decision making and various forms of bargaining involving nontangible rewards and motives (e.g. face-saving, ideological issues, fear, guilt) involved in marital conflict or political-international conflict.

What remains are two basic types of mixed-motive situations: bargaining and social dilemmas. These two classes of situations (in game theory) are special cases of cooperative and noncooperative games, respectively. In a cooperative game, side-payments are possible and are enforced by an external agent, whereas in a noncooperative game, side-payments are not possible, and payoffs are based on the joint choices of two or more players. These two types of situations may be further subdivided into two-person vs N-person (N > 2) cases, resulting in a 2 × 2 classification scheme. In the two-person case we have dyadic bargaining and the classic prisoner's dilemma and their variants (e.g. the game of Chicken). In the N-person case we have research on coalition formation and N-person social dilemmas (e.g. public goods and resource dilemmas).

Many social scientists are interested in mixed-motive interaction, and an enormous number of experiments have been conducted by investigators in other disciplines. Thus, a review of all of these studies would be an impossible task. Fortunately, there are several excellent reviews of the literature in other disciplines. Because Carnevale & Pruitt (1992) have recently reviewed psychological research on bargaining, our discussion of bargaining focuses on coalition research as well as the nonpsychological literature, the latter to inform the reader of approaches and variables other than those typically of interest to social psychologists. However, because it has been more than ten years since the last extensive review of psychological social dilemma research (Messick & Brewer 1983), our discussion of social dilemmas focuses almost entirely on psychological work.

# BARGAINING

As might be expected, bargaining is of fundamental concern to economists and political scientists. What is surprising is their emphasis on experimental studies of bargaining, especially in the last 15 to 20 years. The emphasis on laboratory studies of economic behavior was stimulated by several prominent researchers (Plott 1979, 1982; Roth 1988; Smith 1980, 1982). A similar movement was led in Germany by Sauermann & Selten (1960). Smith (1993) has presented an interesting history of this movement.

Kagel & Roth (1994) provide the most recent review of the literature in experimental economics. In political science, Palfrey (1991) classifies experimental research into three major areas: 1. laboratory elections, 2. committee decision making, and 3. coordination and cooperation. The first two areas are not reviewed here, but the third is touched upon in our later discussion of social dilemmas.

## The Economic Approach to Bargaining

One of the striking differences between studies conducted by economists and those by social psychologists is that economists attempt to test some theoretical principle, such as the core (von Neumann & Morgenstern 1947), the Nash equilibrium (1950), or more recently, the perfect equilibria criteria (Selten 1975). In general, their theoretical principles are based on axiomatic (rational choice) models, and as might be expected, the results of some studies support the models and the results of others do not. The problem then is to determine under what conditions a given model is valid. Such inconsistencies have led to stimulating controversies regarding the relevance of rational choice models (cf Hogarth & Reder 1987, Smith 1991).

A notable exception to this approach is Selten's (1972) research on bounded (limited) rationality, as first proposed by Simon (1957). Selten's work (in addition to Sauermann's) has led to an interdisciplinary approach to mixed-motive research in general (cf Tietz et al 1986). A more recent development is a rapprochement between the axiomatic (i.e. prescriptive) and behavioral (i.e. descriptive) approaches to research in negotiations, called the behavioral decision approach to negotiation (Neale & Bazerman 1991, Neale & Bazerman 1992). It is an important development because it encourages cross-fertilization between the economic and psychological approaches to bargaining.

## Ultimatum Bargaining

Studies on ultimatum bargaining (Guth 1988) illustrate the difference between studies conducted by social psychologists and by economists. In ultimatum bargaining, two bargainers must negotiate the division of a given amount of

money, denoted $c$. One of the players (randomly selected) demands how much of $c$ she wishes; then the other player accepts or rejects player 1's demand. If player 2 accepts player 1's demand, player 1 receives the demand and player 2 receives the remainder of $c$. If player 2 rejects player 1's demand, each receives 0. The optimal strategy for player 1, according to game theory, is to demand $c - \varepsilon$, where $\varepsilon$ is some small quantity. For example, if $c = \$100$, player 1 should demand $99. Player 2 is then left with a choice between $1 (accept) vs $0 (reject), and according to game theory, player 2 should accept.

Several variations of this game have been used, including (a) allowing more than one round of bargaining (if player 2 rejects player 1's demand, player 2 is allowed to demand a share of $c$ and player 1 is faced with an ultimatum to accept or reject player 2's demand); (b) using multiple rounds of bargaining with a "shrinking cake" (the value of $c$ becomes smaller with each successive round of demands); and (c) auctioning of player position (the highest bidder becomes player 1). Guth & Tietz's (1990) review of several studies presents a striking conclusion: the game theoretic prediction is clearly not supported. Because player 1 frequently demands a 50–50 (equal) split, Guth (1988) concludes that norms of fairness (distributive justice) clearly affect subjects' behavior—both in the demands of player 1, as well as player 2's decision to accept or reject player 1's demand. In this context, Roth raises an interesting question about the role of incentives in bargaining experiments. Suppose the value of $c$ is $100 million (instead of $100 in our example). How many of us (as Player 2) would reject 1 million dollars if Player 1 demanded 99 million?

