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ABSTRACT

This issue features four articles which represent social and ethical concerns effecting all world citizens. Three ccnference reports are also presented. A large portion of the jcurnal is devoted to news items. An extensive bibliography is given with a brief description of each publication. A calender lists the ccming events through September, 1980. An article index (arranged by author) and a bibliography index are included. (SA)

SUMMER 1979 ISSUE NO. 28

SCIENCE, TECHNOLOGY, & HUMAN VALUES

AN INTERDISCIPLINARY QUARTERLY REVIEW

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SUMMER 1979 Vol. 4, No. 28

SCIENCE, TECHNOLOGY, & HUMAN VALUES

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TO THE READER

A little more than seven years ago, when science (and rational thought) were under strident attack in the popular and semi-academic press, Gerald Holton perceived the need for a "central switchboard" to bring together the wide spectrum of people concerned about this tension and about the place of science and technology in our culture. With support from NSF and The Commonwealth Fund, the Program on Public Conceptions of Science and its quarterly Newsletter were born in 1972. Under the tutelage of Holton and William A. Blanpied, the newsletter prospered, and when I joined the venture in 1974 it had already found a large and enthusiastic audience. After only two years the Newsletter had attracted a loyal readership in the U.S. and abroad; a burgeoning file of correspondence attested to our readers' eagerness to contribute and obtain information.

During the intervening years, the impressive growth of the science-technology-society field has been an outstanding exception to the retrenchment affecting so many academic disciplines. Such developments as the proliferation of STS units in universities and the expansion of NSF and NEH research programs have been reflected in, and, we hope, favorably affected by, this publication. In 1976 a new Title, "Newsletter on Science, Technology, & Human Values," signalled an increased emphasis on ethical issues in science and technology to complement the original focus on public understanding of science. Still later, as the number and quality of manuscripts increased, it was clear that the publication was entering a new stage of development and that the 'newsletter' designation was no longer appropriate. The continuing evolution of Science, Technology, & Human Values into a scholarly journal is but one of many signs, here and abroad, of the increasing professionalization of the STS field; other indicators include the assignment of faculty to teaching posts and the formation of new groups such as the Science, Technology and Society Association in Britain (see page 26).

Negotiations are now in the final stages toward the co-sponsorship of Science, Technology, & Human Values by the Program for the College of Science, Technology and Society at the Massachusetts Institute of Technology, and the Kennedy School of Government at Harvard. In September 1979 the present co-editor, Marcel C. La Follette, will become Editor, and Susan Howe will assume the role of Production Editor. Over the last five years my own work on this project has been greatly enriched by the participation of many people. In addition to the present and past Advisory Boards, I should like to extend special thanks to Gerald Holton, Harvey Brooks, Joan Laws, Richard Hedrich, and William A. Blanpied.

- Vivien B. Shelanski

Editorial

SCIENCE, TECHNOLOGY, & HUMAN VALUES IN AN INTERNATIONAL CONTEXT

This Spring, Americans who live downwind from the reactors at Three-Mile Island discovered that they could be easily and dramatically affected by events in a neighboring county or state. Now, throughout the U.S. and in Europe, bumper stickers are appearing that declare "We are all residents of Pennsylvania." Upwind or down, such messages say, does not necessarily matter -- we are all upwind or downwind from some effect of modern technology. The effects of science and technology do not respect political or physical borders any more than the benefits can (or should) be monopolized by any one nation. And this truism suggests that our perspectives on science, technology, and human values may need to be broadened.

In his 27 March 1979 message to Congress [Federal Government's Policy on Science and Technology], President Carter devoted considerable attention not only to the national importance of science and technology but also to the global impact of scientific and technical results and the activities of the persons who produce them. He advocated more basic research on the potential risks to the environment and ecosystem which result from human activity that is suddenly "significant on a global scale." He then turned to the subject of science, technology, and international relations:

> Science and technology is increasingly international in its scope and significance. This international dimension affects the planning and conduct of our research and development activities. Such activities, whether carried out by us or by others, serve to increase the fundamental stock of human knowledge. They can also foster commercial relationships, impact on the quality of life in all countries, and affect the global environment. Both our domestic planning and our foreign policy must reflect an understanding of this wide-ranging impact of science and technology.
>
> Much of the existing international cooperation in science and technology takes place in academic or commercial channels. There is, however, a growing role for governmental cooperation as other nations make new commitments to scientific and technological growth. If used wisely these future opportunities for scientific and technological cooperation can support our foreign policy objectives.

