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JOHN T. SANDERS	<i>Why the Numbers Should Sometimes Count</i> 3
STEVEN LEE	<i>Morality, the SDI, and Limited Nuclear War</i> 15
S. PLOUS	<i>Modeling the Nuclear Arms Race as a Perceptual Dilemma</i> 44
ELIZABETH ANDERSON	<i>Values, Risks, and Market Norms</i> 54
TIMOTHY J. BRENNAN	<i>Rights, Market Failure, and Rent Control: A Comment on Radin</i> 66
MARGARET JANE RADIN	<i>Rent Control and Incomplete Commodification: A Rejoinder</i> 80
	<i>Notes on the Contributors</i> 2
	<i>Subscription Information</i> 84

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Modeling the Nuclear Arms Race as a Perceptual Dilemma

In a utilitarian assessment of nuclear disarmament, the issue of pivotal psychological importance is not what policy people prefer, but rather what utilities govern the nuclear arms race. Douglas P. Lackey (1982, p. 199), in a pioneering utilitarian analysis of nuclear deterrence, assumed, "as most students of strategy do," that outcome utilities of the nuclear arms race correspond to a Prisoner's Dilemma. According to this game-theoretic model, the nuclear arms race is represented as a conflict between the superpowers in which response options are dichotomized as "arm" and "disarm." The dilemma exists because the United States and the Soviet Union are always better off individually by arming, but if both superpowers arm, the outcome is lower in utility than if both countries disarm (see Table 1 for an example of a Prisoner's Dilemma).

In a scathing critique of Lackey's utilitarian analysis, Hardin (1983) took exception with many of the assumptions made by Lackey, but on the

TABLE I
A PRISONER'S DILEMMA

	USSR Disarms	USSR Arms
U.S. Disarms	6, 6 (2, 2)	-7, 7 (4, 1)
U.S. Arms	7, -7 (1, 4)	-1, -1 (3, 3)

These numbers are reproduced from the utilities for Column displayed in Table 2. The first number in each cell corresponds to American utility, the second to Soviet utility. Estimates are rounded off to the nearest whole number, and ordinal preferences are given within parentheses.

appropriateness of using the Prisoner's Dilemma to model the nuclear arms race, Hardin agreed fully. "I am convinced," he wrote, "that this game represents the preference ordering of virtually all articulate policy makers and policy analysts in the United States and presumably also in the Soviet Union" (1983, p. 248). Nor are Lackey and Hardin alone in this belief. Experimental research on the Prisoner's Dilemma has been sponsored by the United States Arms Control and Disarmament Agency (Lindskold, Bonoma, Schlenker, and Tedeschi, 1972; Shubik, 1968), the United States Air Force (Scodel, 1962), and the Office of Naval Research (Deutsch, Epstein, Canavan, and Gumpert, 1967; Luce and Adams, 1956; Pruitt, 1967, 1970). It has also involved members of the International Peace Research Institute (Lumsden, 1966, 1973) and the British Ministry of Defense and Department of Atomic Energy (Brew, 1973).

Lackey (1982, p. 199) also assumed that, in contrast to superpower leaders, "a large majority of people in the world prefer . . . neither side having nuclear arms to one side having them." As a result of this and other assumptions, Lackey was able to demonstrate the worldwide utility, or morality, of nuclear disarmament. Establishing the utility of unilateral American disarmament within a Prisoner's Dilemma was more complicated, however, and Lackey faced harsh criticism both for minimizing the possibility of Soviet exploitation and for dismissing the efficacy of incremental initiatives in achieving mutual nuclear disarmament (Hardin, 1983; Kavka, 1983; but see also Lackey, 1983, for a rejoinder).