The results of ultimatum bargaining experiments have important implications for theories of justice and reward allocation, widely studied by social psychologists (cf Bierhoff et al 1986). The results also have implications for some social dilemma games, e.g. sequential "best-shot" public good games (Harrison & Hirshleifer 1989). Roth (1994) provides an excellent discussion of the role of cultural-social-psychological factors on the validity of game-theoretic models.

## Disagreements

Another unique aspect of the economic literature on bargaining is the concern with variables that lead to disagreements. One obvious factor is the cost of disagreement: The greater the penalties for a stalemate in negotiations, the greater the incentive to avoid disagreement. But Roth (1994) argues that disagreements and costly delays occur frequently even when it is advantageous to reach agreement. He cites Kennan & Wilson's (1990) claim that "most strikes are eventually settled on terms that could have been reached earlier, without incurring the costs that the strike imposes on all parties" (p. 42).

Attempts to isolate the factors underlying disagreements are complicated by the fact that face-to-face bargaining evokes much lower rates of disagreement than does anonymous bargaining via written notes. Because face-to-face interaction provides more information about the bargainer's preferences than does anonymous bargaining, another explanation for disagreements is that bargainers have incomplete information and are uncertain about the important aspects of each other's situation. Roth concludes that bargaining models of incomplete information do not provide an adequate explanation of the frequency of disagreements.

A review of a large number of experiments suggests that disagreements are based on differences in the expectations of the bargainers about what is a fair or reasonable division of the payoffs. The intriguing question is how such differences in expectations are resolved to reach an agreement. Carnevale & Pruitt's (1992) coverage of the bargaining process, especially the cognitive processes involved in bargaining, is pertinent here. We do not review this literature here, but the reader is referred to reviews by Messick & Mackie (1989) and Thompson & Hastie (1990). In addition, Bazerman et al (1991) have reviewed the bargaining literature from a variety of perspectives: economic, political science, and in particular, organizational behavior.

## COALITION FORMATION

From one perspective, research on two-person bargaining can be interpreted as a special case of coalition formation, where each bargainer has more than one person with whom he/she can reach an agreement. Consider a three-person game in which players A, B, and C can form two-person coalitions AB, AC, or BC. Each possible coalition, including one-person coalitions, is given a value, denoted $v(C_j)$, and members of coalition $C_j$ must negotiate and reach agreement on the division of $v(C_j)$. For example, suppose $v(AB) = 100$; $v(AC) = 80$; $v(BC) = 60$; and $v(A) = v(B) = v(C) = 0$. The problem for theories of coalition formation is to predict which coalition is likely to form and to predict the payoff shares negotiated by the coalition members. This type of game is called a multivalued game (Komorita & Kravitz 1983). One of the more accurate theories for multivalued games is the equal excess model (Komorita 1979), which predicts that the AB coalition is most likely to form for a 55–45 split of $v(AB)$ for players A and B respectively. Similar payoff predictions are made by the alpha-power model (Rapoport & Kahan 1982) and by the equal division Kernel (Crott & Albers 1981).

When the value of the three-person coalition, $v(N)$, is very large, e.g. $v(ABC) = 150$, the game is called superadditive. For such games, Michener (1992) has developed a behavioral theory, called the Central-Union Theory, that yields probability predictions of coalition formation, as well as payoff

shares of the coalition members. Although this is a remarkable achievement, the theory requires estimates of three parameters to derive predictions. As a result, evaluation of the theory will be difficult, and thus far, no attempt has been made to competitively evaluate its predictions against the predictions of other theories.

## Simple Games

In a *simple game,* all coalitions have one of two values: one value for all winning coalitions and a second value for all losing coalitions (e.g. 100 and 0, respectively). For example, consider a four-person game with winning coalitions AB, AC, AD, and BCD, and losing coalitions BC, BD, CD (as well as all one-person coalitions). Player A has an advantage (greater bargaining strength) because A needs only one other player to form a winning coalition (AB, AC, or AD), whereas players B, C, and D each need both of the other two weak players to form the weak-union (BCD). For a review of research on simple games and other coalition games, see Komorita (1984).

Levine & Moreland (1990) have concluded that research on simple games provides the greatest support for the weighted probability model (Komorita 1974), bargaining theory (Komorita & Chertkoff 1973), and equal excess theory (Komorita 1979). For multivalued games, Levine & Moreland claim that the data "provide a murky theoretical picture," and "although equal excess theory seemed ascendant a few years ago (Komorita 1984), the situation today is less clear" (p. 610). Their conclusions are based on the results of studies showing that situational factors affect the validity of various theories (Komorita & Ellis 1988); some theories are more accurate in one situation but less accurate in others. To complicate matters, some theories may be more accurate in predicting which coalitions are likely to form, but less accurate in predicting the payoff shares of the coalition members. Thus, one of the basic problems for future research is to determine the boundary conditions of various theories.

