

- Turner, C. & Martin, E. *Survey measures of subjective phenomena*. Washington, D.C.: National Academy of Sciences, 1982.
- Tversky, A. Elimination by aspects: A theory of choice. *Psychological Review*, 1972, 79, 281-299.
- Tversky, A. & Kahneman, D. The framing of decisions and the psychology of choice. *Science*, 1981, 211, 453-458.
- Tyler, T. R., & McGraw, K. The threat of nuclear war: Risk interpretation and behavioral response. *Journal of Social Issues*, 1983, 39(1), 25-40.
- U.S. National Academy of Sciences. *The effects of thermonuclear war*. Washington, D.C.: Author, 1975.
- U.S. nuclear industry cries for help. *Business Week*, August 31, 1981, 70-71.
- U.S. Nuclear Regulatory Commission. *Reactor safety study*. Washington, D. C.: Author, 1975.
- U.S. Nuclear Regulatory Commission. *Risk assessment review group*. Washington, D.C.: Author, 1978.
- U.S. Nuclear Regulatory Commission. *Risk assessment review group*. Washington, D. C.: Author, 1981.
- Vlek, C. A. J. & Stallen, P. J. M. Rational and personal aspects of risk. *Acta Psychologica*, 1980, 45, 273-300.
- Wallsten, T. (Ed.) *Cognitive processes in choice and decision behavior*. Hillsdale, NJ: Erlbaum, 1980.
- Wallsten, T. & Budescu, D. Encoding subjective probabilities: A psychological and psychometric review. *Management Science*, 1983.
- Wohlstetter, R. *Pearl Harbor: Warnings and decision*. Stanford, CA: Stanford University Press, 1962.
- Young, H. CND and the perils of nuclear secrecy. *The Observer*, November 1, 1981, 32.
- Zuckerman, S. *Nuclear illusion and reality*. London: Collins, 1982.
- Zusman, P. The dynamics of economic growth, technological force buildup—some strategic tradeoffs. In Lanir, Z. (Ed.) *Defense and national economy in the 1980's*. Ramat Aviv, Israel: Tel Aviv University, 1983.

Social Science and the Politics of the Arms Race

Baruch Fischhoff

Decision Research, Eugene, Oregon

Nick Pidgeon

University of Bristol, Bristol, England

Susan T. Fiske

Carnegie-Mellon University, Pittsburgh, Pennsylvania

Folks don't often try to mix psychology and politics. When they do, there are a number of reasons, including the hunt for interesting data, the wish to be useful to society, and the desire to influence political events. Political involvement itself can assume a number of forms, including helping to shape a political program, helping to sell the program, uncovering the subtle ways in which the opposition has structured public discussion of the issues, and doing battle with opposition experts. Often, political involvement is viewed as the irreconcilable enemy of good science. Yet, the two seem to be very intertwined, with political considerations shaping science in many ways and science helping to shape society in return. By confronting the interdependence, it is possible to create a more deliberate science and one more effectively applied to social problems. In the context of studying people's images of nuclear war, several of the key issues are the degree of respect that psychology implicitly affords to the judgments of experts and of laypeople, as well as the role that it envisions each filling in the determination of defense policy.

We wish to thank John Churcher, Nancy Collins, Lita Furby, Elena Lieven, Joseph McGrath, Joshua Menkes, Michael Milburn, Alan Russell and Tim Shallice for helpful comments on previous drafts. Partial support was provided by the National Science Foundation under Grant 8116925 and by the U.K. Medical Research Council.

Correspondence regarding this article should be addressed to Dr. Baruch Fischhoff, Decision Research, 1201 Oak, Eugene, OR 97401.

After a long period of attending to other issues, the public's attention has again become focussed on the nuclear arms race. First in Europe, more recently in the United States, many people have begun to wonder about what the strategists have been doing while the body politic worried about race relations, sex roles, abortion, nuclear power, or various conventional wars. Few observers seem pleased by what their fresh look at the arms race has revealed. Both liberals and conservatives seem to find, and be alarmed by, weapons systems that are fallible and vulnerable, despite their expense and complexity (Gelb, 1983; Harris Poll, 1983; Schneider, 1983). These concerns are aggravated by the seemingly unsophisticated and unstable national and international social systems that are responsible for managing these weapons.

As often happens with politically hot issues, some scientists have chosen to become actively involved. Among social scientists, this involvement has included special sessions on the arms race at professional meetings, new organizations such as the (UK) Scientists Against Nuclear Arms or the (US) Social Scientists Against the Arms Race and Psychologists for Social Responsibility, and special journal issues such as that of (the Australian) *Social Alternatives* (1982) or the present number of the *Journal of Social Issues*.

Like many other scientific activities, these involvements constitute gambles. In the most "basic" research areas, the gambles that concern researchers are ones such as which problems to tackle, what extra controls to run, how many data to collect, and how far to push the results. When entering applied or political arenas, additional issues must be considered, such as whether to become involved at all, whom to serve through one's efforts, and what balances to strike between science and advocacy, between basic and applied research, or between research and dissemination. Making these gambles, like any other gambles, requires an assessment of values (what one wants) and of facts (what one can get). In order to evaluate or use scientists' efforts, one must know what gambles they were taking. Without understanding their goals, one risks being unfair to them, perhaps accusing them of failing to achieve objectives that they never sought; one also risks being unfair to oneself, perhaps mistaking a work of advocacy for a work of scholarship. Identifying goals is a first step toward consumer protection for the recipients of scientists' advice.

The present article considers the gambles encountered when scientists plan action in politically hot areas. It is designed to help both those contemplating such action and those trying to interpret the actions taken by others. We believe that doing so can reveal something about both the nature of those actions and the nature of the political turmoil that prompted them. We consider first the reasons why scientists might choose to get involved at

all and how that involvement conflicts with certain traditional notions of scientific practice. One response to the conflict between science and politics is to try to reconcile the demands of the two roles into some sort of compromise position; a number of possible ways to do so are considered.

