Chapter 3

Social and Political Rationales for Controls on Research

Photo credit: National Institutes of Health

Chapter 3

Social and Political Rationales for Controls on Research

Harold Green has observed that, all things being equal, there is no question that "a scientist has the freedom to think, to do calculations, to write, to speak and to publish''—as long as these activities remain within the area of abstractions.[1] Research, of course, involves more than abstract thinking. Scientists experiment, observe subjects, record data, and describe their work to others. These activities can be affected by social mores and customs and can in turn affect society, the environment, or the people and objects involved in the research. When research violates the social norms, or when society perceives risks or dangers in the research process, then restrictions may be implemented either by society or voluntarily by the research community.

This chapter develops a typology of the various reasons used to justify either legally enforceable regulations or social restraints on scientific activity. In most cases, the rationale described is one that is used to explain why scientists should not do research on a certain topic or in a certain way, or should not describe their results to a particular group of people. In a few instances, the justification may be used to discourage scientists from pursuing one research line or encourage them to pursue another, or to protect government or commercial rights in scientific information, *

This chapter describes the rationales or legal justifications for two types of regulation of scientific research. One type includes legal barriers, incentives, or other actions that have some binding or controlling effect. The other type of regulation includes forces or actions—ranging from changes in funding to negative public opinion—that do not have the force of law but may have some important effects because of the way in which science is funded and is dependent on political and social support for the continuation of that funding.

Table 3-1 .–Justifications for Control of Research

Regulatory forces on the research agenda:
Ž To fulfill political objectives
• To avoid environmental damage
. To promote or avoid specific economic consequences
• To preserve moral values
Regulation of research procedures and protocols:
• To protect human health and safety
. To protect an i reals used in experimentation
. To protect the environment
Regulation of the dissemination of scientific knowledge:
. To uphold scientific standards
. To protect a professional or economic interest
. To protect the health, privacy, and safety of individuals
• To protect the national military or economic security

[1]Harold I'. Green, "The Boundaries of Scientific Freedom, " Regulation of Scientific Inquiry, Keith M. Wulff (cd.) (Boulder, CO: Westview Press, 1979), p. 140; reprinted from *Newsletter on Science, Technology & Human Values,* June 1977, pp. 17-21.

*Issues or events are described in this chapter as examples of when a particular justification or rationale may have been employed. A scientific topic or project may have been regulated for more than one reason, but all these reasons are not necessarily listed for each example.

REGULATORY FORCES ON THE RESEARCH AGENDA

Attempts to control the research agenda of a field or laboratory may take one of two forms. Opponents of a research topic may wish to suppress a project or a line of research because they are convinced that application of the research could bring harm. Others may be unwilling to grant legitimacy to a morally (or politically) objectionable idea by implying that it is worthy of

scientific attention. Proponents of a research topic may seek to alter the research agenda to include that topic.

For these reasons, justifications are likely to be affected by beliefs about the probability and type of any eventual application. The regulator is convinced that, should the research ever be done, some imaginable (or predictable) result or finding would be unacceptable or undesirable. The potential of research for application—and the regulator's ability to envision such application—thus can have considerable effect on the predisposition to control. Harvey Brooks points out, "the regulatory climate for research which is influenced by its potential applications will depend on the uniqueness of the relation of these applications to the substantive content of the research, since the amount and richness of the applications vary considerably among types of research."[2] Some observers, however, argue that all regulation occurs because of the anticipation of some effect, although they may distinguish between attempts to limit inquiry because of: 1) "anticipated deleterious consequences of the inquiry itself" (e. g., effects of the research procedure on experimental subjects); and 2) "anticipated deleterious consequences of applications of knowledge obtained by the inquiry."[3]

The most common justifications for restraints on research agenda are political, environmental, economic, and moral concerns.

To Fulfill Political Objectives or Avoid Political Effects

Political reasons may underlie both the encouragement and the suppression of research, when society perceives that research could achieve a specific advantage or result in a negative effect. The *protection of national economic or military security*, for example, may justify either the redirection of research toward military goals or the inhibition, discouragement, or prohibition of weapons development research outside of government control. Both justifications were used during the 1970s controversy over research on the laser separation of isotopes of uranium. That research topic became an active area of controversy in 1976, when experiments in both government and private industry labs showed a promising new approach to laser isotope separation. A few months later, a private consortium, Jersey Nuclear-Avco Isotopes, Inc. (JNAI) applied to the U.S. Nuclear Regulatory Commission for a license to build a $15 million facility for large-scale experiments using one of these approaches.' Because laser isotope separation was believed to promise a cheaper, easier way to obtain enriched uranium—for both nuclear powerplants and weapons—these new developments provoked both considerable controversy and attempts to classify the work. Many observers believed that existence of a perfected process would increase the risk of unintentional proliferation of nuclear weapons, would undermine existing international safeguards, and could aid terrorists. In proposing a moratorium on further research and development, physicist Barry Casper argued that "there is still time to stop and consider whether laser enrichment *should* be developed, in light of its broader consequences."5 Proponents of the research argued that laser isotope separation required sophisticated facilities and was not a "garage" technology adaptable by terrorists, and that therefore those fears were groundless. *

At the international level, the nuclear nations have tried to curb the proliferation of nuclear weapons by preventing additional countries—and especially countries considered to be politically unstable—from doing nuclear research that could produce weapons-grade plutonium. International political objectives have also justified government actions that discouraged or denied permission to foreign students from certain countries who wanted to study nuclear engineering in the United States. By preventing access to advanced training in certain fields, the United States was effectively attempting to control the other country's research agenda.

[2]Harvey Brooks, Benjamin Peirce Professor of Technology and Public Policy, Harvard University, personal communication, 1985.

[3]Barry M. Casper, "Value Conflicts in Regulating Scientific Inquiry," *Regulation of Scientific Inquiry*, Keith M. Wulff (cd.) (Boulder, CO: Westview Press, 1979), p. 15.

[4]Barry M, Casper, "Laser Enrichment: A New Path to Proliferation?" *Bulletin 01 the Atomic Scientists*, January 1977, p. 29.

[5]Ibid.

*In fact a special panel of consultants appointed by JNAI concluded that the JNAI process was probably less proliferation-prone than the centrifuge process which was being commercialized, or than the process being developed at Los Alamos.

National economic priorities and international standing may justify redirecting research toward topics related to technological competition. When a country decides to shore up its prestige in the international scientific community, it often concentrates on achieving or maintaining superiority in some but not all scientific fields. Such justifications may be discerned in, for example, the current debate on funding high energy physics and the superconducting supercollider. Belief that the success of U.S. industry in competing in world markets is increasingly tied to research has prompted several regulatory actions in the field of biotechnology. In 1984, for example, the Cabinet Council on Natural Resources and Environment asked 14 agencies to develop a framework for the regulation of gene splicing. ' George Keyworth, President Reagan's Science Advisor, has also suggested that the National Institutes of Health should broaden its mission by paying more attention to the needs of the biotechnology industry through more funding of generic applied work in biotechnology, promotion of intellectual support for biotechnology companies, and training of bioprocess engineers and other needed personnel.[7] International relations may also affect research when science and technology are used as tools for political diplomacy, as in scientific exchange programs.

