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Cooperation: Sociological Aspects

agency (Bandura 2000). The nature of ve and individualistic efforts the conditions nich they are effective need to be further ed. There is a current interest in the values y taught by participating in cooperative and ve situations (Johnson and Johnson 1999). ion, for example, may promote a concern for eing of others and a desire to contribute to on good, while competition may promote a be better than others and a concern for self- ie expense of others. Finally, one of the least nding aspects of cooperation and competition ibility, the willingness to be influenced by iducibility is the center of constructive power, ccurs, in cooperative but not competitive s. World events, furthermore, such as in- economic interdependence among countries ionalization within countries, will keep inter- study of cooperation and competition high in e.

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D. W. Johnson and R. T. Johnson

Cooperation: Sociological Aspects

Individuals cooperate if each willingly acts in a manner that contributes to the others' welfare. Cooperation is one of the oldest and most revered topics in sociology even though it has appeared under a variety of headings, such as 'social order' and 'solidarity.' The classical sociological answers to the question of how cooperation among individuals comes about differ in detail but share a common core: Cooperation is the result of shared values and norms and norm-conforming behavior.

A problem with this 'obligation-centered' solution is that there is no explanation of where norms come from and why the degree of norm conformity varies even for the same individual over time. Theories that might solve these problems were not developed until the 1970s when a sea change in the basic assumptions on human action took place within sociology. At that time, analyses of cooperation among rational egoists (mostly rooted in game theory) began to shed new light on the way one might analyze cooperation, norms, and norm-conforming behavior. For some time, game-theoretic analyses of cooperation had become the most serious attempt to explain cooperation. Big advances were made but many problems remained, especially the problem that individuals do not seem to be as self-centered as they are assumed to be in game theory. Still, the game-theoretic analyses were powerful enough to suggest that there was no way back to explanations of cooperation that ignored human rationality all together. More recently, analyses based on some form of social rationality have arisen in order to address some of the unsolved problems. The following sections first present the most important aspects of sociological research on cooperation among rational egoists, and then discusses some contributions on cooperation with social rationality.

1. Cooperation Among Rational Egoists

It may not be quite realistic to assume that individuals are always looking out for themselves and that they do so by weighing the costs and benefits of their behavior. However, this assumption of 'rational egoism' seems to have four strong points in its favor. First, it allows one to pinpoint why cooperation is an interesting problem. Second, it allows rigorous theory formation with tractable structures of argumentation. Third, everyday experience and research give this assumption

enough support to make it worthwhile to use it in the light of its analytic advantages, especially when analyzing interaction among interdependent individuals. Fourth, at later stages of theory formation, this assumption can be relaxed in favor of more realistic assumptions.

Game theory has furnished the most important instruments for such analyses, and since the late 1970s—inspired by developments in political science and economics—sociologists have begun to use it to study questions concerning cooperation, typically bringing sociological aspects into the analyses, such as network embedding. The crucial first step in the 'new' analysis was to identify typical situations in which cooperation is problematic: social dilemmas. A social dilemma is—roughly speaking—a situation in which the rational decisions of individual actors are likely to lead to a collectively suboptimal outcome. An outcome is suboptimal (i.e., not 'Pareto-optimal') if one or more actors could improve their position without worsening the position of any other actor(s). In a social dilemma, individual and collective rationalities are in conflict. Cooperation can now be succinctly defined: An actor cooperates if and only if he or she chooses a course of action that will lead to a collectively rational outcome when other actors behave cooperatively as well. Social dilemmas occur when Pareto-superior behavior cannot be achieved by enforceable contracts. This may have many different reasons. For example, it may be impossible to communicate with others in order to come to an agreement; or, if communication is possible, transaction costs may be too high to actually reach an agreement. If agreements are within reach, it may be practically or epistemically impossible to specify all relevant future contingencies in the contract. Even if a contract can be drawn up, there may be no court with sanctioning power; or if there is such a court, it may not be possible to prove uncooperative behavior in court.