Next we consider an alternative response, which is to accept the conflict between the roles of scientist and activist as a fact of life having no tidy resolution. Rather, one can only fulfill one role at a time adequately. However, while doing so one remains cognizant of the shortcomings of each role, so that the performance of each enriches one's understanding of the other. We all know what it means to fulfill the scientist's role without concern for activism. So, to explore this topic, we consider ways to fill the activist's role without concern for the niceties of science. Specifically, we adopt the device of describing how an unabashed advocate might use knowledge of social science to further a particular cause concerning the nuclear arms race. Having considered how science can be used in the service of politics, we ask how politics can be used in the service of science. Specifically, we ask how a political context can illuminate the conceptual underpinnings of science. This analysis leads to the conclusion that the various compromise solutions, which attempt to reconcile the demands of science and advocacy, have internal contradictions which must, in practice, be resolved in one direction or the other. Such a consideration of practical issues can lead to better and franker science.

WHY GET INVOLVED AT ALL?

The reasons for scientists' involvement in public issues vary along a number of dimensions, one of them being degree of self-interest. At one extreme on this dimension are scientists who know that focal issues tend to generate research contracts; perhaps there will be some way for social scientists to share in the largesse of those who have funded other aspects of nuclear weapons research (Zuckerman, 1982). A less crass form of self-interest is simply to be where the action is, in order to influence matters, satisfy curiosity, enhance self-esteem, while adding one's good judgment to the resolution of the problem; in a society that respects scientists' opinions, doing a little research might buy admission to some interesting forums. A more socially acceptable form of involvement, albeit with a grain of self-interest, follows from interest in studying unique issues; seeing how people respond to the singular threat of nuclear destruction can be a fruitful ground for studying such traditional topics as fear, risk perception, perceived control, denial, or social cohesion. Finally, one may just hope to do good by helping some of the responsible parties deal with the problem

social science knowledge could help politicians and the public to understand one another, or help civil defense officials anticipate citizens' responses to crisis situations. These reasons are, of course, not exclusive: researchers who are paid for their efforts frequently hope to help society; researchers who are "just trying to help" still might enjoy the flattery of being interviewed by the press.

If they are to achieve any of these goals, then scientists must be quite sensitive to the social context within which their research or expertise is being used. In order to communicate at all, they need a sensitivity to the beliefs, desires, and predispositions of those whom they are addressing. What questions do those potential consumers of science want answered? What answers are they willing to hear? How must those answers be phrased in order to be intelligible? These external constraints are in addition to those "internal" constraints imposed by the scientists' own professions, such as the need to meet certain standards of scholarship, or to publish at a certain rate and in certain places. Meeting either set of constraints is difficult. Meeting both sets may be impossible; for in important ways, their demands are antithetical. Most fundamentally, the official methodologies of most sciences encourage patience in the accumulation of evidence and caution in its interpretation, whereas practical problems typically demand swift, sure answers. A classic expression of the conflict is then-Senator Muskie's call for "one-armed scientists," who don't respond with frustrating explanations of "on the one hand, . . . , on the other hand. . ." (David, 1975)

COMPROMISES BETWEEN SCIENCE AND ACTIVISM

For scientists who wish both to affect policy and to preserve their professional standing, several strategies are possible, none entirely satisfying. One is to appear only as a citizen, forswearing any pretense to special status as a result of one's scientific training. However, if one does know something, such false modesty probably represents a waste of expertise and may even backfire. If the credentials of the plainclothes scientists are known from the beginning, then they will be turned to in any case. If only discovered later, then they may be suspected of having disguised themselves in order to manipulate others.

A second strategy is to divert one's research program into more applied directions, but to maintain silence until substantive results come in. Although the attendant postponement of basic research interests may involve considerable personal sacrifice, it may not save scientists from the social (or personal) approbation directed at those who remain silent during times of crisis.

A third strategy is to present answers to practical questions, but to couch them in the cautions and qualifications that scientists are accustomed to providing. The risk here is that listeners will either turn away from such convoluted accounts or choose to ignore the qualifications and treat the scientists' best guess as a statement of fact. Although the misinterpretation can be attributed to the listener, the scientist might still feel some complicity.

A fourth strategy is to guess what results would emerge from proper scientific investigation and present those as facts. Such shortcutting could be justified by the joint assumptions that (a) laypeople cannot handle uncertainty, hence will treat some best guess as fact; (b) a good scientist is better able to provide such summaries than are laypeople. Failure to provide guidance would constitute false anti-elitism, letting people sink by their own devices, rather than attempting to help them, at the expense of scientific purity. Scientists who adopt this strategy expose themselves (and the sciences that they represent) to the anger directed at those who get hopes up too high. They also deny their clients an appreciation of the uncertainty surrounding their pronouncements, a piece of information that in many decision-making problems is more important than the best guess that it surrounds.

A fifth strategy is to be a source of questions, rather than answers, by pointing to issues that might be important, but that tend to be ignored. The long-term aim of this approach would be to change the way in which laypeople look at problems, so that they eventually acquire the perspective of scientists. In principle, such changes could be powerful, educational, and liberating, by increasing laypeople's sophistication to the point where they no longer need experts (for this particular function). In practice, though, when issues seem complicated enough already, listeners may have little patience with scientists whose barrage of questions implies that the buck starts, but never stops, with them. Furthermore, if one believes that a science's underlying philosophy embodies certain political-ethical assumptions, then making people into scientists means changing their world outlook, an enterprise with insidious overtones.

By and large, the contributors to the present issue adopt similar strategies. Their first loyalty is to scientific respectability, as evidenced by willingness to undergo peer review in a professional journal. All subscribe to the evidentiary standards associated with objectivity (or intersubjectivity). None use demonstrably emotive language. The search for respectability is constrained, however, by a commitment to do socially useful work. All contributors have chosen to look at images of nuclear war because of their concern about the prospect of war, not simply because the problem provides an interesting venue within which to explore human behavior.