Government actions may also be directed at encouraging or discouraging research related to *specific domestic political goals.* During the Reagan Administration, the regulatory system itself has been used to influence the funding of research pertaining to specific regulatory issues. Executive Order 12485 (Jan. 4, 1985) instituted an office of Management and Budget (OMB) review of regulation-related research proposed by executive branch agencies. Through its power to approve the appearance of any research on the regulatory calendar, OMB can control the agencies' research agenda *before* funding. In the late 1960s, both domestic and international politics related to U.S. involvement in the Vietnam War shaped a number of acrimonious debates over whether universities should accept Department of Defense funding.[8]

Special difficulties arise when the justifications for control are linked to a *controversial social or political issue.* Various forms of research to detect XXY and XYY chromosomal aberrations, such as the screening of male newborns to identify and study prospectively the development of those with a XYY karyotype, combine basic epidemiological research with longitudinal followup of "experimental" (XYY) and "control" groups, including potential therapeutic intervention.[9] In the mid-1970s, at Harvard Medical School, objections by Harvard University faculty members and by geneticists elsewhere in the Boston academic community resulted in the voluntary termination of a research project on XXY and XYY children.[10] The project staff argued that research should proceed because of its potential therapeutic value to the patients. They were sincerely attempting to advance science and "to bring what they perceived as the benefits of science to the resolution of a social problem."[11] Their opponents, with equal sincerity, sought to expose and stop what they perceived as a "misuse or abuse of scientific hypotheses and techniques."[12] Scientists critical of the research topic argued that there was no scientific evidence linking XYY and antisocial behavior,[13] and that the research should be stopped because its goals directly contradicted American political beliefs about the rights of individuals. Other critics believed that the research had the potential of being just the first step in an attempt to determine a genetic basis for antisocial behavior. Infants tagged as having such a trait might be treated differently all their lives and therefore identification might become a self-fulfilling pro-

[7]An Administration official was quoted as saying that the framework was aimed at avoidin, "federal actions that could affect the industry's competitiveness. *Business Week,* May 21, 1984, p.40.

[8]Barbara Culliton, "NIH Role in Biotechnology Debated, " *Science* vol. 22Q, July 12, 1985, pp. 147-148.

[9]Dorothy Nelkin, *The University and Military Research: Moral Politics at MIT* (Ithaca, NY: Cornell University Press, 1972)

[10]Dorothy Nelkin and Judith A. Swazey, 'Science and Social Control: Controversies Over Research on Violence," Report No 1979, conference proceedings, Institute for Studies in Research and Higher Education, Norwegian Research Council for Science and the Humanities, p, 5.

[10]Barbara J, Culliton, "XYY: Harvard Researcher Under Fire Stops Newborn Screening, " *Science,* vol. 188, June 27, 1975, pp. 1284-1285; Frederick Hecht, "Biomedical Research Ethics and Right\, " *Science,* vol.188,1975, p, 502, and Loretta Kopelman, "Ethical Controversies in Medical Research: The Case of XYY Screen ing, " *Perspectives in Biology and Medicine,* winter 1978, pp. 1 %204.

[11]Nelkin and Swazey, op. cit., p. 211.

[12]Ibid.

[13]Culliton, "XYY," op. cit., p. 1,284.

phecy. " And finally, some asserted that the research should be stopped because the benefits to society were dubious .15 Defenders of the research called this latter argument "a misplaced ideological approach. "[16] In this case, both proponents and opponents had to weigh the importance of protecting the rights of individuals against the importance to society of predicting (and therefore possibly preventing) criminal behavior, the importance to future generations of developing chromosome screening for the detection of genetically linked illnesses, '7 and the importance to current patients should reliable therapy ever become available.

Political concerns can also drive the research agenda when an individual or a group of researchers attempt to redirect the agenda of an institution or a field away from one topic and toward another considered to be more socially or politically acceptable. Most often, such actions occur at the individual or personal level; but on occasion there have been loosely coordinated actions by groups. In the 1950s, for example, the Society for Social Responsibility in Science and the Committee for Social Responsibility in Engineering "required their members to take a pledge upon joining the organization which stated that they would not engage in research for destructive purposes."[18] In the 1960s and 1970s, many scientists switched fields rather than work on topics connected to weapons or to the military. Some attempted to choose research topics that they considered to be more socially relevant or more expressive of their own moral or political philosophy. Some rejected certain topics out of protest (again, on moral or political grounds) to U.S. military action in Southeast Asia or because they espoused general pacifist objections to their country's military research agenda. Decisions to reject a line of research were, however, more often related to the proposed military sponsorship of the research than to any specific application of the particular investigation. In the late 1960s and early 1970s (as discussed in ch. 2), during controversy over the presence of classified military research on university campuses, for example, the organization Scientists and Engineers for Social and Political Action actively attempted to persuade researchers to forego participation in war research or weapons production.[19]

Rejection of a research line by individuals or groups can be a form of "conscientious objection in science. "2° Individuals who "draw the line" in this way may simply decide to have nothing to do with research linked to the military or, more specifically, with nuclear weapons or chemical-biological warfare. Many physicists, whose line of interest and expertise would fit them notably for the scientific task involved, justify their refusal to work on nuclear weapons research on moral grounds. More recently, a few graduate students in the field of artificial intelligence—where the proportion of Department of Defense funding is increasing—are reported to have either switched their thesis topic to one unrelated to military applications or, in an extreme case, left school or switched fields altogether.

In the 1980s, social anxiety about the nuclear arms race has had a direct effect not in inhibiting but in stimulating research. Funding for—and researchers' interest in—arms control research has increased. * Physicians, psychiatrists, and other medical professionals have encouraged and supported new research efforts on the medical consequences of nuclear war or the psychological effect of the nuclear arms race on children.

To Avoid Environmental Damage

Environmental concerns that provoke the imposition of regulation can trigger similar conflicts in values. At issue here is the narrowness of the relation of the potential application to the overall substance and goals of the research. Does regulation undertaken because of the fear of one particular application serve to deny the potential benefits to society of other possible applications perhaps not now clearly visible?[21] This justifica-

[14] Kopelman, op. cit., notes 11 and 13.
"Ibid., p. 200.
[16] Ibid.
[17] Culliton, "XYY," op. cit.; and Hecht, op. cit., p. 502.
[18] Rosemary Chalk, "Drawing the Line: Science and Military Research, " unpublished manuscript, May 1983, p. 8.