This issue of Science, Technology, & Human Values features several articles illustrating the diversity of social and ethical questions that may be framed in an international context. The lead article by Robert Kates and Murray Todd of the National Academy of Sciences' Committee on Human Rights reflects on some of the conflicts of conscience faced by those who are concerned about the rights of other scientists and yet work within

an enterprise that stresses international cooperation. As Senator Edward Kennedy argued during the Senate debate on the NSF FY1980 Authorization Act, the issues involved in promoting or restricting international travel and cooperative research by scientists are by no means easily resolved:

> No one questions that there are human rights problems in the Soviet Union, as well as in other countries. No one questions that there are occasions -- too many occasions -- when scientists are unable to leave their countries and attend international meetings.
>
> But do we want to address these problems by denying the foreign victims of discrimination their valued access to American colleagues -- who can lend them support, bring their message to the outside world, and express solidarity with them? Do we want to deny American scientists the opportunity to press their human rights concerns with authorities and with their colleagues in foreign countries?

On an individual as well as on an institutional level, scientists are striving to reconcile their desire to work with colleagues in other countries and their belief in the efficacy of boycotts of scientific meetings.

Many scientific organizations throughout the world now have committees, sections, or affiliate societies that are concerned with scientific rights and responsibilities. In her report on a January 1979 conference on "Social Responsibility of Science," Rosemary Chalk describes the New Zealand Association of Scientists, a group whose activities closely parallel those of the AAAS Committee on Scientific Freedom and Responsibility. In Great Britain, the SISCON group, which has for many years promoted discussion of science, technology, and society issues in that country, recently metamorphosed into the Science, Technology and Society Association (STSA). An inaugural address by the new STSA President, Anthony Wedgwood Benn, former Minister of Energy in the British Cabinet, represents an interesting analysis from the British perspective of some emerging social conflicts on energy, and on military technology.

President Carter's message to Congress also stressed the need for greater public understanding of science and technology and for enhanced citizen involvement in scientific and technical decision-making:

> The changes induced by science and technology are infused in the fabric of society, profoundly altering the way we live. The understanding of those changes and their causes, as well as successful adaptation to them, requires an informed citizenry.

This issue of STHV also includes several reports related to international efforts in these areas. One, the draft recommendations of a January 1979 U.S.-Japan Joint Survey Seminar on Science and Society, reflects the participants' assessments of important areas in which fruitful international collaborative research may be carried out. That report illustrates the cross-cultural nature of concerns about public understanding, science education,

and contemporary social, ethical, and political interactions between science and society. A second report includes remarks made at the Joint Survey Seminar and at a separate April conference that focused specifically on the humanistic aspects of science education in the two countries. Finally, a pre-conference report on the forthcoming World Council of Churches debate on Faith, Science, and the Future indicates that many of these issues and concerns have spilled from the academic community and are being forcefully raised in the context of religious, political, and public-interest groups throughout the world.

All these activities and discussions bring home the lesson that the critical issues in the social impact of science and technology may have been too often seen in terms of either upwind or downwind ethical perspectives. Upwind ethical perspectives attempt to weigh benefits to the immediate community (e.g., an improved economy, more jobs, more electrical power, or even the psychological security of seemingly unlimited energy and limitless prosperity) against costs that can be quantified and assessed by the people most directly affected. The public (and the media) have seemed less anxious to assume a downwind perspective -- that is, to take into account the costs and benefits for other people, other places, other times. What will be the effect on the people downwind from the plant? Should we consider the rights of future generations, and if so, how?

The episode at Three-Mile Island reminds us that it is important to view social impacts from both perspectives. Winds can shift and, in a global context, the winds are all part of the same ever-fluctuating atmosphere. Forthcoming issues of Science, Technology, & Human Values will no doubt continue to print articles that refer predominantly to American examples, American science and technology. Nevertheless, it is worthwhile to pause here and reaffirm STHV's commitment to the discussion of issues and ideas such as those presented in the following pages, ones that not only cross disciplines and fields, but also transcend national borders, political ideologies, social beliefs, and generations, and are of common concern to all humans, upwind and down. - MCL

THE SCIENTISTS' DILEMMA: CONFLICT BETWEEN CONCERNS FOR HUMAN RIGHTS AND THE IMPERATIVE TO COMMUNICATE

Robert W. Kates*
Graduate School of Geography
Clark University
Worcester, MA 01610

W. Murray Todd*
Commission on International Relations, NRC
National Academy of Sciences
Washington, DC 20418

In the Summer of 1978 scholarly communities in the United States and Western Europe were wracked by intense emotions generated by the Soviet trials and convictions of Yuri Orlov and Anatoly Shcharanskiy. It is our belief that no other events in the Post-Stalin history of Soviet-Western scientific relations have caused such intense soul-searching within the Western science community. We also believe that no other event has had as profound an effect on the Soviet scientific community as the gradual realization that the protests deriving from those trials and convictions are manifestations of honest concern by individuals, and are not the orchestrated propaganda of government departments and agencies.