STRATEGIES FOR ACTIVISTS

Nonetheless, whenever scientists involve themselves with current issues, the observer should wonder whether they hope not just to help society, but to change it in particular ways. Are they acting in the service of a particular means to the mutually agreed-upon end of reducing the chance of nuclear war? Is there some hidden agenda in the choice of topic, the selection of research method, or the manner of exposition? The attribution of motives or strategies to individual contributors of a volume is not a suitable role for editors (even for their own pieces). As always, the reader must decide what the authors' "good causes" were, how well the articles served those causes and whether they contained material suitable for general consumption. As a point of reference, though, in the section that follows we will describe some of the strategies that might be adopted by social scientists who abandon the search for compromise and attempt to exploit their scientific knowledge for political purposes. Like a lawyer, the advocate wishes to put the best case forward, without worrying about any impropriety that might be involved in hiding the limits of scientific knowledge. Uncovering those limits is a job for the other side (and its experts). When working for the cause, it is unimportant if science is damaged by the overconfident statements made in its name. The nature of the advocate's political work in this caricature is to direct a political campaign, pushing existing knowledge as far as possible in service of the cause.

For simplicity of exposition, we will work but one side of the street, that of the scientist espousing nuclear disarmament. These speculations could be treated as our own best advice to the nuclear disarmament movement, regarding how it should direct its activities. Or, they could be treated as a diagnostic guide for believers in expanded reliance on nuclear weapons, to be used in uncovering the strategies of their opponents and designing counterstrategies. Similarly, research into persuasion could help the persuaders to formulate their messages or the targets of those messages to defend themselves. Which side is served better by the research depends, in part, upon how the research is disseminated. The effectiveness of these particular proposals and the ease with which they are parried might say something about the relative validity of the cases propounded by the two sides—or about the cleverness of their advisors. These recommendations are organized around four aspects of the nuclear arms debate in which the skills represented in this volume play a role. If these seem to be telling points, then they also suggest how central such research into images of nuclear war may be to these issues.

Formulating a Program

Any movement with mass appeal must be able to unite diverse individuals around some common image of the present and the ways in which it might be changed. To have gotten this far, the leaders of the nuclear disarmament movement must have had some feel for what that image was and some success in expressing it. As a movement gains attention, it is increasingly called upon to be specific about its analysis and proposals. If it is not to falter, it will need an increasingly explicit common image.

One kind of help that scientist-advocates can provide is a description of what supporters and potential supporters believe. That description can be based on contextual analysis of political pronouncements (Draper, 1982; Fischer, 1983; Tetlock, 1983), on surveys of public attitudes (Fiske, Pratto, & Pavelchak, 1983; Kramer, Kalick, & Milburn, 1983; Schneider, 1983), or on extrapolation from research on related topics, such as people's responses to environmental hazards of human origin (Fischhoff, 1983; Hohenemser, Kates, & Slovic, 1983; Tyler & McGraw, 1983).

That information can be used nondirectively to articulate the common core of belief that constrains the movement's specific proposals. It can be used directly to create proposals that will meet people's needs and overcome possible sources of opposition. For example:

(a) Disarmament or "peace" proposals often require people to give up something tangible (arms, territory), in return for something intangible (reduced probability of war). Research suggests that such uncertain consequences tend to be discounted, that is, not appreciated for their full worth (Kahneman & Tversky, 1979). Peace proposals could, therefore, be made more attractive by including tangible returns, such as increased trade, reduced defense spending, and eroding the status of the military establishment in other countries (or one's own).

(b) Military proposals typically promise to solve specific, narrow problems (e.g., defending a particular weapons system against a particular form of attack), whereas peace proposals stress more nebulous actions (e.g., having a more robust, resilient, and ethical society). If concrete proposals can be inherently more impactful (Fiske, Pratto & Pavelchak, 1983), then the political program needs to get specific. Examples would include "peace conversion" proposals, suggesting how armaments workers and industries could be converted to nonmilitary purposes, with an attendant increase in the productivity of those industries.

(c) The piecemeal character of military proposals gives proponents the opportunity for small victories, whenever a particular weapons system is

adopted or expanded. Peace proposals need to offer their proponents avenues to reinforcement, short of universal military disarmament. Indeed, the image of a world teetering on the brink which seems to motivate the movement may also doom it, by evoking feelings of helplessness before the machinations of the major powers (Broughton & Zahaykevich, 1982; Tyler & McGraw, 1983). Focussing attention on nuclear freeze resolutions (Kennedy & Hatfield, 1982) provides such an intermediate goal. However, it may backfire if activists come to feel that the resolutions themselves have changed little. To prevent that, the scientist-activist may try to enrich people's image of the strategic arms race to include intermediate events that activists may take partial credit for influencing as a result of their work on freeze resolutions and other immediate projects. These might include reducing arms spending, demonstrating the existence of a "peace block" to allied and opposing countries, and increasing (or just sustaining) the pace of arms reduction talks (Fischer, 1981; Goldblat, 1982).

(d) An unsatisfying aspect of many pro-armaments proposals is that there is little opportunity to verify their validity. For example, one must take it on faith that new arms systems will deter the Soviets from military adventures and work if they are ever tested in real conditions (Freedman, 1981; Weiseltier, 1983). Peace proposals could be more satisfying if they offered such verification. Examples include plans for systematic reduction of missiles with assured inspection (Polling & Barton, 1983), for building up civilian militias (Roberts, 1982), or for increasing civilian contacts between nations.

Presenting the Program

Once a peace program has been formulated, it must then be sold. Those who study images should know something about how to shape them. Some of this knowledge is in the public domain, for example, the potential of bandwagon effects or prestigious endorsements. Indeed, academic students of these phenomena may seem to be laboriously documenting effects that are second nature to the more adroit merchandisers of the world. Indeed, some effects may be so well known that many of the intended audience may already be immunized against them.