[19] Ibid p. 8; see also Colin Norman, "Classification Dispute Stalls NOAA" Program, " Science, vol. 227, Feb. 8, 1985, p. 155.
[20] Chalk, op. cit.
*For example, the International Security Program of the John D. and Catherine T. MacArthur Foundation.
"Brooks, op. cit.

tion underpins, for example, the legal action to halt deliberate release of genetically altered organisms, In a suit discussed in more detail in appendix A, the Foundation on Economic Trends has charged that the National Institutes of Health failed to evaluate adequately the environmental impact of experiments involving the release of genetically altered organisms into the environment. The plaintiffs are seeking to halt the work altogether because they are convinced that the potential long-range benefits of such research are simply not worth the potential risks to the environment.

To Promote or Avoid Predictable Economic Consequences

International competition in trade has been used to justify suspending one line of research (or to cut back on its funding) because another line appears more promising. Such a situation currently exists in the field of silicon electronics; work in that area has been so successful that research on alternative technologies has been cut back.

In another recent case, predictions of adverse economic effects alleged to result from the eventual application of research projects have stimulated protests that may yet lead to restraints. In 1980, California Rural Legal Assistance filed a lawsuit on behalf of 19 farm workers, which charged the University of California "with unlawfully spending public funds on mechanization research that displaced farm workers. "[22]The plaintiffs believe that the research—intended to develop large, more efficient agricultural machines and new farm methods—would reduce the need for human labor in agriculture. They are convinced that such innovations would have an adverse economic effect on the workers displaced by machinery, on small farms, and on consumers, and therefore that public funds should not be used to support such research. Defenders of this research argue that mechanization research should continue "in order to create more desirable jobs and to keep the American fruit and vegetable industry competitive in the international economy."[23](See app. A for further discussion.)

[22]PhilipIMartinand Alan L. Olmstead, 'The Agricultural Mechani7ationControversy," *Science, vol.* 227, Feb. 8, 1985,p.601

[23]Ibid., p 606.

To Preserve Moral Values

In some instances, a society or a group within the society may perceive the very exploration of a topic (or the legitimacy granted to the topic by a serious research effort) as a threat to moral or social beliefs. That is to say, the research hypothesis contradicts the social or political beliefs of the opponents. Early 20th century attitudes to human sexuality, for example, acted to inhibit all types of research relating to sexuality, contraception, and reproduction.[24] Research was discouraged because of fear that it might encourage or condone "immoral" behavior; religious and moral leaders objected to laboratory consideration of what were considered to be private, personal matters.

Such objections continue to be raised today. In public opinion polls run in 1983, approximately one-quarter of the adult population of the United States were willing to endorse the statement that one of the "bad effects of science" is that it breaks down people's ideas of "right and wrong.'"

On occasion, therefore, opponents of a research topic or hypothesis believe that any exploration (however well-controlled) might endanger the social cohesion of the community. Such concerns fuel contemporary objections to research that would attempt to link human intelligence to genetic inheritance. American psychometrician Arthur R. Jensen sparked a controversy in 1966 when he argued that IQ is genetically fixed. " Jensen proposed that social intervention aimed at boosting minority students' IQ scores—e.g., Headstart and other compensatory educational measures—were a waste of time and money. Opponents of the Jensen research are convinced that even to consider such research as scientifically legitimate and morally acceptable would be a racist act. The

[24]For a brief review of this history, see Emily H. Mudd, "The Historical Background of Ethical Considerations in Sex Research and Sex Therapy, " *Ethical Issues in Sex Therapy and Research,* William H. Masters, Virginia E. Johnson, and Robert C. Kolodny (eds.) (Boston, MA: Little, Brown & Co., 1977), pp. 1-10.

"ion D.Miller, *A National Survey of Adult Attitudes Toward Science and Technology in the* United States (Philadelphia, I'A: AnnenbergSchoolofComm un icat i ens, Universityof Pennsylvania, 1983).

[26]See Richard Lewontin, "Race and Intelligence, " *Bulletinofthe* Atomic *Scientists,*March1970. Also see Arthur R. lensen, "Ho w Much Can WeBoost IQ and Scholastic Achievement?" *Harvard Educational Review,*vol.39,1 969, pp. 1-123.

mere existence of the research project was perceived as an insult to members of certain minority groups. The objections can also go beyond the desire to avoid offending certain social groups. "The critics of such research, " Harvey Brooks writes, "believe that the risks of political misuse of the resulting knowledge outweigh any possible social benefits."[27] In some cases, then, the principal objection may be to undesirable application of the research knowledge; the secondary objection, offense to a social or cultural minority group.

On occasion, however, the very idea of doing such research on a taboo subject has been sufficient to warrant social regulation. This justification plays a role in the regulations promulgated by the Department of Education (ED) to implement the 1978 Amendments to Section 439 of the Federal Education Provisions Act, commonly referred to as the "Hatch Amendments" after their originator, Senator Orrin Hatch. The ED language aims to prevent specific subject matter, teaching methods, psychological tests, or educational research from being utilized or conducted without parental knowledge or consent. It would prohibit "research" designed to "reveal" such things as: political affiliations; mental or psychological problems potentially embarrassing to a student or his or her family; sex behavior and attitudes; illegal, antisocial, self-incriminating, and demeaning behavior; critical appraisals of other individuals with whom respondents have close family relationships; legally recognized privileged and analogous relationships such as those of lawyers, physicians, or ministers; or income.

[27] Brooks, op. cit.

REGULATION OF RESEARCH PROCEDURES AND PROTOCOLS

With the exception of protests over the use of animals, social criticism in the early 20th century was more likely to be directed at the topics than at the procedures of research. The moral and ethical concerns expressed in attempts to control how scientists conduct their research are not new, however. What is new is the raising of such concerns to the level of government action or legally enforceable regulation.

In these cases, the rationale for external control is most often that the scientific community's own safety procedures have been or are predicted to be inadequate or insufficient to prevent harm to human beings, animals, or the environment. The motivations for managing the risks inherent in the research process are straightforward: to comply with Federal, State and local laws and regulations and thereby to avoid enforcement actions or civil or criminal sanctions for noncompliance; and to comply with common law duties (e. g., to act with due care) and thereby to avoid personal injuries or environmental degradation, as well as any liability or duty to provide compensation which could arise from claims brought by the injured parties.

To Protect Human Health and Safety

By far the most visible and vocal science policy debates on regulation have been those surrounding how to protect human health and safety. Although the preoccupation with safety is a recent phenomenon, "it has taken hold so universally and absolutely that this operation hardly recognizes the possibility of a different world."[28] Regulations set by local or Federal authorities to *protect the health and safety of workers (e.g.,* requirements for certain types and amounts of safety equipment for persons working with hazardous chemicals) apply with equal force to laboratories and, in some cases, may have been written specifically to apply to laboratory workers. The Occupational Health and Safety Act of 1970 (discussed in more detail in ch. 5) includes protections for research workers who might be subjected to unnecessary hazards on the job.