Yet if Lackey is content to demonstrate the utility of disarmament initiatives (after all, whether disarmament is unilateral can be determined only by the other side), there need not be a conflict here; the problem can be resolved by rejecting the assumption that a Prisoner's Dilemma accurately reflects the utilities that govern the nuclear arms race. As it turns out, there is good reason to reject such an assumption. There is also evidence to suggest that the current arms race approximates a new game-theoretic model called the "Perceptual Dilemma," in which the preference of mutual disarmament to unilateral armament—assumed by Lackey to represent worldwide utilities—is shared by the superpowers.

In a Perceptual Dilemma, the prevailing leaders in both the United States and the Soviet Union (1) prefer mutual disarmament to all other outcomes, (2) want above all to avoid disarming while the other side arms, and (3) perceive the other side as preferring unilateral armament to all other outcomes. Because each side believes that its own disarmament

would be an invitation for the other side to arm—even though both in fact prefer mutual disarmament—the natural result is an arms race. Furthermore, because neither side has a desire to arm, both interpret the arms race as confirming evidence that the other side wishes to arm (Jervis, 1976).

As a model of the nuclear arms race, the Perceptual Dilemma differs in several important ways from a Prisoner's Dilemma. Most traditional models, such as the Prisoner's Dilemma, assume that each side ideally prefers unilateral armament. In contrast, each party in a Perceptual Dilemma prefers mutual disarmament to all other outcomes (whether for economic, strategic, or other reasons), but is prevented from disarming by the *perception* that the other side favors unilateral armament. Unlike a Prisoner's Dilemma, in which conflict is endemic, a Perceptual Dilemma can be solved when either side persuades the other that it genuinely desires mutual disarmament more than unilateral armament. If, for example, members of the Politburo were convinced that the utilities in Table 2 are representative of American preferences, and if, as Soviet leaders have said, mutual disarmament is more desirable than unilateral armament, little reason would remain for continued participation in the nuclear arms race. In shifting models from a Prisoner's Dilemma to a Perceptual Dilemma, the problem for research in conflict resolution becomes how best to convince each side of the other's true perceptions.

THE EVIDENCE FOR A PERCEPTUAL DILEMMA

No method of assessing utilities is entirely adequate, but each, in its own way, can be very informative. For example, in a mail survey during the summer of 1984, thirty-two United States senators directly rated the utility of (a) mutual disarmament, (b) mutual armament, (c) unilateral armament by the United States, and (d) unilateral armament by the Soviet Union (for details, see Plous, 1985). The scale ranged from a low of -10 (worst possible consequences) to a high of $+10$ (best consequences imaginable), with 0 as the midpoint (consequences neither good nor bad). Once senators rated the four outcomes for the United States, they attempted to take the perspective of Soviet leaders estimating the utility of the same four situations for the Soviet Union.

The results, after averaging across all thirty-two senators and rounding off to the nearest point, are summarized in Table 2. As can be seen, the

TABLE 2
HALF OF A PERCEPTUAL DILEMMA

	USSR Disarms	USSR Arms
U.S. Disarms	8, 6 (1, 2)	-7, 7 (4, 1)
U.S. Arms	1, -7 (2, 4)	-5, -1 (3, 3)

Utility estimates as perceived by thirty-two United States senators. The first number in each cell corresponds to American utility, the second to perceived Soviet utility. Estimates are rounded off to the nearest whole number, and ordinal preferences are given within parentheses.

matrix corresponds perfectly to the American half of a Perceptual Dilemma. In fact, senators viewed unilateral armament by the United States as only marginally positive in utility. Mutual disarmament, with an average utility seven scale points higher than unilateral armament, was seen as the most desirable outcome. Unlike the United States, however, the Soviet Union was perceived as desiring unilateral armament more than any other outcome. Of the senators who responded, 66 percent believed that unilateral armament was the first choice of the Soviet leadership, 72 percent believed that American unilateral disarmament would be the worst outcome for the United States, and 81 percent attached the greatest American utility to mutual disarmament. Because this asymmetry seriously violates the assumptions of a Prisoner's Dilemma, an ordinal analysis was conducted to double-check the results, but contrary to the historical assumptions of experimental game research, not a single senator evaluated the nuclear arms race as a Prisoner's Dilemma.