Other effects, though, have appeared more recently in the literature and seem more subtle, hence less readily defended against. Rather than adding to the message, they affect the way in which it is framed, with such frames being hard to detect or undo (Fischhoff, Slovic, & Lichtenstein, 1980; Hogarth, 1982; Turner & Martin, 1981; Tversky & Kahneman, 1981). That is, of course, what ideologies are meant to do: provide a coherent

universal perspective that affects the interpretation of all issues, in ways that need not reflect the best interests of the perceiver. Here are some ways in which nuclear disarmament proposals might be framed so as to create sympathetic images in the public's mind (assuming the validity of the conditioning conclusion from the research that underlies each suggestion):

(a) Because losses loom larger than equivalent gains, frame opponents' proposals (e.g., civil defense plans) in terms of the lives that will be lost rather than those that will be saved, even if those numbers are two sides of the same coin (Churcher & Lieven, 1983; Steadman, 1983). Conversely, describe one's own plans in terms of enhancing peace rather than mitigating risk.

(b) Because people place added weight on consequences that will be achieved with certainty, do anything possible to cast at least a shadow of doubt on the effectiveness of each of the other side's schemes. For example, highlight the contingencies that will render civil defense plans or command-and-control systems inoperative (Campbell, 1982; Fallows, 1979; Greve, 1979).

(c) Because people tend to forget factors that are not mentioned explicitly, note, if only briefly, the great variety of effects that a nuclear war or civil defense program or arms race will have on society (Quasrawi, 1983; Weber, 1982).

(d) Because statistical abstractions using unfamiliar units are hard to grasp, personalize the implications of policies; disaggregate social costs and benefits into their impact on individual members of the audience (Molander, 1981). Lurid descriptions of the consequences of nuclear war are also an attempt at concretization, but one that risks terrorizing listeners into denial and inaction (Fiske, Pratto, & Pavelchak, 1983).

(e) Because it is hard to maintain a long-term perspective, summarize for people the cumulative impact of the other side's program (Slovic, Fischhoff, & Lichtenstein, 1978). The costs of armaments and the risks of war over one's lifetime (or that of one's children) are much greater than those that are imposed in any moment, day, or even year. Conversely, the benefit from any reduction in the probability of war increases with the period of aggregation. Show people how the consequences add up.

Identifying Imposed Perspectives

In order to have an independent opinion on an issue, it is necessary to identify the framework within which it has initially been cast. Insofar as the pro-weapons side has created the arms race, it has probably also created the way in which it is framed in public debate. Without a careful scrutiny of that perspective, disarmament advocates may unwittingly adopt hidden

aspects of their opponents' image of the topic. Here are some possible hidden aspects of that image:

(a) Emphasizing causes and effects that are readily quantifiable (Fischer, 1983). This preference may occur because the unquantifiable factors are politically awkward (e.g., social cohesion, cultural destruction), because technical analysts focus on their own areas of expertise (e.g., expected body counts, economic costs), or because there is a calculated plan to dissociate people from their own feelings (Broughton & Zahaykevich, 1982; Tribe, 1972).

(b) Using terms in a restricted way. "Survival" often seems to mean biological survival, despite the obvious importance of having other aspects of civilization emerge intact. Subtle submission to this particular bias might be seen in pro-disarmament physicians' descriptions of the health effects of nuclear war or in pro-disarmament physicists' attempts to compete with the military in analyzing the actual extent of destruction.

(c) Failing to develop alternatives. Debate naturally focuses on courses of action whose details and consequences are clearest in people's minds. In defense matters, these tend to be military options, which lobbies and ministries are employed to render credible. These options (and particularly their weaknesses) need to be examined more fully from a disarmament perspective. However, there may also be great utility to doing enough work on peace alternatives so that people can have concrete images of them (e.g., by amassing minimal technical data, eliciting and refuting the first line of counterarguments). In some cases, these will even be military options (Carver, 1982) that military strategists themselves have ignored (e.g., increased spending on conventional arms, civilian militia, improved training).

(d) Overlooking behavioral assumptions. Many policy options make unrecognized and often fallacious assumptions about how people perceive and respond to various situations. This leads to oversold military systems that do not work with human operators in stressful situations, to civil defense plans that assume a passive, relaxed, and trusting population, and to foreign policies that neglect the impact of US pronouncements on its allies (Adelman, 1982; Central Office of Information, 1980; Churcher & Lieven, 1983; Etzold, 1980; Fialka, 1980, 1981; Freedman, 1982; Tyrrell, 1982). Identifying these omissions can lead to pro-disarmament plans that are both more realistic and more human.

Engaging the Opposing Experts

As with most high-tech issues, people's images of the nuclear arms race can ultimately be traced to information provided by technical experts.

The scientist-activist who wants to affect those images must confront those sources. A social science perspective suggests three possible forms of engagement, with the choice between them depending upon one's intellectual resources for fighting on a particular issue, one's personal disposition toward different forms of combat, and one's general attitude toward the relationship between science and politics.

(a) Helping the opposing experts to do their work right. If one believes in the truth of one's position, then good science and good politics go hand in hand. There are reasonable epistemological reasons to doubt the ability of either side in a conflict to understand an issue thoroughly. For example, each side may recruit and reward experts who share certain world views (Janis, 1972; Lanir, 1983; Schurrer, 1979). Or, the low level of foreign language knowledge in the US and the recent assault on Russian Studies programs in the UK suggest a general dearth of understanding of the "Russians as people" (Arnett, 1979; Clark, 1979; Wilson, 1981). Working together increases the chances that the truth will win out. This upbeat approach, in effect, attempts to remove the political barriers to good science. Whether it works depends upon the willingness of both sides to let honest work be done and to abide by its results. Often, however, external critics of official government analyses find themselves in an endless struggle to counter each new analysis with their own analysis or critique. If they accept this challenge, then they risk being worn down by the other side, which not only has greater resources, but can in the pinch claim that secret information justifies its position. Helping the opposition means trusting it to be interested in discovering the truth.