Certainly, other trials have generated strong sentiments; but the Orlov and Shcharanskiy episodes followed closely one after the other and, with the grossly insensitive atmosphere that surrounded each, they stood as unique monuments to a brand of justice that scientists in the West find almost incomprehensible. Three kinds of feelings predominated. There was a sense of impotent outrage that the scientists and their families could be so sorely mistreated and that there was so little we as individuals could do about it. There was grave disappointment that the Soviet leadership felt compelled to crush such insignificant manifestations of dissent with such an overwhelming display of internal control and with such tastelessness and purposeful disdain for any external pleas for mercy. And there was a nagging concern that such disdain heralded a throwback to a more fearful time of cold war tension and might threaten the achievement of a significant reduction in the arms race.

The considerable stresses felt in both scientific communities have not abated. Many scientists have thought long and soberly about what they can do as individuals and how the scientific community might exercise collective influence to gain these two men their freedom. Groups on both sides of the Atlantic have declared their opposition to any further personal contact with Soviet science. They are pledged (in varying degrees and within different self-imposed time and other limits) to refuse to attend scientific meetings in the USSR, to refuse to be host to Soviet visitors in their laboratories and places of work and to attend lectures by Soviet visitors (unless the visitor is invited). The group known as "SOS" (Scientists for Orlov and Shcharanskiy in the U.S.), has made additional pledges to oppose both any expansion of the official exchange programs and the export of sophisticated technology to the USSR.

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* Dr. Kates is Chairman of the Committee on Human Rights of the U.S. National Academy of Sciences; Mr. Todd is staff officer of that committee and on the staff of the National Research Council, National Academy of Sciences.

After comparable lengthy and sober reflection, other scientists are following distinctly different courses. They have reasoned that the Soviet scientific community is anxious for contact with the West and that this provides the West with some leverage. They also reason that the dissidents and others within the Soviet community to whom human rights have special meaning need the contact with their fellow scientists even more than they need the symbolism of a boycott.

Some Western scientists who strive to continue contact also argue that communication with the Soviet scientific community is essential, almost at any cost, because the Soviet Union is the one technological equal to the U.S., in terms of armaments and the capacity to destroy the world. This point is seconded privately by some genuinely concerned Soviet scientists. It is also the official line of those Soviet scientists who are permitted to attend the conclaves of "private" citizens interested in disarmament (Pugwash, for example).

We have chosen to illustrate the scientist's dilemma about human rights using the example of Orlov and Shcharanskiy and the Soviet Union because the contrasts are vivid and the drama is ineluctably stark. In this instance, our collective ambivalence is one more manifestation of the powerful political dichotomy of this age. But similar, albeit smaller, dilemmas exist for scientists who deal with colleagues, organizations, and institutions in any part of the world where repression is a way of life. Whether to collaborate scientifically with people in Argentina, Chile, Indonesia, South Africa, and many other countries is a question that perplexes significant numbers of scientists. In Summer 1978, for example, a great many scientists had to decide whether to attend the Cancer Congress in Buenos Aires, Argentina. Groups of French and American scientists organized boycotts of the Congress and actively urged their colleagues not to attend the Buenos Aires meeting.

The pragmatic response to the dilemma is to opt for the course that permits both the individual and the organizations to which he or she may belong, to speak out forcefully when it seems required, and simultaneously to avoid either threatening or actually suspending relations. This permits backstage attempts to influence human rights matters as well as sustaining the connections that are the warp and woof of the scientific fabric. However, although this prescription permits a wide range of options, it has no ultimate sanctions and is therefore limited in its effectiveness.