## Types of Coalition Theories

A surprisingly large number of coalition theories have been proposed, and they can be classified according to their assumptions about the motives for forming a coalition (Komorita 1984). Various theories assume that the parties are motivated either to maximize control over other members, maximize status in the group, maximize similarity of attitudes and values, or minimize conflict among its members. However, the majority of theories assume that the parties are motivated to maximize some external reward, such as money or points.

Among theories that are based on reward maximization, many are axiomatic (prescriptive) theories. These theories predict the payoff shares of various possible coalitions, but they do not yield predictions about the likeli-

hood of these coalitions. Most social scientists are interested in both of these response measures (see below); thus, we restrict our review to theories that predict both coalition formation and the payoff shares. For a review of axiomatic theories, see Kahan & Rapoport (1984) and Selten (1987); for a review of other types of theories, see Cook & Gilmore (1984), Ordeshook (1986), Schofield (1985), and Wilke (1985).

## Critique of Coalition Research

As in many areas of psychological research, there is disagreement on the extent to which theories should be broad and general, or specific enough to allow rigorous tests of the theory. Almost all the theories discussed in this review are quite narrow in scope, but sufficiently specific so that they are vulnerable to rejection. However, in recent years, there have been several critiques of and pleas to broaden the scope of coalition research (Cook & Gilmore 1984, Mumighan 1986, Pearce et al 1986).

One way to extend the generality of theories is to enlarge the number of motives of the parties to form coalitions (e.g. all members are motivated to maximize reward, status, common goals) but with different weights for each factor. Stryker (1972) suggested this approach when he recommended that we extend coalition theories to situations in which "rewards are internal to the triadic relationship, rather than emanating from outside" (p. 373).

Stryker's suggestion is quite compelling because in many real-life situations, the rewards are indeed internal to the relationships within the group. However, Komorita (1984) argued that "such an approach would involve multiple (unspecified) motives among the participants and would be highly intractable. Some members may be motivated to maximize rewards or achieve the goals of the group, some may be motivated to maximize control or status, while others may be motivated by similarity of attitudes and values" (p. 187). Such an approach would be a formidable task without specifying the strength of each motive of each participant and would represent an attempt to develop a general theory of groups.

A less formidable approach is to restrict the theory to the two-person case . This approach was first proposed by Thibaut & Kelley (1959) and includes many variants of two-person bargaining (e.g. Lawler & Yoon 1993). Another approach is to retain the reward maximization paradigm but embed the task in a larger, more realistic social context (Cook & Gilmore 1984, Mannix & White 1992, Miller & Komorita 1986, Molm 1987, Murnighan 1986, Murnighan & Brass 1990, Stolte 1990). For example, Cook & Gilmore (1984) asked subjects to maximize points worth 2 or 3 cents each, but unlike the typical coalition experiment, subjects bargained with incomplete information: All players knew the value of the coalitions that included them but were uninformed about the values of other coalitions.

In contrasting the work of economists and social psychologists, we indicated that economists emphasize formal (axiomatic) theory, whereas psychologists tend to emphasize cognitive-motivational approaches. We also cited the work of Selten and his associates (Tietz et al 1986), who emphasize a bounded rationality approach to mixed-motive interaction. Their work demonstrates the influence of psychological research, but with some notable exceptions (e.g. Dawes, Rapoport and their associates), social psychologists do not seem to have been influenced by research in economics. This lack of cross-fertilization between economists and social psychologists is unfortunate, but seems to be changing—witness the *Journal of Economic Psychology* and the International Association for Research in Economic Psychology (IAREP).

Research on coalition formation has declined markedly. During the past five years, fewer than a half-dozen studies were published in psychology journals. This decline is partly because the vast majority of coalition studies lack social relevance (ecological validity). Although we described several ways to extend the generality of coalition research, we should point out that these approaches do not attempt to evaluate theories of coalition formation, but focus on social psychological variables that affect coalition behavior. This is the major weakness of this approach. If we increase the complexity of the situation (in the interest of ecological validity), it is difficult to develop theories that yield clear predictions. Predictions cannot be derived logically, and the increased realism is attained at the cost of theoretical precision.

This dilemma suggests another direction for future research—the development of process theories of bargaining and coalition formation. Komorita & Ellis (1988), for example, note that there is considerable variability in payoff shares in various coalition games. The most plausible explanation for this variability is that differences in the sequence and process of sending and rejecting offers affect the final outcome. Several investigators have emphasized the development of a process theory (e.g. Kahan & Rapoport 1984, Komorita 1984), and several attempts have been made to examine coalition processes (e.g. Kahan & Rapoport 1984, Komorita et al 1983). Thus far, these attempts have been discouraging. Perhaps more innovative methods such as protocol analysis (Ericsson & Simon 1980) may yield more promising results.