[28] Robert L. Sproull, "Federal Regulation and the Natural Sciences, " *Bureaucrats and Brainpower: Government Regulations of Universities,* Paul Seaburg (ed.) (San Francisco, CA: Institute of Contemporary Studies, 1979), p. 86.

Emotional controversy has surrounded efforts to extend special legal protections to the *human subjects of experimentation (see* box in ch. 4 for the specific regulations). Human subjects are used in all parts of science. They are used to test new forms of diagnostic procedures, treatments, or medicines. Carefully controlled clinical trials in drug research are necessary to prove effectiveness, to set dosage, and to uncover unknown side effects before drugs may be licensed for general use. Human subjects must be observed for research on mental disorders. Private industry uses them to test new consumer goods, or in research on how to make products more useful.

The types of experimental situations involving human subjects can be classified generally into four categories:

1. experiments done to test physiological states and environmental manipulation, both internal and external, in "normal" subjects;
2. studies of human performance and process—e.g., memory or vision;
3. the trial of new methods, procedures, or drugs on persons who are ill; and
4. the use of terminally ill patients to test potentially dangerous drugs or procedures .2'

In the latter case, research may be conducted only as a "compassionate" procedure not requiring the review of a local ethics board if it is an "emergency" treatment with potential therapeutic value and involving a new or investigational drug or device.

Historically, the impetus for controls on the use of human subjects has been either the documentation of abuse of subjects or questions raised about potentially risky research. In the 1960s and 1970s, studies such as the Milgram "psychology of obedience" project (in which subjects were encouraged to act with increasing severity against other subjects),[30] or the Public Health Service Tuskegee study experiments in which over 300 black prisoners with syphilis were examined and tested but not treated for more than 40 years in order to observe the complications arising during terminal stages of the disease,[31] served to focus public and congressional attention on the need for more formal governmental surveillance of research on human subjects. In these and other cases, critics were able to show that human beings were subjected, usually without their knowledgeable consent, to the risk of some potential harm: death, physical abuse or injury; psychological abuse or injury; damage to interpersonal relations (e. g., loss of trust in others); legal jeopardy (e.g., creating and revealing a record of criminal behavior); career damage; economic harm; or invasions of privacy.[32]

Of all aspects of the human subjects debate perhaps the most sensitive has been the use of subjects with "limited civil freedom, " a classification that includes prisoners, residents of institutions for the mentally ill and retarded, and children/minors .33 As research institutions are often located in large urban areas, subjects are frequently drawn from the disadvantaged in those cities. Hospitalized or incarcerated subjects also provide a convenient, stable population that can be monitored with ease.[34] The large U.S. prison population, in fact, makes it possible for a research project to choose subjects with any necessary characteristic. Proponents of the use of such subjects argue that, moreover, there are also considerable advantages to society: prisoners are provided with a break from monotony, a feeling of altruism, and some monetary reward; research on mental illness and retardation cannot proceed without access to such patients,

Foremost in the discussion of whether minors or institutionalized subjects should be used is the question of coercion; for these subjects' peculiar position renders their "consent" to participation questionable and may also lead to subtle, and often unintended, abuse by experimenters.[35] Op-

[29]Robert E. Hodges and William B. Bean, "The Use of Prisoners for Medical Research, " *The Journal of the American Medical Association*, vol. 202, Nov. 6, 1967, p, 177,

[30]Stanley Milgram, *Obedience to Authority* (New York: Harper & Row, 1974).

[31]James H. Jones, *Bad Blood: The Tuskegee Syphilis Experiment (New* York: The Free Press, 1981).

[32]Donald P. Warwick, 'Types of Harm in Social Research, ' *Ethical Issues in Social Science Research*, Tom Beauchamp, et al. (eds.) (Baltimore, MD: The Johns Hopkins University Press, 1982), pp. 105-110.

[33]Robert J. Levine. *Ethics and Regulations of Clinical Research* (Baltimore, MD: Urban & Schwarzenberg, 1981).

[34]Ibid.

[35]Alexander M. Capron, "Medical Research in Prisons, " *The Hastings Center Report*, June 1973, p. 4,

ponents argue that because such research may be carried out in prisons or mental hospitals, it does not receive the scrutiny and criticism by colleagues which may be routine or required in normal research settings.

Concern that special populations might not be adequately covered by existing regulations led in the 1970s to the suggestion of a moratorium on research involving prisoners. In some countries—e.g., England—prisoners may not be used **as** subjects of experiments. The World Medical Association's Declaration of Helsinki (1964, revised in 1975) states that the only appropriate subjects are those "in such a mental, physical, and legal state as to be able to exercise fully [their] power[s] to consent. " Dissension over exactly how to treat prisoners has apparently stymied recent Food and Drug Administration efforts to finalize its regulations on such research.

Additional questions may be raised about how human subjects are used in social science research. Quite a bit of controversy arose in the 1960s and 1970s over deception that occurred in such research. Because they used stooges or engaged in covert observation of unsuspecting people, some social scientists appeared to be using "dubious means to achieve questionable ends. " The researchers insisted that deception was only used to advance human understanding and thus was beneficial to human welfare, that it helped in the study of "underdog" social groups such as homosexuals, and that deception in research—just as deception in muckraking journalism–could help to expose the unethical conduct of the power elite. Critics argued that any study that involved the violation of moral norms could not advance the human welfare, that "a chain of lies was not morally justified, "[36] and that no gain could offset the magnitude of potential discomfort to the subject .[37]

The tremendous acceleration of medical research—e.g., in immunology, genetics, and biomedical engineering-has created new controversies for those fields. Many medical researchers would like to use new techniques or technologies on patients before they have been fully tested. They believe that if a procedure could help a patient, then they have a responsibility to try it, even if they are not sure it will work. Others believe that the physician's responsibility is to be certain that a technique will result in some benefit. The conflict between these two perspectives raises such questions as: Who is or is not an experimental subject? What are the justifications for delay in using a new technique? Ethicist Thomas Murray has pointed out, in discussion of the "Baby Fae" baboon heart transplant, that even in a desperate therapeutic situation, certain rules should be followed. He suggests that four questions should be asked before an experimental treatment is used: Is the scientific background right? Is the next experimental subject naturally a human being? Is there no superior alternate therapy available? And can the researcher get truly informed consent—or informed consent from a guardian or parent?[38]

Similar questions are being raised for the use of human somatic-cell gene therapy[39] when opponents ask whether such research is playing with the very essence of humanness, or when animal rights groups object to the use of primates as a substitute for human experimental subjects .40 Those arguing for proceeding with the research cite the potential benefit to existing patients. The "bottom line" for that debate—as with many others—has become, as Alexander Capron has writ ten, "when may a society, actively or by acquiescence, expose some of its members to harm in order to seek benefits for them, for others, or for society as a whole?"[41] In some other contexts, society has already answered Capron's question by putting some people in jeopardy to protect the whole population. We select firemen and members of the military forces, sometimes by conscription, sometimes by lottery, sometimes by offering incentives. We have also used some of these

"Donald P. Warwick, "Social Scientists Ought to Stop Lying, " *Psychology Today*, February 1975, pp. 38-40, 105-106.