(b) Eroding the credibility of opposing experts. The very act of conducting competing analyses can have a political impact, independent of their content or competence. It shows that the opposing experts' views are not definitive and that other sources of information exist. For some opponents of nuclear weapons, simply knowing that a credible case can be made for their position will strengthen their resolve, without their even knowing what the contents of that case are. Establishing oneself as an expert opens the way to invitations from those uncertain about nuclear weapons, witness Scientists Against Nuclear Arms' Local Authority Advisory Service (which has advised the Manchester City Council, among others, about civil defense policies). However, one may wish to take the battle of the nuclear experts one step further, attempting to destroy the opposition, not just compete with it. Obvious strategies include: claiming that the hidden assumptions (discussed in the previous section) are deliberate obfuscations, not just oversights; attributing the prominence of one's opponents to their willingness to serve as conduits for official news leaks, rather than to any deep understanding of the issues; making *ad hominem* descriptions of opponents' political affiliation and academic

credentials (Communicators for Nuclear Disarmament, 1982; Radical Statistics Nuclear Disarmament Group, 1982).

(c) Denying the possibility of expertise. At times, the most important political message is that there is enormous uncertainty about a question (e.g., no one knows where the bombs will fall, how great the damage will be, or how it will affect you). At times, it is the uncertainty that motivates people to action (Fischhoff, Lichtenstein, Slovic, Derby & Keeney, 1981; Levine, 1982; Lowrance, 1976). This goal can be achieved, in large part, by scientifically respectable actions. These include the conduct of competing analyses whose conclusions diverge widely from those of one's opponents (without indicating how those differences can be reconciled), by adopting a position of unassailable methodological rigor (in the light of which no study is entirely defensible), or by pointing to the lamentable difficulties facing one's opponents (e.g., the sheer mass of material to be mastered, the need to satisfy their employers, their being held responsible for foolish actions that were allegedly based on their work).

If they are to have the desired effect on people's images of nuclear war (and peace), these strategies need to be undertaken adroitly. Confronted by further complications or competing simplifications on such an important issue, the public may respond as desired, or it may lose faith in science, look for experts who will exude confidence, decide that "my guess is as good as theirs," flee from the confusion, or be disturbed by the uncertainty. Our science is not quite up to the fine-tuning needed to get just the right image.

A MORE POLITICAL SCIENCE

Science can facilitate political ends only when some useful work has been performed. Politics can facilitate science both when science proves useful and when it does not, for both success and failure can be revealing about the foundations of a science. It says something about scientists' predilections if they have failed to study a topic that legitimately falls in their domain or if they have studied it to death. It also says something about the limits to their knowledge if their advice proves erroneous because it neglects boundary conditions. Just as we might criticize engineers and physicists for ignoring human factors in their calculations of weapon system performance or evacuation speed, they might criticize psychologists for ignoring the shaping effect of technologies on human behavior or the impact of interpersonal ties on people's responses to threat communications.

It is a matter of intellectual hygiene for scientists to attempt to separate their science from their values. However, a total separation is never

entirely possible (Fiske, 1982). At the very least, the choice of topics for research is an expression of what seems important. Those concerns may seem far removed from political arenas, as when a scientist studies what will make university officials happy and ensure promotion or what will be a good candidate for funding. But even these choices reflect personal values (if only willingness to let one's priorities be dictated by practical considerations). Readiness to do work with no immediate applications is itself a statement, as is eagerness to study topics whose importance is not a matter of controversy (e.g., cancer). A critical look at the place of science in society can reveal values in other aspects of the enterprise as well, in features such as the way in which terms are used (Buss, 1978; Fischhoff, Watson, & Hope, 1983), the attention paid to the historical context of behavior (Gergen, 1973), or even the relative weight assigned to Type I and Type II errors in experimental design (Page, 1978; 1981).

We believe that a candid description of the underlying values of a science is necessary not only for it to present its wares honestly, but also for scientists themselves to design their research programs more deliberately. At times, that examination will reveal values that scientists were not aware of having embraced, but which just came with the territory (see, for example, Page's (1978) demonstration that the conventional design of some kinds of toxicological studies gives them low statistical power, which effectively represents a social policy that protects chemicals more than people). At times, that examination will reveal implicit constraints that can either be eliminated or exploited to circumscribe more explicitly the range of validity for a particular kind of research. The following are some lessons that the preceding analysis has taught us about the nature of the science represented in this volume.

Formulating a Program

The fact that we (the authors) are concerned with formulating a widely acceptable program indicates that we assign a significant role to the wider public in setting strategic policy. That assignment may reflect political realism: our assessment that in the social and legal conditions of the US (and, to a lesser extent, Canada and the UK), the public will force its way into these decisions. Or, it could reflect political idealism, our desire to have the public represented. The fact that the psychological literature offered us some guidance indicates that the profession's ideology has generally assigned the public such a role, whether as a matter of realism or of idealism or both.

Although the profession sends a clear message regarding the reality of the public participating in policymaking, it is a bit more ambiguous

regarding the contribution of that participation. Our own attitude was respectful, granting the legitimacy of whatever views and desires the public held and searching for a realistic political program that would satisfy them. However, there is another tradition in the literature, which views people as poorly informed and readily confused, with little facility for understanding complex, novel, and uncertain issues (Fiske, Kinder, & Larter, 1983). Even if it were not found in the literature, this view is certainly prevalent among the technical elite who manage nuclear weapons and other complex technologies (Bracken & Shubik, 1982; Florman, 1981; Starr & Whipple, 1981). A subtle symptom of that view may be found even in "respectful" research when that focuses solely on the attitudes of those opposed to increased reliance on nuclear weapons, as though the views of those in favor need no explaining. Perhaps similarly, lay perceptions of the risks from hazardous technologies only became a popular (and fundable) topic when the promoters of those technologies were alarmed by the inexplicable (to them) opposition of the public to some developments. That research has, in time, come to look at the perceptions of all involved, but it still took some years to free itself from the world outlook embodied in the promoters' presenting symptoms (Fischhoff, Slovic, & Lichtenstein, 1981, 1983). If our science creates an unduly negative image of people's intellectual capabilities, then it aids those who would exclude the public from the management of its own affairs. If our science either over- or underestimates people's abilities, then it limits its own ability to help them (Fischhoff & Beyth-Marom, 1983).