## SOCIAL DILEMMAS

A social dilemma can be defined as a situation in which a group of persons must decide between maximizing selfish interests or maximizing collective interests. It is generally more profitable to maximize selfish interests, but if all do so, all are worse off than if everyone had maximized collective interests. Since Messick & Brewer's (1983) review, there has been increasing interest in social dilemmas in a variety of disciplines. Scientists have used social di-

lemma analyses to explain topics such as evolution (e.g. Alexander 1987, Boyd 1988), international security (e.g. Lichbach 1990), and funding of governmental programs (e.g. Kotlikoff 1987). Psychologists have used its logic to explain the suboptimal performance of decision-making (e.g. Kameda et al 1992) and task-performing laboratory groups (Shepperd 1993), as well as real work groups (Rutte 1990, Tomer 1987). Research has centered upon three paradigms: the prisoner's dilemma, public goods, and resource dilemmas.

## Prisoner's Dilemma

Although the popularity of the prisoner's dilemma (PDG) as a research tool has clearly declined, this paradigm is still used in some work. Much of this work involves the use of reciprocity as a gaming strategy. The simplest of these strategies, tit-for-tat (TFT), involves cooperation on the first trial, followed by imitation of the opponent's move on each succeeding trial. In a now-classic computer simulation, Axelrod (1984; see also Axelrod & Dion 1988) demonstrated the effectiveness of tit-for-tat in comparison against a variety of other strategies. Many researchers have since conducted computer tournaments to test the effectiveness of various strategies under different constraints. These results provide a baseline for cooperation rates and an evaluation of the effectiveness and limitations of various types of strategies.

COMPUTER SIMULATIONS    Researchers have altered the PDG to assess the robustness of TFT. Reciprocity seems to be effective in asymmetric games (Swistak 1989), and a more lenient version (in which retaliation for defection is not as severe) works well with an expanded (5 × 5) choice matrix (To 1988). In noisy environments (i.e. when the likelihood of an action being misperceived is nonzero), TFT is suboptimal, although it is not clear whether the best strategy should involve some unconditional cooperation (Bendor et al 1991, Molander 1985) or be harsh and unforgiving (Mueller 1987). Also, strategies that are effective in two-person games are not necessarily effective in N-person games (Molander 1992).

Investigators have also devised and tested new strategies that were not included in Axelrod's simulation. Messick & Liebrand (1993) tested a "win-cooperate, lose-defect" strategy, which involves cooperation if the payoff is at least as large as the average of the other players, and defection otherwise. This strategy always converges upon cooperation in a homogeneous environment. Marinoff (1992) found that utility-maximization (MEU) strategies consistently outperform reciprocal strategies in a standard game (except, interestingly, when playing another MEU). Boyd & Richerson (1992) proposed a "moralistic" strategy, which is selective in nature: Retaliation is invoked only against noncooperators and those who allow defection to go unpunished. Moralistic

strategies are similar to Yamagishi's (1986a,b) notion of a sanctioning system (see below).

Finally, a recent simulation has compared social dilemmas to physical thermodynamics. This simulation indicates that an initially homogeneous group of strategies tends to remain homogeneous, even if noise is introduced into the system (Glance & Huberman 1993).

LABORATORY STUDIES OF TFT    Reciprocity has also been tested in the laboratory. Komorita et al (1991) studied immediate versus delayed reciprocation and found it much more important to immediately reciprocate cooperation than defection. They also showed that TFT's "niceness" (initial cooperative choice) inhibits cooperation over time. Tit-for-tat's effectiveness declines as group size increases (Komorita et al 1992) and is minimal when there is little incentive to cooperate (Komorita et al 1993). Data also suggest that TFT's effectiveness lies partially in the perceived control it instills in its target; a reciprocated individual completely determines TFT's choices and outcomes, conditions that tend to foster cooperation (Friedland 1990). In asymmetric games, mutual cooperation appears to be suboptimal, probably because the temptation to defect differs for each player. A strategy of complex alternation seems to maximize total payoff (King & Murnighan 1987, Murnighan 1991, Murnighan & King 1992, Murnighan et al 1990).

Other factors encourage cooperation in PDG-type games. One important factor is group identity, or caring about one's fellow group members (Orbell et al 1988). Instigation of group identity has been found to enhance cooperation in standard PDG games (Wit & Wilke 1992). Group identity has been researched much more heavily in public goods games (see below).