There are structurally different variants of social dilemmas, and game theory helps to distinguish them. For example, there is the *common's dilemma* (Hardin 1968, Ostrom 1990) in which various actors have free access to a resource (such as fishers from different nations in international waters); there are *step-level public goods* (Taylor 1987), for which only a limited number of actors have to cooperate in order to produce the public good for a much larger group. A special case of this is the *volunteer's dilemma* (Diekmann 1986), for which only one volunteer is necessary to produce the public good for all, such as rescuing a drowning child with a crowd of onlookers; there is the *trust game* (Dasgupta 1988) in which the trustee can honor or opportunistically exploit the cooperation of the other (as when you lend money to an acquaintance who promises to pay it back with interest).

The *Prisoner's Dilemma* (PD) is by far the best known variant of a social dilemma. It involves an arbitrarily large number of people. The special case of

	C	D
C	R, R	S, T
D	T, S	P, P

Figure 1

Prisoner's Dilemma Game. In the Axelrod simulation is T (temptation) = 5, R (reward) = 3, P (punishment) = 1, and S (sucker's payoff) = 0

a two-person PD has been explored the best so far. In a two-person PD, both players have the option to cooperate or to defect (see Fig. 1). If both cooperate, each gets a payoff of value R. If one defects while the other cooperates, the defector gets T and the cooperator gets S. If both defect, both will get P, with $T > R > P > S$. There is a dominant strategy for each player (i.e., an individually rational choice, no matter what the other does) leading to a 'Nash equilibrium' (in which no player can unilaterally improve his or her position by deviating from the equilibrium strategy) and to a Pareto-inferior result. The assumption of rational egoism leads to two motives in a PD: the defensive motive to shield against exploitation (if the other defects you are better off defecting yourself), and the aggressive motive to exploit a cooperative player (if the other cooperates, you get even more by defecting). Together, these motives result in the conflict between individual and collective rationality. Mutual cooperation would be the Pareto-optimal result but the two motives lead to mutual defection.

1.1 The Embedding of Cooperation

Raub and Weesie (2000) have suggested that game-theoretic work on solutions to social dilemmas can be divided into three kinds of embeddings of potential cooperation: embedding in time, in institutions, and in social networks. We follow their suggestion for this overview.

1.1.1 Time. When actors find themselves in a social dilemma that is iterated indefinitely over time, new sources for cooperation arise. First of all, defection can be sanctioned by the other player(s) in later moves, and the resumption of cooperation by the defector can be rewarded by a similar response of the

other player(s). Friedman (1977) and Taylor (1987) have shown that if the value of future outcomes is high enough, this opportunity to make one's cooperation conditional on that of the other leads to cooperative strategies with Nash equilibrium and Pareto optimality. Axelrod (1984) built on this result to ask the question which strategy would be most conducive to lead to cooperation in an iterated PD. In order to answer this question, he conducted computer simulations in which various strategies played against each other for about 200 rounds. Axelrod had invited suggestions for the strategies that would create the most cooperation. The winner was the conditional strategy 'tit for tat' (TFT) suggested by the mathematician and psychologist Anatol Rapoport.

TFT is very simple: (a) always begin with cooperation; (b) for the present round, copy the move of your partner in the previous round. TFT has a number of distinct features. It is 'nice,' because it starts with cooperation; it cannot be provoked, because it sanctions exploitation; and it is forgiving, because it returns to cooperation after the other has done so. Contrast this for example with 'permanent retaliation' in which defection is answered by unforgiving defection, a strategy that did much worse than TFT. TFT won against other strategies but it is not ideal under all circumstances. It does not do well against all sorts of strategies and it has not the property of 'evolutionary stability.' The heart of Axelrod's results, however, is thoroughly in line with a classical sociological insight: that the norm of reciprocity is probably the most essential norm generating cooperation in time-embedded interactions. As sociologists have argued for quite some time, homogeneity of a group in terms of important characteristics (including the use of 'nice' strategies) will increase the likelihood of reciprocity, as does smallness of the group because it helps identification of defection. Similarly, a low rate of fluctuation of membership helps reciprocity because it increases the shadow of the future. A related argument has been made in terms of 'social capital' (Coleman 1990).