These views are apparently shared by the American public. On 17 October 1985, results were released from an independent nationwide poll commissioned by an influential and politically conservative group in Washington, D.C. (Committee on the Present Danger, 1985). Among other things, the poll suggested that (1) 70 percent of American adults favored "mutual reductions of nuclear weapons that would leave the United States and Soviets with nuclear arsenals of equal capability"; (2) 87 percent opposed "mutual reductions of nuclear weapons that would leave the Soviets with a nuclear arsenal of greater capability than that of the United States"; and (3) when asked whether "the Soviets are sincere

in their desire for mutual reductions of nuclear weapons or are they interested only in maintaining a nuclear advantage over the United States," 74 percent indicated that the Soviets were interested only in maintaining a nuclear advantage. These results suggest that a Perceptual Dilemma is descriptive not only of the American political leadership, but of the American public too.

Although direct Soviet survey data is unavailable, "surrogate" studies of Soviet opinion, undertaken by the United States International Communication Agency, support the Soviet half of a Perceptual Dilemma (Guroff and Grant, 1981). In these studies, a large number of Americans and Western Europeans who had close ties to Soviet political elites were asked to answer questions as their Soviet counterparts would. Despite certain drawbacks in this methodology, a surrogate approach has the advantage of easing social desirability biases, and in many cases, the survey yielded results approaching consensus. According to Guroff and Grant (1981, p. 16), findings indicated that (1) Soviet leaders viewed arms control as "logical, even imperative"; (2) "Soviet elites find it difficult to interpret proposed massive new arms expenditures in the United States as other than attempts to, first, gain military superiority and, second, drive the Soviet economy to bankruptcy"; and (3) "Soviets say that they will never allow the United States to gain outright military superiority over them again, that they will make whatever sacrifices are necessary to prevent this." In other words, Soviet outcome utilities, like those of United States senators and the American public, conformed precisely to a Perceptual Dilemma.

This pattern is equally apparent in political declarations made by American and Soviet leaders. To take but one example, Major General Yuri Lebedev of the Soviet armed forces recently wrote:

The Soviet Union believes that a rough parity is sufficient for defensive needs. It has never set the goal of upsetting the existing equilibrium and gaining military superiority over the other side. Moreover, the Soviet Union holds the view that the maintenance of the military and strategic parity is exactly what is needed to ensure implementation of the principle of equality and equal security and lays groundwork for preserving and strengthening peace, for everything which, taken en masse, is termed international stability.

The United States holds a different position. The U.S. ruling quarters have set themselves a task of tipping in their favour, whatever the cost,

the alignment of forces in the world scene and securing military supremacy of the U.S.A. over the U.S.S.R. and of NATO over the Warsaw Treaty Organisation. (1986, pp. 23–24)

Statements such as this have, in the past several years, proliferated among members of the American and Soviet military and political leadership (cf. Plous, 1985). They are also documented in the work of such eminent Sovietologists as Bialer and Afferica (1982), Caldwell and Legvold (1983), Garthoff (1978), Holloway (1984), and Talbott (1984), as well as Soviet writers who specialize in international security affairs (e.g., Bykov, 1980; Luzin, 1981).

Finally, there is experimental evidence concerning the tenacity and emotional quality of a computer-generated Perceptual Dilemma (Plous, 1987). In this research, the effects of two strategies were compared within the context of a Prisoner's Dilemma and within the context of a Perceptual Dilemma: a matching strategy (called Status Quo) and a matching strategy preceded by unconditional cooperation (called Disarmament Initiatives). Results indicated that (a) the Status Quo strategy sustained competitive behavior, attitudes, and emotions in both the Prisoner's Dilemma and the Perceptual Dilemma; and (b) the Disarmament Initiatives strategy induced significantly more cooperation among subjects locked in a Perceptual Dilemma than among those in a Prisoner's Dilemma (see, for example, Figure 1). Social perceptions were also affected; subjects who were presented with "disarmament initiatives" within the context of a Perceptual Dilemma perceived the "other person" (in reality, a computer programmed to mirror responses by the subjects) as more honest, more similar to themselves, more desirable as a friend, and more responsive than did subjects in the other experimental conditions. Taken together, results from this and other research establish the Perceptual Dilemma as a viable game-theoretic model of the current nuclear arms race.