It has long been suspected that the way in which the dilemma is framed will affect behavior. Most recent work on this question has been spurred by Brewer & Kramer's (1986) finding that cooperation is more frequent when the dilemma is framed as gains rather than losses. Subsequent studies, however, have not totally supported this finding. Some researchers have replicated the positive effects of gain frame (Komorita 1987), but others have not (Aquino et al 1992, Komorita & Carnevale 1992, Rutte et al 1987b). Still others have found interactions with how the opponent's payoff is framed (de Dreu et al 1992) and with the opponent's behavior (Fleishman 1988).

## Public Goods

The social dilemma that has received the greatest attention in the last decade is the public goods paradigm. A public good is a commodity (or service) that can be provided only if group members contribute something (e.g. money, effort) toward its provision. However, all persons—contributors and noncontributors—may use it. If one does not have to give to use the good, the individually

rational action is to not contribute (behavior known as free riding). Of course, if everyone reasons this way, then there will be no contributions, the good is not provided, and all are worse off. A special case of a public good is the Volunteer's Dilemma (Diekmann 1985, 1986; Weesie 1993; see also An Rapoport 1988a), in which only one contributor is necessary for the good to be provided.

Two types of public good paradigms are frequently used. The most common is the linear model, in which the value of the public good varies directly with the total amount contributed by the group members. In the second paradigm, called the step-level paradigm, there is a provision point such that the public good is provided (all-or-none) if the total amount contributed exceeds the provision point. Thus, in the step-level paradigm, the value of the public good is fixed, and there is an optimal level of contribution: Once the provision point is attained, it is not optimal for additional persons to contribute. In contrast, in the linear model, each additional person increases the value of the public good, and it is optimal for all members to contribute.

FACTORS IN CONTRIBUTION BEHAVIOR    An important problem in public goods research is the question of when people will sacrifice self-interest to help the group. One important factor is self-efficacy. Group members are more likely to cooperate if they feel that their contribution is critical. In large groups, members tend to believe that their efforts will be insignificant (Kerr 1989, Rapoport 1985), and this belief persists even when in reality it is inaccurate (Kerr 1989). Conversely, group members who perceive their contribution as critical are exceedingly likely to cooperate (Rapoport et al 1989, van de Kragt et al 1986).

Related to self-efficacy are expectations about the actions of fellow group members. We would be foolish to contribute if we believed no one else was going to do so. Complementary lines of research have shown that people seem to make heterogeneous assumptions about others, i.e. they believe that some people are more likely to contribute than are others (Rapoport 1985, 1987, 1988; Rapoport & Bornstein 1987). Also, expectations are often based on our own behavior, i.e. we expect most others to act as we do (Dawes & Orbell 1994, Orbell & Dawes 1991).

Endowment size, or the amount of a person's contributable resource, also affects expectations, either inversely (i.e. resource-poor individuals are expected to give more than the wealthy, because the poor have less to lose if the good is not provided), or directly (i.e. the wealthy are expected to give more than the poor because they can more easily afford it). Research tends to support the latter perspective. Most studies show that subjects are more likely to contribute as their wealth increases (Kerr 1992, Rapoport 1988, van Dijk & Grodzka 1992, van Dijk & Wilke 1991, Wit et al 1989a). However, the inverse relationship occurs when the gap between rich and poor is quite large (Aquino

et al 1992). Moreover, groups with unequal endowments across members are less successful at public goods provision than are groups with equal endowments (Rapoport & Suleiman 1993).

Most real-life social dilemmas involve very large groups, and group size also affects contribution behavior. The sheer size of the group increases the opportunity for one's free riding to go unnoticed. Removing the element of anonymity by providing explicit feedback about each member's actions produces significant increases in cooperation (Sell & Wilson 1991, Sniezek et al 1990). Large group size may also instill feelings of low self-efficacy (see Weick 1984), although the empirical evidence for this relation is mixed at best (Kaufman & Kerr 1993).

As we might expect, fear and greed (Coombs 1973) seem to moderate contribution behavior—fear that one's contribution will be wasted, and the greedy desire to both maintain wealth and enjoy the public good. Many studies have found greed to play an important role in the contribution decision (Bruins et al 1989, Dawes et al 1986, Liebrand et al 1986b, Poppe & Utens 1986, Rapoport & Eshed-Levy 1989). The effects of fear are not as clear. Some studies have found fear to contribute significantly to competition (Bruins et al 1989, Liebrand et al 1986b, Rapoport & Eshed-Levy 1989), but others have not (Dawes et al 1986, Poppe & Utens 1986). Yamagishi & Sato (1986) have argued that the effects of fear and greed depend on whether provision of the good is conjunctive (i.e. determined by the worst member, which produces fear) or disjunctive (i.e. determined by the best, which produces greed).

Vested interest represents one's utility for the good (Kemp 1991), and recent research shows that vested interest affects contribution behavior. Wit et al (1989a) have shown that individuals who stand to receive a larger payoff than others have higher contribution rates. However, this seems to hold true only in equity-type situations, where the strong-interest individuals have been selected at random rather than on an effort basis (van Dijk & Wilke 1993; see also Sniezek & May 1990).