[37]See Tom L. Beauchamp, et al. (eds.) *Ethical Issues in Social Science Research* (Baltimore, MD: The Johns Hopkins University Press, 1982).

[38]"The MacNeil 'Lehrer News Hour: The Baby Fae Case, " transcript #2385, *Thirteen, Nov.* 16, 1984, pp. 1-9.

[39]See "Points to Consider in the Design and Submission of Human Somatic-Cell Gene Therapy Protocols, " prepared by the Working Group on Human Gene Therapy of the NIH, *Federal Register*, vol. 50, No. 14, Jan. 22, 1985.

[40]Judith A. Johnson, "Human Gene Therapy, Updated 10/30 /84," Library of Congress, Congressional Research Service, Science Policy Research Division, Apr. 3, 1984.

[41]Capron, op. cit. ,p.4.

means—incentives and lotteries—to select subjects for experiments .42

In the debates over experimentation on fetuses (either still in the womb or newly aborted or miscarried), the emotionally charged issue of abortion—as a potential "source" of fetuses or fetal tissue—has often been the implicit or explicit justification for controls. (See ch. 4 for discussion of specific regulations on use of fetuses.) Similar debates are now raging in England. '3

On occasion, objections to research have focused on accusations that a city or special population might be "experimented on. " Concern that research might jeopardize the health and safety of the general public was, for example, expressed during the 1970s' recombinant DNA controversy in Cambridge, Massachusetts (see ch. 7).[44] The argument was not that such research was intrinsically "bad" or that it might not result in positive gains for society, The argument was that the safety of the research procedures was untested and the consequences of an accident —even if only remotely possible—were potentially so negative that the community might be unwilling to risk any mistake. In such cases, until the procedures can be proved to be reliable, the public and the legislative bodies have acted to suspend research temporarily—until public study and debate can take place. The Catch-22 in this scenario is often that the procedures cannot be proven to be safe without trying them in some way.

To Protect Animals Used in Experimentation

The first attempts at social regulation to protect the welfare of animals (to obtain legal protection for members of nonhuman species) date to 19th-century England, although social concern—in the form of cultural reverence for some animals, and/or repulsion at cruel treatment of animals—may be found in many countries for hundreds of years.[45]

The controversy over the experimental use of animals is characterized by certainty of moral position on both sides. Thomas H. Moss of Case Western Reserve University observes that:

> . . . those who are convinced that laboratory animals are cruelly or unnecessarily used have often characterized the scientific establishment as insensitive to animal pain, and lacking in basic compassion toward living creatures. Those who are convinced that animal experiments are natural and appropriate tools to serve the advancement of science . . . have often characterized the animal welfare movement as irrational and as blindly myopic in the sense of moral outrage at animal suffering but lack of recognition of human health needs .46

In its attempt to abolish totally the use of animals in experiments, the animal liberation movement is saying:

> . . . that animals and humans have similar interests . . , those interests are to be counted equally, with no automatic discount just because one of the beings is not human.

This argument extends to such similarities as avoiding physical pain.[47]

The justifications for the various positions are based on a number of philosophical arguments related to perceptions of the appropriate relationship between humans and animals. Members of the animal rights community believe that animals possess a consciousness and certain attributes—e.g., symbolic communication, self-awareness, and anticipation of future events—which imbue animals with rights as exercised by humans. They see the animal rights movement as the progeny of the "humanitarian" movement, as the logical successor to the civil rights movement and the feminist movement. In comparison, the animal *welfare* movement, which includes some animal

[42] DaelWolfle, Emeritus Professor, Graduate School of Public Affairs, University of Washington, personal communciation, 1985.

[43] See Mary Warnock, *A Question of Life: The Warnock Report on Human Fertilization and Embryology* (New York: Basil Blackwell, Inc., 1~851.

"Sheldon Krimsky, *Genetic Alchemy: The Social* History *of the Recombinant DNA Controversy* (Cambridge, MA: The MIT Press, 19821.

"Harriet Ritvo, *"Plus ça Change:* Anti-\ 'ivisection Then and Now, " *Science, Technology, & Human Values,* vol.9, spring 1984, pp. 57-66.

"Thomas H.Moss, "The Modern Politics of Laboratory Animal Use, " Science, *Technology?', & Human Values, vo].* 9, spring 1984, pp. 51-56.

[47] Peter Singer (cd.), *In Defense of Animals (New* York: Basil Blackwell, Inc., 1985), p.9.

researchers, believes that as humans, in the words of Arthur Caplan, we hold a certain "moral stewardship" over animals, which requires that we treat them with respect even in the service of humans. The concept of moral stewardship infuses a spectrum of regulatory activity, ranging from outright bans on the use of certain animals (or of any animal in certain types of research) to National Institutes of Health regulations governing the treatment, handling, and use of animals in laboratories. (See ch. 4). *

To Protect the Environment

If research involves the use of toxic chemicals or biological materials known or suspected of causing some adverse effect on the environment by altering the natural composition of air, water, or soil, or by destroying or altering the ecological balance, then regulation of the research process may be implemented with the specific intention of protecting the environment.

The dangers in the introduction of new plant or animal species or new genetic forms have been obvious for decades in the destruction caused by, for example, the introduction of such nonnative species as kudzu vine and gypsy moths. Comparison of the effect of a current line of research to the past adverse effects of nondeliberate alterations of the balance between species or environments forms the basis of many attempts to regulate research on environmental grounds .48 Because it is virtually impossible to design tests to predict the ecological risk from a nonnative species, these concerns have been raised again and again and have now reached the courts via legal action to prevent agricultural research involving deliberate release of genetically engineered bacteria.

*Concern about this issue has also lead to a National Academy of Sciences study of the numbers of animals used in the United States in research and testing and to an OTA report on *Alternatives to Animal Use in Research, Testing, and Education, OTA-BA-273,* January 1986,

[48]See for example, Winston J. Brill, "Safety Concerns and Genetic Engineering in Agriculture, " Science, vol. 227, Jan. 25, 1985, pp. 381-384.