Is this course any less effective than boycotting? Put another way, do we have any evidence that boycotting effectively changes the posture of any repressive regime? With our understanding of the situation, we would answer "no" to both these questions, but would not be surprised by contrary assertions. (We know of no systematic examination of this question.) However, the pledge to boycott, if taken by a significant number of people in a position to exercise the boycott, can be a palpable reminder to the repressive authorities. It is one of the ironies of the dilemma that the existence of an effective group willing to take an extreme position makes the "moderates" appear all that much more "reasonable." In the United States, and in other countries of the West, that the scientific community could emerge with people in both camps is, of course, a manifestation of Western pluralism and intellectual freedom. As such, it is itself a source of disbelief, wonderment and concern to repressive authorities

because it is so clearly individualistic and so manifestly the product of open debate and serious analysis of their ideologies and regimes.

The "moderates" or "pragmatists" are themselves divided on this issue. At no point has there been a serious assertion that individual scientists should not concern themselves with matters of human rights; however, the two schools of thought diverge on the question of the institutional base from which the scientists should operate. One school contends (and the Royal Society of London has taken this position) that there are organizations devoted to human rights matters and interested scientists should join them if they wish to protest the treatment of scientists (or others) who suffer from repression. An exception may be made to this rule-of-thumb if a scientist is persecuted for pursuing science. The case most often cited is that of the political reprisals taken against Soviet geneticists who opposed Lysenko. In such cases, it is regarded as quite appropriate for the institutions of science to protest.

The other school of thought (adhered to by the U.S. National Academy of Sciences, NAS) is that the scientific community and its institutions have the responsibility to try to help those members of the scientific community who suffer political repression. This position recognizes that intellectuals are often the most persecuted because they frequently are the most vocal about the abuses they detect. It also takes note of the particular vulnerability of members of the scientific community and the exposed position they occupy in certain societies. For example, in the Soviet Union, scientists are well paid, highly respected, the recipients of numerous perquisites not enjoyed by other members of the society, and the objects of heavy state investment in their education and the facilities required for their work. Thus, criticism of the state or "the system" by some of its most favored sons and daughters is regarded as an act of almost unbelievable ingratitude as well as a political act that could serve for ordinary citizens as a dangerous model of the way the elite think.

Other questions of ethics perplex scientists, engineers, physicians, and scholars whose technical training and skills make them desirable servants of or allies to any government. These questions range from whether to provide sophisticated econometric help to the economic planners of repressive regimes in developing countries, to the terrible decisions of physicians who may be called upon to treat wounded rebels clandestinely, or to patch up the victims of torture so that they can be tortured again. To what extent do these matters relate to questions of human rights? Or, put another way, to what degree should human rights considerations overrule other (and sometimes equally pressing) issues? These questions transcend the decisions of scientists, physicians, economists, or any other group, for they are the decisions that individuals and society must make. They are very difficult questions.

Rather than plunge into discussion of all or only some of these issues, we shall show how one institution of science, The Committee on Human Rights of the National Academy of Sciences, has grappled with the scientists' dilemma of communication.

This Committee was created in 1976 in response to a plea from the floor at the Annual Meeting of the Academy. Since its founding, it has polled the membership of the Academy (who now total 1224) and has received the voluntary assurance of some 334 members that they wish to be "Correspondents" of the

Committee and will act on behalf of individuals the Committee selects for attention (or "adopts," to use more common parlance). The Committee has limited its attention to individuals who are suffering severe repression and about whom it believes it has sufficient evidence to be reasonably sure that the repression is in contravention of the Universal Declaration of Human Rights. In practice, this means people who are in jail, or are about to be persecuted, or those who have suffered torture.

The Committee focuses its attention on scientists, engineers, physicians, social scientists, and others whose technical training makes them part of the natural constituency of a broadly-based academy of sciences. Occasionally we are asked why we do not confine our efforts only to the problems of other members of academies of science. There are two answers to that query: first, very few academy members are in trouble compared to the rather large number of scientists and engineers who are; and, second, the membership of the National Academy distinctly rejects such a position, on the grounds that the institution has a responsibility to the entire scientific community.

In the three years since the Committee was established, it has taken formal public action for eighteen people and informal action for about half that number. Of the eighteen formal cases six have been released from jails, and four others are believed to be dead (they are considered "disappeared" in Argentina). Of the several informal cases, three have been helped in some tangible way and we hope others may have benefitted in ways we do not (perhaps cannot) know. The Committee has met ten times, released seven public statements, sent ten mailings to its Correspondents, made two statements at Congressional hearings, mobilized one group effort to cable in behalf of a prisoner, and sent one mission to Latin America on behalf of prisoners. Much of this effort was accomplished in 1978. It took some time for the Committee to really get started and 1978 was a year of substantial human rights activity for reasons noted above.