ENHANCING COOPERATION   Whereas some researchers are interested in why people contribute, others are more concerned with how we can improve contribution rates. One approach is to allow group members to discuss the dilemma before making a contribution choice. The benefits of group discussion in social dilemmas are well established, and recent research has demonstrated its effectiveness with public goods (Bornstein & Rapoport 1988, Braver & Wilson 1986, Orbell et al 1988, van de Kragt et al 1986). Several explanations have been suggested for why discussion is so effective. For example, group members use discussion to make explicit, unanimous promises of cooperative behavior (Orbell et al 1988, 1990, 1991); discussion enhances group identity (Orbell et al 1988); it allows groups to plan and coordinate their contributions (Bornstein &

Rapoport 1988); and it triggers a general "norm of cooperation" (Kerr 1994, Kondo 1990; but see Orbell et al 1988).

Arguing for the coordination explanation, Ledyard (1994) hypothesizes that face-to-face communication should have a greater effect on contribution rates in the step-level paradigm than in the linear paradigm, because the problem for step-level groups is to coordinate behaviors and designate which members should contribute. However, Orbell et al's (1988) work on group identity, which has been replicated consistently (see Dawes et al 1988), suggests that the function of communication is not to facilitate coordination but to alter motivational-normative processes. This problem is analogous to the problem of coordination vs motivational factors in Steiner's (1974) process losses, and we currently have little (if any) data on the validity of Ledyard's hypothesis.

Yamagishi (1986a,b) has argued for the use of a sanctioning system to enhance cooperation in public goods. Under this system, group members would cooperate both in the provision of the good and in the provision of some means of punishing noncooperators. The punishment could be tangible (e.g. restricted access to the good) or intangible (e.g. embarrassment). Research on sanctioning suggests that such a system is particularly effective when dealing with distrustful group members (Yamagishi 1986a, 1988b) and when the temptation to defect is high (Yamagishi 1988a).

Finally, cooperation may be inhibited by the constraints of the experimental paradigm. In many laboratory experiments, contribution behavior is discrete (i.e. subjects give all of their endowment or none of it) and simultaneous (i.e. all subjects act at the same time). However, cooperation rates increase when choice is continuous (Suleiman & Rapoport 1992) or sequential (Budescu et al 1992, Erev & Rapoport 1990, Rapoport et al 1993; see also Bolle & Ockenfels 1990), situations that seem to more closely simulate real-world processes.

## Resource Dilemmas

The other major type of social dilemma (in terms of research attention) is a resource dilemma, in which group members may harvest from a common resource pool that is replenished periodically. The dilemma is that if all take as much of the resource as they want, it will run out quickly. As with public goods, researchers interested in resource dilemmas attempt to isolate factors underlying harvesting behavior, although some have begun to apply laboratory findings in attempts to solve real-life dilemmas (Samuelson 1990, Thompson & Stoutemyer 1991; see also Huppes & Midden 1991, Vlek & Keren 1992). In fact, Ostrom (1990) has compiled an insightful book dedicated to analyses of real-life resource dilemmas, as well as an evaluation of the role of game-theoretic models in real dilemmas.

CHOICE MOTIVATION    There seem to be three motives behind harvest choices: 1. individual rationality, or acting in one's self interest; 2. responsibility, or the desire to counteract abuses by others; and 3. conformity. The latter two motives are well established (e.g. Fleishman 1988; Rutte et al 1987a; Samuelson & Messick 1986a,b; Wilke et al 1986). Individuals may actively seek conformity because they do not want their choices to be deviant from others (Liebrand et al 1986a,b, Wilke & Braspenning 1989). Abusers seem more likely to conform to underuse behavior than are underusers to abusive behavior (Chapman 1991).

Other aspects of resource dilemma behavior have also been addressed. Individuals in negative moods have difficulty managing a resource (Knapp & Clark 1991), seemingly because the negative mood makes the self-interest motive predominant. Individual harvests increase as uncertainty about the exact size of the pool increases (Budescu et al 1990, Rapoport et al 1992).

SOLUTIONS TO RESOURCE DILEMMAS    Solving a resource dilemma means finding ways to make optimal harvests, where an optimal harvest is defined as an amount that maintains the pool. Implementation of a solution may be difficult, because subjects tend to view their (and others') choices as being cooperative, even when in reality they are not (O'Connor & Tindall 1990). Group members may thus be hesitant to adopt a new system if they believe behavior to be optimal under the current one.