Presenting the Program

Some of these same issues carry over to consideration of how to present peace proposals. The very idea of selling implies a certain disrespect for one's audience: they do not know the facts already, they have trouble seeing the validity of our arguments, they can be manipulated. The more respectful face of selling is that focussed upon by free-market economists. They view advertising as a means for transmitting information which provides a net good to society by improving the efficiency of market mechanisms. To many, this would seem to be a rather naive view, even with the best efforts of the Federal Trade Commission and Federal Elections Commission to ensure truth in packaging.

As a profession, we seem to have two responses to these worries. One is to focus our research on purely intellectual aspects of information processing, so as to avoid any of the nastiness of toying with people's emotions. So, we study how people accumulate and integrate facts and we treat their values as statements of principle that are logically combined with

their factual beliefs in order to derive attitudes and actions (Fiske, 1981). Although it provides some safeguards, such "cognitizing" deprives our science of an understanding of affective issues. And, the messages that that science produces offer little help to people who must cope with the affective side of their own images of nuclear war.

The second response to the quandary of manipulation is to study all the issues, but then to make our results known to all. In that way, although our science may be the source of certain forms of knowledge, it will not be the ultimate reservoir for it. Certain skills were needed to test hypotheses, but now the results can, with a little help from us, be understood and used by all. In this light, if we act as manipulators (in the service of our respective good causes), it is not because we are superior people, but because we have superior access to the literature. If we choose not to act as manipulators, then it is incumbent upon us to ensure that the various parties to various struggles have equal access to our literature. Most commonly, this constraint is served by passive accessibility, namely, printing our results in the open literature.

A commitment to affirmative accessibility means ensuring that the various parties have, in effect, equal opportunity to view, understand, and exploit those results. It is in the nature of things that some groups have more of the skills needed to track and interpret the literature (or more of the resources needed to pay someone to do so) than do others. Balancing things out means aggressively giving science away to those with poorer access, for example, by writing popular expositions or by helping them to develop effective messages. Such dissemination activities exact a price on several levels: they take time and energy that could be devoted to job or home, they lead to products that cannot contribute to career advancement, and they can cheapen the disseminators' image in the eyes of their colleagues. These costs themselves tell something about the nature of our scientific enterprise.

Identifying Imposed Perspectives

Intellectually, this is the most difficult of the four tasks, insofar as it requires all scientists to be philosophers of science, alert to the unspoken assumptions of whatever research they view or produce. They could relax their guard if they felt that scientists from other disciplines or the scientists who formed the basic structures of their own science (a) had done so with a clear understanding of the assumptions that they were making and (b) shared a common world view. However, as our analysis of images of nuclear war suggested, these conditions are unlikely to be fulfilled. In the US, relatively few scientists have the ideological orientation or

philosophical training to analyze the underlying assumptions of their research, let alone to shape it for political ends. They are thus quite vulnerable to subtle shaping by forces from within their disciplines (e.g., accepted practices, dominant personalities) and from without (e.g., funding opportunities, requests for help). Another reflection of this subtle shaping is the recurrent complaint that psychology has distorted itself in order to model itself in the image of physics (and perhaps a mistaken image at that, Kaplan, 1964). It is significant that the norm in psychology is for reflection on the foundations of the enterprise to be reserved for special journals and volumes rather than to be a part of every empirical piece.

One reason for institutionalizing self-criticism is that there are no easy routes to self-insight. Rather, it is something to nibble away at constantly, asking questions such as: what topics have we chosen and neglected, are there other ways to use our key terms, who outside the field reads our results, and do we share common social origins or political views that might influence our formulation of problems? Carrying research into the political arena can aid this self-analysis. If particular parties show particular enthusiasm or disdain for some research, then it is a hint as to whose interests are (perhaps inadvertently) being served. We anticipate that the research in this volume will be popular in pro-armaments circles to the extent that it studies the anti-armaments public and either reveals ways to manipulate their opinions or shows those opinions to be the product of emotion and misinformation. It will be popular in pro-disarmament circles to the extent that it reveals ways to frustrate those incursions and uncovers the biases of pro-nuclear experts.

Work in the political arena can also be good for science if it brings different sciences together. Having to cooperate with sociologists on a campaign might show psychologists the naivete of their ideas about the relationship between attitudes and action; it might show the sociologists the ambiguity of their survey questions ("Do I favor a nuclear weapon freeze?" What does "freeze" mean? Does it include adequate inspection? What alternatives are offered?). Explaining to physicists or economists why we do what we do and believe what we believe can produce even more productive awkward situations. A final benefit of doing political work is being taken seriously. Academic battles are often so vicious because the stakes are so small. It can be more useful to confront a diverse crowd of people who do not care what theory one embraces, what methods one uses, or who one's friends are, if a strong case can be made for one's conclusions.

Engaging the Opposing Experts

In a disturbing critique of the scientific community, Lord Zuckerman (1982) has attributed much of the escalation in the arms race to the

scientists involved in weapons development. Like other research programs, ordinance has its own internal dynamic. Seeing the possibility for a new twist on current arms, these scientists exploit the political and military machinery to get the required support. Their own expertise allows them to demonstrate the vulnerability of current weapons and the threat posed by enemy arms. Happily, psychologists have not been protagonists in these particular struggles. Yet, one might ask whether that is because we were not invited or because we have some built-in controls and sensibilities.

The particular skills that we have for criticizing opposing experts may put us to some interesting tests. Some may come from our friends. If the quality of expert and lay judgment did become a central issue in the nuclear arms debate, then our services might become in demand. A likely form of that demand would be requests to describe what the public believes and what the experts know with far greater definitiveness than our data can provide. Such demands would reveal just as fundamental a disbelief in the social sciences as really being "sciences," with a need to conduct empirical research as a supplement to armchair speculations, as does the current disinterest in these fields.