THE MORALITY OF NUCLEAR ARMS

Returning to Lackey's moral analysis of deterrence, the American utility of disarmament initiatives is evident within the framework of a Perceptual Dilemma. If the most influential leaders in the United States and the Soviet Union view the nuclear arms race from the perspective of Row in Table 2, then an unambiguous, time-limited succession of significant dis-

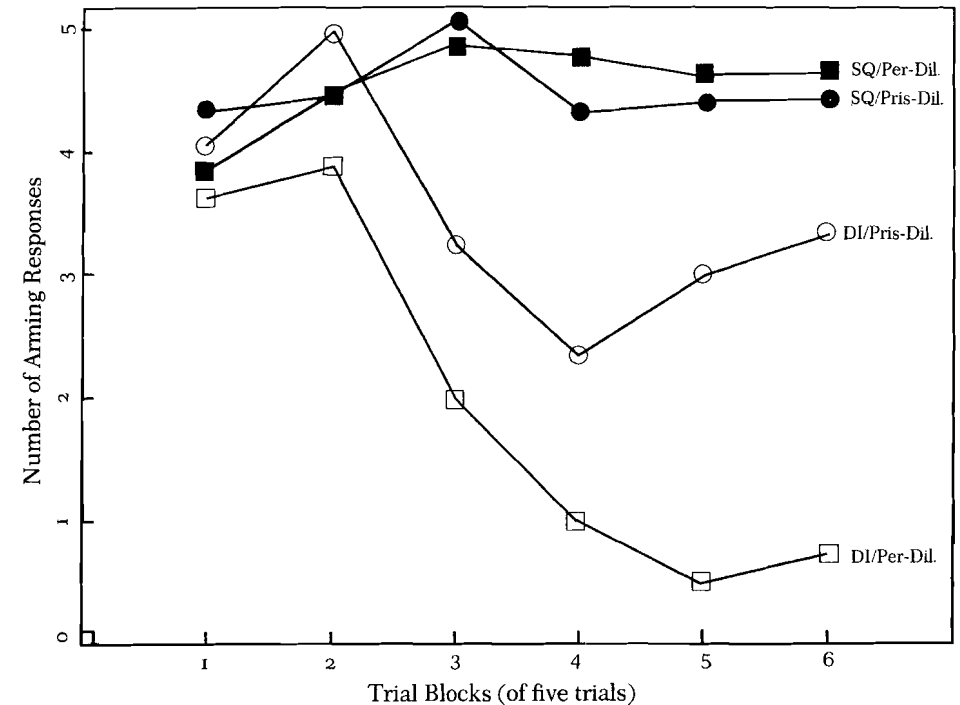


FIGURE 1

Number of arming responses by experimental condition (from Plous, 1987). For the first ten trials, the computer armed regardless of experimental condition or subject behavior. During the next ten trials, the computer matched responses in the Status Quo conditions and unconditionally disarmed in the Disarmament Initiatives conditions. In the final phase, when matching was instated across all conditions, only subjects who had been presented with disarmament initiatives within the context of a Perceptual Dilemma consistently disarmed.

armament initiatives will, in all likelihood, expose the underlying game of cooperation and lead to mutual disarmament. This outcome was precisely the result of "disarmament initiatives" within the computer-generated Perceptual Dilemma mentioned earlier. Moreover, unlike mutual disarmament within a Prisoner's Dilemma, reciprocated cooperation within a Perceptual Dilemma constitutes the outcome of greatest individual utility. According to the utilities in a Perceptual Dilemma, neither the United States nor the Soviet Union can do better than mutual disarmament.