Some studies emphasize *structural solutions,* in which the basic choice procedure is altered in some way. The alteration most often studied involves elimination of free choice of harvest size. Such a solution is effective but unpopular, particularly if members view it as a violation of rights or unfair punishment of nonabusers (Baron & Jurney 1993). A useful alternative is a leader-based system, under which one group member decides for all (Samuelson 1991, Samuelson & Messick 1986a), although it is very unpopular with noncooperators (Samuelson 1993). Support for the leader is affected by the amount of success the group experiences (Wit & Wilke 1988) and by the consistency of resource replenishment (Wit et al 1989b).

An equality norm, under which all members receive the same harvest, has more support (Allison & Messick 1990, Rutte et al 1987a, Samuelson & Messick 1986b), but the resource must be easily divisible (Allison et al 1992, Allison & Messick 1990) and relatively small (Allison & Messick 1990). Equality will be violated if a subject believes he or she has a valid reason for doing so (Samuelson & Allison 1994).

Another class of solutions, called *individual solutions,* involves introducing manipulations aimed at changing the behavior of group members. Many such manipulations have been investigated. As with public goods, group discussion substantially improves harvesting behavior (Messick et al 1988, Ostrom & Walker 1991, Ostrom et al 1992). Other interventions that have positive ef-

fects on harvest behavior are individualized training in resource management (Allison & Messick 1985), enhancement of social identity (Brewer & Kramer 1986, Dawes et al 1988), punishment for overconsumption (Bell et al 1989, Martichuski & Bell 1991), detailed description of the dilemmatic properties of a commons (Mio et al 1993, An. Rapoport 1988b), and verbal reinforcement of conservation (Birjulin et al 1993). Interestingly, neither concern for the environment nor prior commons experience (Moore et al 1987) seems to affect conservation (Smith & Bell 1992).

Samuelson & Messick (1994) have synthesized this research into a decision model of resource dilemmas. They assume that preference for change is a function of dissatisfaction with current outcomes and that it varies with the attribution as to the cause of the problem. Individual solutions are preferred over structural solutions because they are easier to implement and can be undertaken without consent of the entire group. The model also assumes that several factors affect the choice of a specific structural solution (e.g. fairness, efficiency).

DILEMMAS WITH INCOMPLETE INFORMATION    Our review thus far assumes the availability of considerable information about resource size and the behavior of others. But in the real world, it is often difficult to acquire this information. When there is uncertainty about the resource (environmental uncertainty) and/or actions of others (social uncertainty) communication is effective at reducing both (Messick et al 1988). For situations in which interaction is not possible, Suleiman & Rapoport have developed expected utility (1988) and game-theoretic (Rapoport & Suleiman 1992) models of the individual decision process, but both need systematic testing.

ORGANIZATIONAL DILEMMAS    An organization can be thought of as a pool of resources (e.g. labor, information) from which workers can draw (Kramer 1991a,b). If the organization uses a reward-for-performance system, then a limited resource pool presents a social dilemma. Workers or work teams may overuse resources, a strategy that benefits the team, but hurts the company as a whole. In a series of studies, Mannix (1991, 1993; Mannix & White 1992) has observed that workers in competition for resources often form coalitions, and that these coalitions are poor at managing a resource, giving too much to coalition members and not leaving enough for others.

## Other Factors in Cooperation

PERSONALITY    Research on social values has established that one's personality plays an important role in mixed-motive behavior. Many social values have been identified, but three have received the greatest support: competition (i.e. maxi-

mize the difference between payoffs), cooperation (i.e. maximize joint payoff), and individualism (i.e. maximize own payoff). Some researchers continue to study the values themselves. For example, the competitive orientation can be primed, producing even lower levels of cooperation in such people (Neuberg 1988). Values are predictive of the amount of help offered in helping situations (McClintock & Allison 1989) and of response latencies on interpersonal decision tasks (Liebrand & McClintock 1988). Whether or not a social value predicts cooperative behavior seems to be based on the payoff structure of the dilemma (Parks 1994).

Most studies have focused on how persons with different value orientations view cooperation. Cooperators seem to believe that cooperative behavior reflects intelligence and is the correct way to behave, while noncooperators see cooperation as a sign of weakness and defection as a sign of strength (Liebrand et al 1986a, McClintock & Liebrand 1988, van Lange & Liebrand 1991a, van Lange et al 1990; see also Samuelson 1993). This is referred to as the "might versus morality" hypothesis. That cooperators view cooperation in moral terms is well supported, but some studies have failed to show that noncooperators think in power terms (Beggan et al 1988, Sattler & Kerr 1991). In addition, individuals perceived as truly moral (e.g. priests) are expected to be highly cooperative (Orbell et al 1992) and are not expected to be exploited by noncooperators (van Lange & Liebrand 1989, 1991b).