How does the Committee work? The group is now being expanded beyond its original ten members, and some of the original members are being rotated off. Several members of the NAS professional and support staff have volunteered as part-time staff members (their effort is not, however, charged to the contracts and grants that support specific projects within the institution). All Committee members are members of the Academy and all public statements of the Committee must be reviewed by members of the Council of the Academy in a group chaired by the Foreign Secretary.

In practice, the Committee attempts to select the cases of people who have symbolic importance, and to find and adopt cases of people who are under severe repression in different parts of the world. (It has had cases or made inquiry for people in Africa, Indonesia, Latin America, Eastern Europe, Korea, Taiwan, and Israel as well as the USSR.) It attempts to assure itself that the person about whom it is concerned has not participated in or advocated acts of violence.

The Committee's preferred mode of operation is to direct inquiry to appropriate authorities in the countries where repression has taken or is taking place and, politely but firmly, to ask for explanations of charges and details of legal procedures, the status of prisoners, information about their whereabouts or their well-being, and modes of possible legal redress. If, as is

frequently the case, the response is either noncommittal, evasive, or pro forma, further inquiry will be directed both to the Washington embassy and other institutions within the country in question. When there is no official response, which is usually the case in the USSR and the countries of Eastern Europe, inquiry will be made to the appropriate Academy of Sciences. The Committee frequently also asks the local U.S. Embassy to provide either information or advice about how to proceed, but it is not Committee practice to ask the U.S. Embassy either to intervene on behalf of a prisoner (unless the Embassy volunteers to do so) or to "carry the Academy's mail" to authorities in the host country. Thus, only after private inquiry and expressions of concern have failed does the Committee make a public statement and ask its correspondents to send letters and cables in behalf of a prisoner.

We are frequently asked about our "successes." Without being evasive, it is germane to consider what a success in these matters may be. Certainly, the spotlight of public opinion, shown so as to illuminate the murky areas of unconscionable behavior, is in itself the beginning of assistance to the repressed. Whenever we talk to the victims of repression or to their families we are assured that in their view to remain silent is to acquiesce and to speak out -- either privately or publicly -- is to have taken sides against wrongdoing. This is an act of solidarity with the victim.

Once a stand is taken on behalf of a victim, the authorities that are repressing him or her are put on notice. This may have the effect of reducing the level of repression, or it may have the effect of improving the chances for the victim's release, exile, trade for some other prisoner elsewhere, or amnesty. In no case have we been told to be silent to avoid further repression (although that is a possibility) or to reduce the danger to the prisoner. Obviously this does not mean that the spotlight is infallible or that public outcry will necessarily lessen the ultimate punishment suffered by the prisoner. It does suggest that sustained expression of concern is critical once a private or public campaign is begun. We fear the ephemeral quality of protest.

The Committee is also deeply committed to personal support for a prisoner and his or her family and friends. For example, after considerable study and review by legal and other authorities, a briefing paper was prepared for our Correspondents suggesting ways they can manifest sustained interest in the three Soviet prisoners for whom we have spoken (Kovalev, Orlov, and Shcharanskiy).* The paper applies to all Soviet prisoners, but carried the specific addresses and information germane to these three. Briefly, the paper points out that efforts on behalf of imprisoned Soviet scientific colleagues may appear to be of little avail. Rarely will a correspondent receive confirmation that a book or letter has reached its destination. A prisoner may not receive all the letters and packages addressed to him, but he may become aware of their existence, and this can be of great psychological comfort. Even if the only persons directly aware of outsiders' actions are government officials, this may result in amelioration of the conditions of confinement, or at least help prevent their deterioration. The prisoner's family will be more likely to receive mail or

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* Copies may be obtained from: The Committee on Human Rights, National Academy of Sciences, 2101 Constitution Avenue, N.W., Washington, DC 20418.

telephone calls from abroad, but may never be able to say "thank you." Nonetheless, expressions of interest and concern will have great meaning.

Article 10 of the Corrective Labor Code of the RSFSR (1970) (RSFSR -- Russian Soviet Federated Socialist Republic) requires that:

> All activity of corrective labor institutions, and organs executing court sentences for exile or banishment without deprivation of freedom, is based on strict observance of the laws. Officials of these institutions and organs are responsible for ensuring legality in their activity.