REGULATION OF THE DISSEMINATION OF SCIENTIFIC KNOWLEDGE

Open communication, through such things as publications, symposia, and face-to-face meetings, has always been an essential aspect of scientific endeavor. Unrestricted interaction sets forth a framework within which peer review, criticism, and data sharing can occur; it provides the arena for cross-fertilization of ideas, and helps avoid duplication of effort .[49] As the American Association for the Advancement of Science, Committee on Science in Promotion of Human Welfare, stated in a 1965 report:

> Each separate study of nature yields an approximate result and inevitably contains some errors and omissions. Science gets at the truth by a continuous process of self-examination which remedies omissions and corrects errors. The process requires free disclosure of results, general dissemination of findings, interpretations, conclusions, and widespread verification and criticism of results and conclusions.[50]

Because openness in science also encourages uninhibited dissemination of results outside of the laboratory, the justifications for restraining such communication center primarily around the potential effect of the information, the information's "value" (economic or otherwise), and who is perceived to "own" the information (e. g., the scientist or the organization that supported the scientist's work).

Regulation of scientific communication is far from simply a process of stamping a label on a document, however; it involves restraints *or* controls on, for example: 1) who may know certain

[49]NATO Science Committee, "Open Communication in Science, *NATO Science & Society,* 1983.

[50]Harold C. Relyea, "Shrouding the Endless Frontier—Scientific Communication and National Security: The Search for Balance, " *Striking a Balance: National Security and Scientific Freedom,* Harold C. Relyea (cd.) (Washington, DC: American Association for the Advancement of Science, 1985), p. 76.

scientific data or information, 2) the dissemination of printed documents, 3) who has access to an electronic communication system, 4) descriptions of processes or computer programs, and 5) even who may share or receive certain cell lines or biological strains. [51] Physicist Lee Grodzins has pointed out that the appropriate point of classification often may not be a specific formula or instruction but the knowledge that a result can be accomplished, for "once it is disclosed that something can be done, then someone will be able to duplicate it. "[52] Joan Bromberg, a historian of science, adds that "keeping secret that a research program exists is one way to hold the edge in a field, " because such "revelations also give hints at the correct direction for research."[53]

Because of the differing values of the groups involved in the communication of science, the information developed during research frequently becomes the object of dispute or tension between those who sponsor and those who conduct research. In general, this tension derives from conflicting desires to disseminate and to restrict access to information, As each actor defines differently the areas of restriction, then the tension grows.

This tension is particularly apparent in contemporary restraints on communications relating to national security and commercial property rights in such things as biological materials. In these cases, a lack of consensus on boundary definitions has resulted in increasingly large "gray areas" of information perceived as possible candidates for restriction in the future. The more that military systems depend on advanced technology-including such things as large-scale integrated circuitry, space technology, and microbiology[54]—the more that basic research appears to have the potential for military importance. For technology related to international industrial competition, similar uncertainty about what may prove to be important in the future has stimulated restrictions on the sharing of information with citizens of other countries and on the freedom of industrial scientists or industry-supported university professors to converse openly with their colleagues about their work,

Four main rationales may underpin actions to restrict communication:

- to uphold scientific standards;
- to protect a professional or economic interest;
- to protect the health, privacy, or safety of individuals; and
- to protect national military and economic security.

To Uphold Scientific Standards

Within science, both traditions and good laboratory practice govern the flow of dissemination of research results—who can communicate, who will receive communications, and when and where communication takes place. A junior member of a research team may be restricted from discussing his or her own original work until the team's publication is ready, or scientists in one laboratory group may refrain from discussing their work with colleagues elsewhere in the organization or with journalists until a writeup is submitted to a scientific journal. The ultimate justification for most such controls—whether reinforced by laboratory "rules" or by the pressure of tradition—is to uphold scientific standards, to assure that only verifiable and replicable science is presented as legitimate science.

The peer review system in scientific journals, for example, seeks to filter out reports of scientific work that do not meet the highest standards of research in the field, Readers must be able to accept publication confidently as a seal of legitimacy and accuracy, thereby allowing them to trust the author's conclusions without replicating the experiment or redoing the research. In theory, the norms of good scientific practice justify acceptance or rejection of communications; in practice, the current agenda and occasionally the biases of the research field may determine which topics are favored as well as which determine the mode of presentation.

[51] Patrick D. Kelley and Ernest G. Jaworski, "Agreements Covering Exchanges of Biological Materials, " American Association for the Advancement of Science, annual meeting, New York, May 1984.
[52] "Openness and Secrecy in Scientific and Technical Communication, Seminar, Dec. 11, 1984, Massachusetts Institute of Technology, Cambridge MA
[53] Ibid.
[54] NATO Science Committee, op. cit.

The goal of preserving the quality and integrity of science, and the goal of protecting the public are both used to justify an unusual but effective restriction on the timing and, in a few cases, the actual publication of articles in medicine. In 1969, Franz J. Ingelfinger, editor of *The New England Journal of Medicine*, began to worry that premature disclosure of unevaluated and unauthenticated medical research results before they were published in a peer-reviewed medical journal (and hence presumed to be evaluated and authenticated) could be dangerous to the public. He argued that such reports might contribute to false expectations of unevaluated drugs or treatments or, on occasion, might advocate treatments later found to be useless or potentially harmful.[55] Ingelfinger therefore instituted an editorial policy that denied publication to an article if its conclusions or major data had appeared in a medical news publication or similar unrefereed format. This rule has been continued and reinforced by the Joumal's subsequent editor,[56] and similar practices are followed by editors at other journals.

To Protect a Professional or Economic Interest

Scientists have always exercised a form of self-regulation in publication in order to achieve personal or professional rewards. Timing and placement of publication, for example, can significantly affect a scientist's career success.

Protecting an economic advantage has also long been accepted as a legitimate motive for communications restraint in commercial circles; businesses control publication to protect their economic rights in the material, to make a profit, or to avoid a loss. Examples of such motivations for restrictions may be the protection of patent rights, the maintenance of competitive advantage, or the protection of rights in biological materials.[57] Industry, in fact, has cited the ability to protect intellectual property as a major determinant of success:

> There is a direct correlation between the security of patent rights and industry's willingness to commit large sums to the inherently risky efforts needed to find and develop new technologies .58

In industrial research, the sponsor wants to protect the proprietary nature of the research and may not want competitors to have access to the information resulting from the sponsored research. This justification for secrecy now extends widely as more and more universities enter into research agreements with industrial sponsors. The institutions' naturally opposing views about the value of information are often a subject of negotiation in university-industry relations, where the traditional openness of the university could act against the commercial interests. Most frequently, the resolution is a contract provision that allows a prespecified delay of publication in order to permit the sponsor to file a patent application. Some university research projects will submit to a delay to allow an industrial sponsor to review a document for proprietary data.