1.1.2 Institutions. When reciprocity norms work, they are self-enforcing because no player can do better by unilaterally deviating from the cooperative strategy (Nash equilibrium). However, under many conditions, norms of reciprocity will not work properly. For example, when future contingencies are so complex that it is difficult to determine *a priori* what constitutes defection and/or difficult to detect defection, a reciprocity norm is not enough to secure cooperation. Similarly, such self-enforcing norms do not work well for the production of collective goods in larger groups, the less so the more unhomogeneous and fluctuating the group membership. In such situations, expectations concerning the relative importance of one's own and others' contribution are likely to be low and individuals tend to free ride

rather than to contribute to the production of the collective good.

When self-enforcing norms do not work, cooperation may be achieved by embedding interactions in formal and/or informal rules which create 'selective incentives,' that is, added rewards for cooperating and/or punishments for not cooperating. This argument was first forcefully made by Olson (1965) and has been refined by sociologists and other social scientists (e.g., Hechter 1987, Marwell and Oliver 1993, Ostrom 1990). For example, the state punishes tax evasion and provides some standard instruments for contracting: in many countries labor unions offer extra benefits (such as cheaper insurance) for joining the labor union. The formation of institutional solutions has been explained by Hechter (1987) as a two-stage process. First, groups for the joint production of private goods are established (such as insurance). They are small enough that noncooperators can be detected and excluded (hence no free rider problem, see Lindenberg 1998). The profits made from the joint production can then be used to establish selective incentives for the joint production of collective goods. In this way, labor unions may be born out of mutual insurance groups. Abell (1996) adds to this kind of analysis that a proper institutional explanation of cooperation should include the explanation of how cooperation can be combined with rivalry and competition. More work in this direction is needed.

Williamson (1985) has pointed to the importance of 'private orderings' in which, in the shadow of the law, contract partners may voluntarily restrict their own options, thereby creating selective incentives for their own cooperative action. For the partner, such measures work if there are 'credible commitments,' for example, by posted hostages and granted warranties. Sociologists have used this idea successfully to study contractual behavior (e.g., Weesie et al. 1998).

Often, credible commitments are difficult to establish (due to the size of the group) and formal institutional arrangements (with enforced sanctions) may not be available. In such groups, informal rules (social norms) that govern selective incentives for cooperation are needed. Like all rules, informal rules only work if they are enforced, and this creates the second-order free rider problem. Sanctioning non-cooperators is itself a (step-level) collective good. There seems to be an infinite regress. How do groups get out of this problem? There is no handy solution to this problem within the rational egoist approach. However, as Heckathorn (1996), following Marwell and Oliver, has shown, public good production is not always subject to the first and second order free rider problems. In fact, the production function (i.e., the function that relates the proportion of cooperators to the level of the public good production) is likely to be S-shaped and only for certain values of the function will the situation have the structure of a PD. The reason for this is that an S-shaped production function

implies a changing marginal utility from cooperation as the proportion of cooperators increases. Interestingly, Heckathorn also found that in certain phases 'hypocritical cooperation,' in which people criticize others for not cooperating even though they do not cooperate themselves, is quite effective in eliciting contributions to the collective good (see also Yamagishi 1986). The main lesson to be learned from Heckathorn's analysis is that collective action should be analyzed dynamically, a conclusion one can also draw from Hechter's analysis of institutional controls mentioned above.

1.1.3 Social networks. It has long been known in sociology that it often matters to people what other people say about them. Cooperation is helped by the effects of reputation within networks. For example, DiMaggio and Louch (1998) found in a national sample that consumers, when they are uncertain about products and performance, prefer to buy goods and services from suppliers with whom they have social ties outside the transaction itself. If the suppliers in such a network are clearly unreliable, the consumers are likely to have heard about it. If these suppliers begin to be unreliable, the network relations can be turned against them. Thus, networks have an information function (people learn about the cooperativeness of certain others) and a control function (people can use the network to sanction noncooperators).

Both aspects have been worked out game-theoretically by Buskens (1999). For dyadic transactions, characteristics of the network (such as density, 'indegree,' and 'outdegree,' i.e., the number of others with whom people are connected) play an important role but it turns out that reputation effects are quite complex and there are indications that they might be less important than the temporal embeddedness. For economic transactions, Uzzi (1996) has found interesting additional effects of networks on tacit knowledge and joint problem solving. Network embeddedness for collective action has apparently not been studied yet in any rigorous way.