But what if the utilities of the nuclear arms race do not in fact correspond to a Perceptual Dilemma? What if disarmament initiatives are not reciprocated? Are disarmament initiatives moral, in the utilitarian sense, if a chance exists that the perceived Soviet utilities in Table 2 are accurate?

Even in such a case, there is good reason to implement a time-limited policy of clearly articulated disarmament initiatives. First, given the evidence for a Perceptual Dilemma, policy advocates must weigh not only the consequences of initiating disarmament if the United States and Soviet Union are not in a Perceptual Dilemma, but the consequences of continuing to arm if the superpowers are truly in a Perceptual Dilemma. The historical trend in the United States has been to err on the side of "conservatism" and assume that the Soviet Union does not desire mutual disarmament, yet with every additional nuclear accident and every additional superpower crisis, the wisdom of the status quo is challenged. Second, given the redundancy of each country's nuclear retaliatory forces, a series of modest disarmament initiatives would leave the strategic balance unaffected. Indeed, there is some evidence that disarmament initiatives, even if discontinued, would have a salutary effect on superpower relations (cf. Etzioni, 1967).

More problematic from a utilitarian standpoint is whether to continue disarmament after both superpowers have reduced their nuclear forces to a minimal deterrent. As forces are reduced, it is conceivable that, all else being equal, the utility of unilateral armament will grow and the utility of mutual disarmament will decline. If, at some point, unilateral armament becomes more desirable than mutual disarmament, the nuclear arms race will be transformed from a Perceptual Dilemma into a Prisoner's Dilemma.

The supergame in Table 3 depicts an example of such a transformation. The game furthest to the right constitutes a static Perceptual Dilemma, but as Row continues to disarm, the game moves toward the left. The leftmost game in Table 3 is a static Prisoner's Dilemma. In a Prisoner's Dilemma, as the discrepancy in utility between unilateral armament and mutual disarmament grows (extrapolating leftward from Table 3), the temptation to arm increases, but if either side arms, a renewed arms race is likely to result. With the consequent accumulation of redundant, expensive, or destabilizing weapons, however, the relative utility of mutual disarmament again increases, moving the game back to a Perceptual Dilemma. This movement, from a Prisoner's Dilemma to a Perceptual

TABLE 3
HALF OF A SUPERGAME INCLUDING PRISONER'S AND
PERCEPTUAL DILEMMAS

	D	A	D	A	D	A	D	A	D	A
D	4, 6	-7, 7	5, 6	-7, 7	6, 6	-7, 7	7, 6	-7, 7	8, 6	-7, 7
A	5, -7	-5, -1	4, -7	-5, -1	3, -7	-5, -1	2, -7	-5, -1	1, -7	-5, -1

Note: As Row continues to choose "D," or disarmament, the game moves leftward. As Row continues to choose "A," or armament, the game moves rightward. The utilities for Column are Row's perceptions; in actuality, both participants operate from the position of Row.

Dilemma, may have already occurred once in the nuclear age (in the United States between the 1950s and the 1970s).

Of course, contrary to Table 3 it is also possible that, after reducing their nuclear arsenals to a minimal deterrent, the superpowers will have built up enough confidence to eliminate—or, more realistically, relinquish sovereign control of—the remaining weapons. The moral question of whether to forgo a minimal nuclear deterrent may no longer be an issue by the time minimal deterrence is reached, because each superpower will have had to spend the equivalent of ten years dismantling approximately 100 megatons per month, and the explosive force of 24,000 megatons of cooperation is hard to overestimate. Yet, whether the superpowers are destined to live in harmony or destined to cycle endlessly in and out of conflict, the utilitarian case for disarmament initiatives is a strong one. For the United States, for the Soviet Union, and for the rest of the world, morality must begin, naturally enough, with cooperation.

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*Modeling the
Nuclear Arms Race as
a Perceptual Dilemma*

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