A desire to secure or protect certain legal rights of the generator or sponsor of the research may also motivate restrictions. With respect to new products or processes developed during research, three outcomes are possible: it may be kept secret; it may enter the public domain; or it may be granted a patent. The patent laws grant an exclusive right, for a fixed period of time, to commercial exploitation of an innovative product or process to the person who discloses the invention to the U.S. Patent Office. Data or analyses collected during research may also receive protection via the copyright laws, which prevent plagiarism. The first U.S. regulation concerning the use of research results was, in fact, stated in the patent and copyright clause of the Constitution.[59]

Premature disclosure of patentable information could endanger the legal rights of the inventor and

[55] Barbara J. Culliton, "Dual Publication: 'Ingelfinger Rule' Debated by Scientists and Press, " *Science,* vol. 176, June 30, 1972, pp. 1403-1405,

[56] Arnold S. Relman, "The Ingelfinger Rule, " *The New England Journal of Medicine*, vol. 305, 1981, pp. 824-826.

[57] Kelley and Jaworski, oP. cit.

Se Alexander MacLachlan, testimony before the U.S. Congress, Science Policy Task Force, House Committee on Science and Technology, Apr. 25, 1985.

[59] Harold Relyea, Congressional Research service, personal communication, 1985.

therefore restriction is chosen. In other cases, disclosure might be used to establish some such right.

An organization may take action to impede dissemination (or to hasten dissemination) in order to preserve a corporate image or administrative power. Similar action might be taken to support the mission of a government agency. In a few reported cases, businesses have acted to impede the dissemination of scientific data in order to protect the company's legal position or to avoid adverse publicity. When studies of the toxic effects of vinyl chloride on rats revealed cancer, one Italian researcher, for example, found that his industrial sponsor refused to let the evidence be released. It was some time after that suppression occurred that cancers were found in workers in the United States who had been exposed to vinyl chloride.[60]

To Protect the Health, Privacy, or Safety of Individuals

Federal regulations as well as informal controls on the publication of data from human subjects research often seek to control dissemination in order to *protect the privacy or safety of individuals described in the reports,* or to protect subjects who participate in research on controversial topics or illegal activity."[1]

Some research information may have the potential of harm to the public welfare either because of what is said or when it is said. In those cases, dissemination is regulated (delayed or prohibited) *to protect the public health and safety.* Announcements pertaining to some real or potential public health problems could cause panic, and so restraint is used in the dissemination or publicity prior to publication—a justification that has been used for restricting communication of data on possible modes of transmittal of acquired immunodeficiency syndrome (AIDS). Dissemination of a result may also be delayed or controlled to prevent a potential adverse economic, social, or political reaction. This justification is used to avoid the panic or devaluation of property that might follow publication of an earthquake prediction for a specific area. The "Paigen" report, which analyzed the alleged health effects of the chemicals dumped at Love Canal, was later criticized by a panel of scientists for improper epidemiologic methods that "fueled rather than resolved public anxiety. "[62] One of the most important questions raised in such situations is how, in the face of great scientific uncertainty, adverse economic effects should be weighed against possible health risks to individuals or the general public.

Opponents of such restrictions argue that they inhibit free discussion in a democracy. The American public has a right to be told the technical information, even if the public policy decisions are ultimately based on normative rather than technical grounds. In the laser isotope separation case discussed earlier in this chapter, the argument was made that severe classification of such research might not, in the long run, prevent dissemination of the scientific "trick" or secret of the laser isotope separation process to other countries, but that it *could* discourage public discussion in the United States on whether the work should continue. The "lid of secrecy" would "effectively preclude public scrutiny, " one observer wrote.[63]

To Protect National Military and Economic Security

Protection of national security has been used for centuries as a justification for government regulation of technical information.[64] During World War II, American scientists and engineers accepted two kinds of censorship or control of communications—voluntary (justified in the spirit of patriotism) and mandatory. Scientific journal editors practiced extensive voluntary censorship during the war—they believed that some type of censorship was necessary to prevent the leakage of vital information to U.S. enemies.[65] Scientific pub-

[60] John T. Edsall, "Scientific Freedom and Responsibility: Report of the AAAS Committee on Scient i tic Freedom and Responsibility, " *Science, vol,* 188, May 16, 1975, pp. 687-693, and vol.189, July 18, 1975, pp. 174-175.

[61] Barry Barnes, *Who Should Know What: Social Science, Privacy and Ethics* (Cambridge, England: Cambridge University Press, 1979),

[62] Lewis Regenstein, *America the Poisoned* (Washington, DC: Acropolis Books Ltd., 1982), p. 140.

[63] Casper, "Laser Enrichment, " op. cit., p. 38.

[64] Relyea, "Shrouding the Endless Frontier, " op. cit., p. 80.

[65] Michael M. Sokal, "Restrictions on Scientific Publication, " *Science,* vol. 215, Mar. 5, 1982, p. 1182; and Michael M. Sokal and Janice F. Goldblum, 'From the Archives, " *Science, Technology, & Human Values,* vol. 10, spring 1985, pp. 24-27,

lications of all types were also subject to mandatory review by the Office of Censorship. And scientists engaged in weapons research were, of course, subject to the military's restraints and controls on all their activities, including conversations as well as written communications. In peacetime, however, the "conflicting imperatives of national security and open scientific communication" have occasionally led to controversy and legal action and are continually the subject of vigorous debate." The tension between these two objectives arises primarily in a clash between the justifications for restraint and openness. The government wants to control all information that could be of possible value to potential enemy states; the scientists stress that such measures could damage scientific progress and creativity and abridge traditional scientific freedom. '7

The motives for restrictions justified by national security can be both economic and military. Often, the restriction is indicative of whether the research has demonstrated application. * Although "national security" is vaguely defined in the law and the uses of the term range from "defense of the United States" and "public peace and safety" to "financial policies of the United States, " there is agreement among policy analysts that that policy concept does provide to the President a broad grant of administrative discretion to justify all sorts of policies.

Recently, the justifications for communications restraints based on national security considerations have tended to relate to quite specific perceptions about the importance of science in an international context. First, those who believe that the United States' lead over the Soviet Union in some important areas of military technologies is diminishing attribute that situation to Soviet absorption of U.S. technologies. Second, the military systems themselves have become more dependent on sophisticated new technologies and on the science that feeds them. Third, proponents of restrictions believe that a steadily increasing share of these technologies is dual-use in nature, that is, that they can have both military and nonmilitary applications. 'a And fourth, such national policies as East-West detente and scientific exchanges with the Chinese are perceived to have increased the opportunities for leakage of technical information of all types. Such rationales were clearly stated in the draft "National Policy on the Transfer of Scientific and Technical Information, " issued by the executive branch on June 15, 1984:

> The acquisition of advanced technology from the United States by Eastern Bloc nations for the purpose of enhancing their military capabilities poses a significant threat to our national security. Intelligence studies indicate that a small but significant target of the Eastern Bloc intelligence gathering effort is science and engineering research performed at universities and federal laboratories. At the same time, our leadership position in science and technology is an essential element in our economic and physical security. The strength of American science requires a research environment conducive to creativity, an environmentin which the free exchange of ideas is a vital component .[69]

The government has recently justified the application of export control regulations to basic research as necessary to protect: 1) tangible goods, including technical data, that relate to national security; and 2) the domestic economy. The application limits "information of any kind that can be used or adapted for use, in the design, production, manufacture, utilization, or reconstruction of articles or materials."[70]

The ensuing controversy over the wide-scale application of these controls has led to a reaffirmation by the Department of Defense/University Forum that: "No restriction may be placed upon the conduct or reporting of fundamental research that has not received national security classification." However, how the various participants in such restrictions define what is or is not fun-

---

"Richard D. DeLauer, "Scientific Communication and National Security, " *Science,* vol. 226, Oct. 5, 1984, p. 9.