Yet another use of networks for the explanation of cooperation has been suggested by Coleman (1990). He points to the importance of intermediaries for the creation of trust and thus for cooperation. Intermediaries can play a number of roles: as advisors who introduce interested parties and facilitate the interaction necessary to create trust; as guarantors who absorb the risk if trust turns out to be misplaced; and as entrepreneurs who combine the resources of several actors to place them into the hands of others who are expected to realize gains. For future research, a sociologically interesting question is under what conditions structures with certain kinds of intermediaries will emerge.

2. Cooperation Among Socially Rational Individuals

There is a growing sociological literature on cooperation that holds on to the assumption of rational action but adds specific 'bridge theories' on preferences, learning, and/or framing, the effect of which is to render regard for others quite prominent in the analyses. Hence the term 'social rationality.' While the traditional literature on the effects of socialization was unrelated to the analysis of scarcity and choice, the social rationality literature connects effects of socialization with purposeful action in the face of scarcity. In this literature the trade-off between empirical richness and analytical tractability is different than in most game-theoretic analyses. In the latter, added analytical power and tractability is often achieved by the 'rational egoist' assumption at the expense of some loss in closeness to reality, whereas in the former, some analytical power and tractability is sacrificed in favor of added closeness to reality. Clearly, each kind of approach profits from the existence of the other. In this review, there remains room for the discussion of only a few developments.

2.1 Goals (Preferences)

By far the largest amount of literature on cooperation in the 'social rationality' category is concerned with 'social preferences.' Although the term 'preference' is often used in this context, a better term would be 'social goals.' One variant of this approach, found in social-psychological and sociological research, is the 'social orientation' research, in which individuals are differentiated according to their orientation towards others. This orientation is often assumed to be more or less stable and the joint result of nature and nurture. Different types of orientation are distinguished, most frequently the following three: 'cooperative' (the goal is to maximize joint payoffs); 'individualistic' (the goal is to maximize individual payoff); 'competitive' (the goal is to maximize the positive difference between own and other's payoff). Such 'types' can be combined with game-theoretic analyses and/or with analyses of evolutionary learning at the population level.

Sociologists and economists focus especially on questions of signaling and the spread of strategies over time, some of them using genetic algorithms taken from evolutionary biology. This makes *trust* a central concept in the analysis of cooperation. For example: 'Are the tendencies to trust and to honor trust correlated?' (Snijders 1996); 'How can cooperative types convincingly signal their type to others so that they will be trusted and cooperation comes about?' Or 'Under what conditions will effective rules for trusting (i.e., conventions for detecting cooperators) evolve in neighborhood interactions and spread across the population through contact with strangers?' (see Macy

and Skvoretz 1998). Another question concerns the explanation of preferences themselves. For example, Frey (1997) has linked a long tradition in sociology to study the effects of voluntary sacrifice (the 'gift') on others' willingness to cooperate with psychological research on autonomy. He argues forcefully that a cooperative orientation (he speaks of 'intrinsic motivation') is driven out by monetary rewards and by forced cooperation. Conversely, Raub and Voss (1990) investigated circumstances that would create or increase a pro-social orientation.

One problem with the concept of social orientation is that it does not allow for situational influences. Couldn't there be situations in which one is pro-social and others in which one would be quite egoistic? A different approach to social goals incorporates answers to this problem. It consists of assumptions on general human goals that imply different social orientations, most notably the achievement of status (leading to an emphasis on outcome differences), behavioral confirmation (leading to an emphasis on own outcomes) and affection (leading to an emphasis on joint outcomes) (see Lindenberg and Frey 1993). Even if a person has a particular disposition, it now depends on the situation which goal and thus which orientation becomes particularly salient. Note that all three goals are inherently directed towards others.

2.2 Framing Effects

The willingness to cooperate may also depend on how people define a situation. Of particular importance is the difference between gains and losses. Kahneman and Tversky have shown that individuals are keener on avoiding losses than on achieving gains, *ceteris paribus*. This leads to the hypothesis that it is easier to bring about cooperation concerning the defense of a common pool resource than the achievement of a (new) public good. For example, it should be easier to bring about a campaign to preserve a rainforest than a campaign to create a wildlife preserve. The evidence for this is somewhat mixed (see van Assen 1999), but when the disturbing effects are carefully controlled, the framing prediction finds support, especially for initial stages of cooperation (see Sell and Son 1997). There is also a claim that people often cognitively transform a PD into a game with conditional cooperation ('assurance game'). The interesting question then is how the beliefs that others will cooperate are influenced by social circumstances or by cultural beliefs (see, for example, Hayashi et al. 1999), and what influence certain thresholds of cooperation have for triggering conditional cooperation in a larger group (see Yamaguchi 2000).