Another test concerns our allegiance to the expert community as a whole. Discrediting opposing experts can backfire and lead to general distrust of all experts, including the discreditors. In the short run, that could lead people to feel that they can choose their own experts, who might not be us. In the long run, it could erode the prestige of experts and science in general: if scientists cannot agree among themselves and do not even trust one another, who needs them? Should we then temper our criticism to defend the profession? One answer to that question may be seen in the courtroom and regulatory hearing battles in which experts argue about whose science to believe, but not over whether to believe any science. Until psychology is treated more seriously, it may be enough to think, "tempt us, tempt us (to overstate our case)." However, some preemptive thought about and study of the nature of expertise, including our own, might be in order. Expert judgment has been investigated rather little by psychologists, compared to studies of lay judgment. What studies there are tend either to treat experts with great deference (e.g., as sources of knowledge to be captured for computerized diagnostic systems) or to look for gaps in the inferential processes of other experts without too much self-reflection.

CONCLUSION

Science and society help create one another. If those processes are to be deliberate, then scientists must consider how their work has been shaped by the society that holds them and how that society can be changed by their science. The content of this ongoing reflection will vary from scientist to

scientist and from issue to issue. Psychologists studying other people's images of nuclear war may wish to clarify their own implicit images of the quality of those others' judgment and of the role that they play in determining public policy. When either experts or lay-people are given too much or too little credit, it can lead to bad science or misdirected politics. Whatever issue one chooses as important, the interplay of science and politics is inevitable. By facing these questions directly, one has the best chance of realizing what interests one is serving and how one's vision is colored by that service.

REFERENCES

- Adelman, D. A. Clash with the Soviet Union. *Foreign Policy*, 1982, 49, 37-51.
- Arnett, R. L. Soviet attitudes towards nuclear war: Do they really think that they can win? *Journal of Strategic Studies*, 1979, 2, 172-191.
- Bracken, P. & Shubik, M. Strategic war: What are the questions and who should ask them? *Technology in Society*, 1982, 4, 155-179.
- Broughton, J. M. & Zahaykevich, M. The peace movement threat. *Teachers College Record*, 1982, 84, 152-173.
- Buss, A. R. Causes and reasons in attribution theory: A conceptual critique. *Journal of Personality and Social Psychology*, 1978, 36, 1311-1321.
- Campbell, D. *War plan U.K.: The truth about civil defense in Britain*. London: Burnett Books, 1982.
- Carver, Field Marshall Lord. *A policy for peace*. London: Faber and Faber, 1982.
- Central Office of Information. *Protect and survive*. London: HMSO, 1980.
- Churcher, J. & Lieven, E. V. M. Images of nuclear war and the public in British civil defense planning documents. *Journal of Social Issues*, 1983, 39(1), 117-132.
- Clark, D. L. Who are those guys? *Air University Review*, May-June 1979, 47-59.
- Communicators for Nuclear Disarmament. *Using the media against the arms race*. St. Louis: Nuclear Weapons Freeze Campaign, 1982.
- David, E. E. "One-armed scientists?" *Science*, 1975, 189, 891.
- Draper, T. How not to think about nuclear war. *New York Review of Books*, June 15, 1982, 35-43.
- Fitzold, T. II. Our diminishing manpower resources. *Army Magazine*, January 1980, 10-14.
- Fallows, J. Muscle-bound superpower. *Atlantic*, 1979, 244(4), 59-64.
- Fialka, J. J. The grim lessons of Nifty Nugget. *Army Magazine*, April 1980, 40-44.
- Fialka, J. J. GAO says new weapons are often too complex. *Washington Star*, February 3, 1981, 4.
- Fischer, D. V. A. *Nuclear issues: International control and international cooperation*. Canberra: Australian National University, 1981.
- Fischer, G. W. Conceptual models and military threat assessment. *Journal of Social Issues*, 1983, 39(1), 87-116.
- Fischhoff, B. Strategic policy preferences. *Journal of Social Issues*, 1983, 39(1), 133-160.
- Fischhoff, B. & Beyth-Marom, R. Hypothesis evaluation from a Bayesian perspective. *Psychological Review*, 1983, 90, 239-260.
- Fischhoff, B., Lichtenstein, S., Slovic, P., Derby, S. L. & Keeney, R. L. *Acceptable risk*. New York: Cambridge University Press, 1981.
- Fischhoff, B., Slovic, P. & Lichtenstein, S. Knowing what you want: Measuring inbuilt values. In T. Wallsten (Ed.), *Cognitive processes in choice and decision behavior*. Hillsdale, N. J.: Erlbaum, 1980.
- Politics of the Arms Race
- Fischhoff, B., Slovic, P. & Lichtenstein, S. Lay foibles and expert fables in judgments about risk. In T. O'Riordan and R. K. Turner (Eds.), *Progress in resource management and environmental planning, Vol. 3*. Chichester: Wiley, 1981.
- Fischhoff, B., Slovic, P. & Lichtenstein, S. The "public" vs. the "experts": Perceived vs actual disagreements about the risks of nuclear power. In V. Covello, G. Flamm, J. Rodericks, & R. Tardiff (Eds.), *Analysis of actual vs. perceived risks*. New York: Plenum, in press.
- Fischhoff, B., Watson, S. & Hope, C. *Defining risk*. Decision Research Report 82-15, 1982.
- Fiske, S. T. Social cognition and affect. In J. H. Harvey (Ed.), *Cognition, social behavior, and the environment*. Hillsdale, N.J.: Erlbaum, 1981.
- Fiske, S. T. An encyclopedia of stereotypes: Balancing science and politics. Review of A. O. Miller (Ed.), *In the eye of the beholder: Contemporary issues in stereotyping*. *Contemporary Psychology*, 1982, 27, 951-953.
- Fiske, S. T., Kinder, D. R. & Larter, W. M. The novice and the expert: Knowledge-based strategies in political cognition. *Journal of Experimental Social Psychology*, 1983.
- Fiske, S. T., Pratto, F. & Pavelchak, M. Citizens' images of nuclear war: Content and consequences. *Journal of Social Issues*, 1983, 39(1), 41-65.
- Florman, S. C. *Blaming technology*. New York: St. Martin's Press, 1981.
- Freedman, L. *The evolution of nuclear strategy*. London: Macmillan, 1981.
- Freedman, L. Limited war, unlimited protest. *ORBIS*, 1982, 26, 89-103.
- Gelb, L. H. Poll finds doubt on U.S. strategy on the Russians. *New York Times*, April 15, 1983, 1ff.
- Gergen, K. J. Social psychology as history. *Journal of Personality and Social Psychology*, 1973, 26, 309-320.
- Goldblat, J. *A review of obligations in the arms control agreements/multilateral and bilateral arms control agreements*. Stockholm: Stockholm International Peace Research Institute, 1982.
- Greve, F. Pentagon calls super-computer a disaster. *San Francisco Chronicle*, November 4, 1979, 1ff.
- Harris Poll. The freeze issue has Reagan on the spot. *Business Week*, May 16, 1983, 14.
- Hogarth, R. M. (Ed.) *New directions for methodology of social and behavioral science: The framing of questions and the consistency of response*. San Francisco: Jossey-Bass, 1982.
- Hohensmeyer, C., Kates, R. W., & Slovic, P. The nature of technological hazard. *Science*, 1983, 220, 378-384.
- Janis, I. *Victims of groupthink*. Boston: Houghton Mifflin, 1972.
- Kahneman, D. & Tversky, A. Prospect theory. *Econometrica*, 1979, 47, 263-292.
- Kaplan, A. *The conduct of inquiry*. Glencoe Free Press, 1964.
- Kennedy, E. & Hatfield, M. *Freeze! How can you prevent nuclear war*. New York: Dutton, 1982.
- Kramer, B. M., Kalick, S. & Milburn, M. Continuity and change in nuclear attitudes: 1945-1982. *Journal of Social Issues*, 1983, 39(1), 7-24.
- Lanir, Z. *Fundamental surprise*. Tel Aviv: Kibbutz Hameuchad, 1983.
- Levine, A. G. *Love canal*. Lexington, Ma.: Heath, 1982.
- Lowrance, W. W. *Of acceptable risk*. Los Altos, Calif.: Kaufmann, 1976.
- Molander, R. *Nuclear war: What's in it for you?* New York: Bantam, 1981.
- Page, T. A generic view of toxic chemicals and similar risks. *Ecology Law Quarterly*, 1978, 7, 207-243.
- Page, T. A framework for unreasonable risk in the Toxic Substances Control Act. In R. Nicholson (Ed.), *Carcinogenic risk assessment*. New York: New York Academy of Sciences, 1981.
- Polling, S. & Barton, D. *Negotiations for conventional force reductions and security in Europe*. Stockholm: Stockholm International Peace Research Institute, 1983.
- Quasrawi, A. *Civil defense, nuclear-free zones and local advisory service*. London: SANA, 1983.