## Intergroup Relations

How groups interact with other groups in mixed-motive settings has received considerable attention in recent years. In social dilemmas, Rapoport, Bornstein, and colleagues have studied group competition for a public good. They have devised a simple paradigm, called an intergroup public goods (IPG) game, in which groups of individuals compete for a good that only the winners may use (Rapoport & Bornstein 1987). Several studies show that a larger group will not necessarily prevail over a smaller group (Rapoport & Bornstein 1989, Rapoport et al 1989). Preplay discussion within each group (though not between groups) substantially increases contribution rates (Bornstein & Rapoport 1988, Bornstein et al 1989, Rapoport & Bornstein 1989), although this result may be true only for step-level goods (Bornstein 1992).

Insko and colleagues have shown that interaction between groups is more contentious and less cooperative compared with individuals interacting with other individuals. The phenomenon is known as individual-group discontinuity and is very robust. Insko & Schopler (1987) offer two explanations for discontinuity. The "social support for shared self interest" hypothesis argues that self-interested behaviors (i.e. competition) receive support within a group that isolated individuals cannot obtain. According to the "schema-based distrust" hypothesis, group members maintain beliefs that intergroup interactions

are by nature contentious and, thus, act accordingly. Support for schema-based distrust is equivocal. Intergroup interactions are expected to be competitive and hostile (Hoyle et al 1989), but groups rarely choose to withdraw from such interactions (Insko et al 1993). The fact that greed is a significant motivator in intergroup choice (Insko et al 1990, Schopler et al 1993) makes the social support explanation seem more plausible.

## CRITIQUE OF MIXED-MOTIVE RESEARCH

Mixed-motive interaction continues to be a popular research topic, and we doubtless will learn considerably more about such interaction in the near future. However, there are some definite weaknesses that we feel researchers have not adequately addressed.

We have already touched upon what we see as a weakness in coalition research: the lack of any process-oriented theories. Many theories are able to predict which coalitions will form, but these theories are superficial and do not address the psychological factors involved in the coalescing process. Many theorists have emphasized the need for process theories, but with the exception of Friend et al (1977), none have appeared. Unfortunately, Friend and colleagues' theory is restricted to a "game of status," which is a special type of coalition game and is not applicable to the more general coalition situation. However, their work may serve as a guide for theorists who wish to develop a process theory of coalition formation.

By contrast, social dilemma researchers have made some theoretical progress. As we have seen, several psychological variables have been researched in-depth regarding their role in facilitating cooperation. Group identity, self-efficacy, uncertainty, and expectations, for example, have been shown to affect cooperation across a broad range of dilemmas. What is missing is a general model of cooperative behavior that postulates how these factors are interrelated. We are not alone in calling for such a theory. Liebrand (1992) identified 14 factors that conclusively affect dilemma behavior, yet he noted that almost nothing is known about how these factors interact.

Accordingly, mixed-motive researchers should become more process-oriented. In particular, coalition researchers need to shift their focus away from prediction of coalitions and concentrate on psychological variables that will facilitate the development of a process theory. By contrast, social dilemma researchers have done an excellent job of documenting the psychological factors that drive cooperation. It is time to integrate these factors to obtain a more complete picture of how cooperation evolves in a group.

## SOME CONCLUDING COMMENTS

Psychologists are not alone in pondering mixed-motive problems. Economists in particular are also interested in bargaining, coalition formation, and social dilemmas (see Ledyard 1994), as are sociologists (see Yamagishi 1994) and political scientists (see Palfrey 1991). But to date, many social psychologists have largely ignored economic principles and concepts. At least in the social dilemma area, many economists seem to be similarly unaffected by psychological research (see Ledyard 1994). However, some economic theories of bargaining draw freely from basic psychological work.

This lack of sharing between the two disciplines is unfortunate. Given that the research goals of psychologists and economists are often complementary, the potential exists for fruitful collaboration. Happily, there are many indicators that this state of affairs may be changing. For example, economic psychology continues to grow as a viable subdiscipline; important interdisciplinary publications have appeared recently (see Hogarth & Reder 1987, Lopes 1994; see also the *Journal of Behavioral Decision Making*); and psychological articles have been published in nonpsychology journals. Perhaps these developments will encourage the kinds of cooperation and collaboration we are calling for.

### A Final Comment

Experimental research on mixed-motive interaction was once dominated by social psychologists. During the last decade this dominance has been called into question. In 1986 Steiner warned us that "if social psychologists do not research the group, someone else surely will" (p. 238). In response to Steiner, Levine & Moreland (1990) concluded that "Steiner's warning comes too late. Despite all the excellent research on small groups within social psychology, that discipline has already lost its dominance in this field" (p. 620). They also stated that "the torch has been passed to colleagues in other disciplines, particularly organizational psychology." Although psychologists involved in mixed-motive research have not yet "passed the torch," that point may be approaching rapidly. Bargaining and coalition research is now dominated by economists and organizational behaviorists, and a sizable amount of social dilemma research is also conducted by investigators outside of social psychology. Mixed-motive research may not regain the prominence it had when prisoner's dilemma research was at its peak, but neither is it ready to be abandoned. There are simply too many interesting psychological variables yet to be explored.

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