A different framing effect comes from 'framing through goals' (see Lindenberg 1998). Goals are assumed to have a strong impact on the way individuals define a situation and thereby create a difference between 'foreground' and 'background' information

and preferences. What is in the foreground will have a much stronger impact on behavior than what is in the background, *ceteris paribus*. For example, if the goal (the action frame) 'to act appropriately' is salient, then information on normative expectations and ways to meet them are in the foreground, whereas the goal to minimize costs (of meeting these expectations) is in the background. As a result, when the action frame is normative (i.e., driven by the goal to act appropriately), costs of cooperation must be much larger in order to reduce people's willingness to cooperate than when the action frame is, say, gain. In addition, people are likely to signal their action frame to others through their behavior (through 'relational signals') which puts a high premium on including symbolic behavior in the analyses of cooperation, even in game-theoretic analyses.

All in all, in sociology, studies on cooperation are both based on the assumption of rational egoists and on some kind of social rationality. The latter are clearly on the rise in number and sophistication.

See also: Altruism and Self-interest; Cooperation and Competition, Psychology of; Dispute Resolution in Economics; Emotions, Sociology of; Game Theory; Game Theory: Noncooperative Games; Groups, Sociology of; Institutions; Network Analysis; Networks and Linkages: Cultural Aspects; Networks: Social; Norms; Organizational Decision Making; Organizations, Sociology of; Prisoner's Dilemma, One-shot and Iterated; Psychoanalysis in Sociology; Rational Choice Theory in Sociology; Rationality in Society; Social Relationships in Adulthood; Solidarity, Sociology of; Trust, Sociology of

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A. Diekmann and S. Lindenberg

Cooperative Learning in Schools

Cooperative learning, instructional methods in which students work in small groups to learn academic material, is one of the most extensively studied and

widely used classroom innovations. Hundreds of studies have compared cooperative learning to other instructional methods on various social and academic measures. By far the most frequent objective of cooperative learning research has been to harness its effects on student achievement. Field and laboratory studies of the achievement effects of cooperative learning have been conducted in every major subject, at every grade level, and in all types of schools the world over. Cooperative learning is not only the subject of research and theory, the knowledge generated by that labor is used at some level by hundreds of thousands of teachers. A national survey of US teachers found that 79 percent of elementary teachers and 62 percent of middle school teachers reported making some sustained use of cooperative learning (Puma et al. 1993).

While there is little doubt about the facilitating effect of certain forms of cooperative learning on student achievement, there is still great disagreement over how and why cooperative learning affects achievement. Perhaps more importantly, there is intense debate over the conditions under which cooperative learning practices are effective. Some researchers describe theoretical mechanisms underlying the achievement effects of cooperative learning that are completely different and at odds with those assumed or described by others. In particular, some scholars emphasize the role of incentive structure while others attribute achievement effects to students' interactions in the types of task structures used in cooperative learning. Though often working in parallel, there has been remarkably little cross-fertilization in the work of cooperative learning researchers. Applications and investigations of cooperative learning emerging from different perspectives typically differ in their operationalization of aspects of both the incentive and task structures. As a result, it is difficult to determine which is responsible for which outcomes.

This article summarizes and updates earlier discussions of the major theoretical perspectives that seek to explain the facilitating effects of cooperative learning (Slavin 1995). It describes motivational, social cohesion, and cognitive elaboration perspectives on cooperative learning and explores the conditions under which each may operate. Finally, it suggests future research that will be needed to sustain the study and practice of cooperative learning in the twenty-first century.

1. Four Major Theoretical Perspectives on Cooperative Learning and Achievement

1.1 Motivational Perspectives

Motivational perspectives on cooperative learning emphasize the reward and/or goal structure of the