- Radical Statistics Nuclear Disarmament Group. *The nuclear numbers game*. London: British Society for Social Responsibility in Science, 1982.
- Roberts, A. The alternative, non-nuclear way to defend ourselves. *New Society*, February 4, 1982, 175-177.
- Schneider, W. Military spending: The public seems to say, 'We've gone far enough.' *National Journal*, April 23, 1983, pp. 866-867.
- Schurrer, E. Death of the devil's advocate. *The Washington Monthly*, July/August, 1979, 52-53.
- Slovic, P., Fischhoff, B. & Lichtenstein, S. Accident probabilities and seat belt usage: A psychological perspective. *Accident Analysis and Prevention*, 1978, 10, 281-285.
- Social Alternatives*. Special issue devoted to peace and disarmament, 1982, 3(1).
- Starr, C. & Whipple, C. Risks of risk decisions. *Science*, 1981, 208, 1114-1119.
- Steadman, P. Review of I. Tyrrell, *The survival option*. *SANA Newsletter*, March 1983, No. 6, 2-6.
- Tetlock, P. E. Source and consequences of policy makers' images of international conflict. *Journal of Social Issues*, 1983, 39(1), 67-86.
- Tribe, L. H. Policy science: Analysis or ideology. *Philosophy and Public Affairs*, 1972, 2, 66-110.
- Turner, C. & Martin, E. *Survey measures of subjective phenomena*. Washington, D. C.: National Academy of Sciences, 1982.
- Tversky, A. & Kahneman, D. The framing of decisions and the psychology of choice. *Science*, 1981, 211, 453-458.
- Tyler, T. R., & McGraw, K. M. The threat of nuclear war: Risk interpretation and behavioral response. *Journal of Social Issues*, 1983, 39(1), 25-40.
- Tyrrell, I. *The survival option: A guide to living through nuclear war*. London: Cape, 1982.
- Weber, P. *London after the bomb*. Oxford: Oxford University Press, 1982.
- Wieseltier, L. The great nuclear debate. *New Republic*, 1983, 188(1 & 2), 7-39.
- Wilson, A. The farcical face of the red army. *The Observer*, October 4, 1981, p. 9.
- Zuckerman, S. *Nuclear illusion and reality*. London: Collins, 1982.

The Evaluation of Prevention Programs

Leonard Bickman

Peabody College of Vanderbilt University

Throughout the past decade I have been involved in various prevention-oriented programs. These projects have ranged from research and evaluation on crime prevention, to projects dealing with preventing illness, to ones dealing with home fire prevention. I have maintained a strong belief in the efficacy of a prevention approach to dealing with social problems, as opposed to more traditional treatment approaches. However, we do not really have good evidence that such prevention programs are effective (Kelly, Snowden, & Munoz, 1977; Heller, Price, & Sher, 1980). We need to create bodies of knowledge that help us understand the workings of and the theories behind prevention programs. But there are many barriers to doing so. This paper is about those barriers, and about ways we might cope with them.

THE IMPORTANCE OF EVALUATING PREVENTION PROGRAM EFFECTIVENESS

I think we are all aware of the atmosphere of criticism that surrounds claims about the effectiveness of social programs. The funding of all societal programs is clearly on a decline and it is probable that funding of preventive programs is going to suffer as well. This pessimistic prediction stems in part from the context within which prevention programs get addressed in the fundamentally political arena where funding decisions are made.

Correspondence regarding this article should be addressed to Dr. Leonard Bickman, Department of Psychology and Human Development, Peabody College of Vanderbilt University, Nashville, TN 37203.