"NATO Science Committee, op. cit.

*". . . know-how is a precious commodit, leading to the commercial or military products that determine the fortunes of nations in peace and in war. Yet sometimes it is hard to tell where scientific knowledge leaves off and engineering know-how begins. " DeLauer, op. cit.

[68]Panel on Scientific Communication and National Security Committee on Science, Engineering, and Public Po] icy, *Scientific Communication and National Security* (Washington, DC: National Academy Press, 1982), p, 11.

[69]U S. Congress, "Scientific Communication and National Security, " hearings before the House Committee on Science and Technology, May 25, 1984.

[70]15 CFR 379. 1.a.

damental research can determine the extent of restriction. This window of uncertainty prompted the Department of Defense (DOD) to state its definition of "fundamental research":

> For DOD purposes the decision whether a particular research activity is or is not fundamental will be determined primarily by considering the following easily identified characteristics: 1) performer (for example, university, industry, inhouse) 2) budget category (for example, 6.1, 6.2) 3) sponsoring DOD entity 4) special contract provisions. . . . Unclassified contract research supported by 6.1 funding shall be considered 'fundamental. Similarly, unclassified research performed on campus at a university and supported by 6.2 funding shall with rare exceptions be considered 'fundamental.'[71]

In the disputes over restrictions on scientific communication, DOD sees itself as "caught in a dilemma. " In the words of the Defense Science Board:

> If it vigorously attempts to regulate the flow of scientific information in the scientific community, it could jeopardize the strength and vitality of the very community it is seeking to revitalize for the sake of national defense. On the other hand, if DOD abandons any attempt at regulation in the university context, it could seriously compromise and, in certain cases, totally undercut other efforts to control the out-flow of militarily critical technology. The middle ground is a difficult one to establish. "

The Corson panel of the National Academy of Sciences, fearful that the government policy could begin to endorse a form of "blanket justification" for restricting some fields of basic research, attempted to clarify the limits of acceptable restraints. The Corson panel's report[73] stated that communication restrictions should not be applied to any area of university research, be it basic or applied, unless they involve a technology meeting all the following criteria:

> The technology is developing rapidly, and the time from basic science to application is short; The technology has identifiable direct military applications; or it is dual-use and involves process or production-related techniques; Transfer of the technology would give the U.S.S.R a significant near-term military benefit; and the U.S. is the only source of information about the technology, or other friendly nations that could also be the source have control systems as secure as ours.[74]

[71] Leo Young, "Commentary: The Control of Government-Sponsored Technical Information," *Science, Technology >,, & Human Values, vol. 10,* spring 1985, pp 82-80.

[71] Report of the Defense Science Board Task Force on University Responsiveness to National Security Requirements, January 1982.
[73] Panel On Scientific Communication, op. cit.
[74] Ibid.

SUMMARY

In 1979, Miller, Prewitt, and Pearson conducted a public opinion poll for the National Science Foundation in which they asked respondents about specific types of scientific studies and whether scientists should be "allowed" to conduct those studies. Because the structure of the poll questions implied regulation, the response can be interpreted as one measure of the public's willingness to restrain certain types of scientific inquiry.[75] The results indicate that a majority of the respondents would have liked to prohibit research dealing with the creation of new life forms and with the gender of children, Opposition to genetic engineering declined some when the question specified plants and animals rather than humans, but there was still substantial disapproval of scientific research in this area. In contrast, only one-quarter of the population expressed opposition to studies that would involve weather modification or the extension of the average human life span.

Such data tend to indicate that Americans, in deciding whether research should be restricted or prohibited, may make such decisions based on whether they believe that the restriction would respond to moral or social objections. The results may also indicate that the public is more likely to approve regulation for reasons relating to the immediate protection of human health or safety or to preservation of the moral order than for rea-

"ion D Miller, et al., *The Attitudes of the 11, S, Public Toward Science and Technology* (Washington, DC: National Science Foundation, 1980); also Jon D Miller, *The American People and Science Policy* (New York Pergamon Press, 1983).

sons relating to potential long-term damage of the environment or depletion of economic resources.

Although most Americans believe that the government has some control over the work of scientists, the public does not appear to be willing to endorse more direct public control. A 1983 Annenberg study asked whether the government presently has any control over "what scientists do" and 77 percent of the respondents indicated that they thought that the government did have that kind of control. " When asked if the government "should" have control over what scientists do, 67 percent of the public agreed that this kind of control was appropriate. In a 1979 study, respondents were asked whether "most citizens are well enough informed" to help set goals for scientific research or to decide which new technologies should be developed .77 Approximately 85 percent of the public indicated that they did not feel that most citizens had the knowledge needed either to set research goals or to select technologies.[78] Contradictory evidence of such willingness to participate was found, however, in a pilot study conducted in 1979 by the Public Agenda Foundation, which concluded that public participation in decisionmaking can extend to priority-setting based on limiting or restraining certain areas of research .[79]

Available public opinion data suggest that the public is not unwilling, based on a number of rationales, to restrict the scope of scientific inquiry, especially in the area of human health and safety such as genetic engineering. The data also suggest that a larger portion of the public would be comfortable with the genetic modification of plants and animals, but that there is substantial concern about work involving changes in the human genetic structure. Other evidence, such as increased demonstrations, publicity, and legislative initiatives, indicates that, in the eyes of the general public, some regulation of experimentation on animals is supported.

It is possible that because the public appears to place such high value on science's contribution to human health and to quality of life, and because usefulness and application play such a significant role in the public's evaluation of scientific priorities, a willingness to regulate may indicate that, in such instances, the perceived risk is believed to outweigh perceived benefit, even though there may be inadequate evidence to support either position.

[76]Miller, *The American People and Science Policy,* op. cit.
[77]Miller, et al., op. cit.
[78]Ibid.

[79]Public Agenda Foundation, *Science Policy Priorities and the Public,* a report to the National Science Foundation on a Pilot Project to Assess Public Attitudes About Priorities and Indicators of Quality for Scientific Research, New York, 1983.