Moreover, Article 11 states that:

> Supervision over the precise observance of the laws in the execution of sentences for deprivation of freedom, of exile, banishment, and corrective labor without deprivation of freedom, is exercised by the General Procurator of the USSR, the Procurator of the RSFSR, and Procurators subordinate to them in accordance with the Statute on Procurator's Supervision in the USSR. Exercising in the name of the Government the highest supervision of observance of legality, the Procurator is required at the same time to take measures to prevent and eliminate all violations of the law no matter under what circumstances those violations took place, and to bring guilty parties to responsibility.

In view of these legal provisions, one may write to the Procurator General of the USSR inquiring about a prisoner's conditions of confinement and his general welfare. The purpose of such inquiries is to let responsible government officials know that people are concerned.

Once a legal appeal of a conviction has been made and heard by the Supreme Court of the USSR (as we believe to be the case with Orlov, Kovalev, and Shcharanskiy), the only channel that Soviet law provides for relief seems to be a clemency decree by the President of the USSR, L. I. Brezhnev; therefore, letters appealing for clemency should be addressed to him.

There are strict limitations on the number of parcels with items of personal use (e.g., food and clothing) that prisoners can receive, so such parcels should not be sent by anyone but a prisoner's family. However, prisoners apparently may receive an unlimited number of packages containing scientific literature, and they may also receive personal correspondence. All packages and communications are, of course, closely inspected, and any attempt to convey literature or information deemed unfit by the prison administration may be considered a provocative act and may result in even harsher terms of confinement for the prisoner.

University administrations have, on occasion, arranged to have official invitations issued to scientific colleagues who are in prison. This is not an empty gesture and, although obviously the invitation will have to remain open for quite some time, it can have the same psychological effect vis-à-vis the government as other actions on his behalf.

Sending a prisoner simple personal greeting cards on appropriate occasions may stand the best chance of having an expression of interest reach its intended destination. In particular, cards sent on the occasion of official Soviet holidays -- January 1, May 1, May 10 (V-E Day), October 7 (Constitution Day), November 7 (anniversary of the October Revolution) -- might be the most successful in this respect. In the light of these suggestions, it has been particularly dismaying in recent weeks to read in the press that Yuri Orlov has been forbidden by prison officials to write anything about science to his family. It can be hoped that this is an isolated and correctable instance of the abuse of authority.

The NAS Committee on Human Rights treads the fine line between, on the one hand, relegating human rights to the human rights establishment, and, on the other, severing scientific communication in the name of human rights. We do not, nevertheless, find the middle of the road a comfortable position; yet, as we know from being privy to their agonizing, neither do the scientists who choose other paths. Put simply, there is naught for anyone's comfort in responding to persistent and widespread repression of fellow human beings. Ironically, we may take some comfort from our discomfort, for it is evidence of widespread caring and sharing, diversity and pluralism, and common humanity in the house of science.

DOE-NEH JOINT SUPPORT FOR FACULTY DEVELOPMENT WORKSHOPS ON ENERGY

The Department of Energy is expected to issue guidelines soon for proposals to conduct summer 1980 energy education workshops for college and high school faculty (deadline for submission: October 1979). For the first time there will be provision for joint support by DOE and the National Endowment for the Humanities of workshops for high school teachers which include substantial humanities content. Guidelines may be requested from: U.S. Department of Energy, Attn: Document Controls Specialist, Office of Procurement Operations, 400 First Street, N.W., Washington, DC 20585; (202)-376-9819.

SOCIAL RESPONSIBILITY IN SCIENCE: THE NEW ZEALAND ASSOCIATION OF SCIENTISTS*

Rosemary A. Chalk
Staff Officer
Committee on Scientific Freedom and Responsibility
American Association for the Advancement of Science

The 1979 annual meeting of the Australia-New Zealand Association for the Advancement of Science (ANZAAS) (January 22-26) included a three-day symposium on social responsibility in science sponsored by the New Zealand Association of Scientists (NZAS), a small interdisciplinary professional organization of approximately 500 scientists. NZAS was established in 1942 to promote the professional standing and social responsibility concerns of its members and has considerable interests in areas that closely parallel those of the AAAS Committee on Scientific Freedom and Responsibility.

The NZAS activities on professional concerns have ranged from economic issues to questions of secrecy and dissent. In the early 1970's, for example, NZAS protested the government's $50 limit on tax deductions for purchase of books and subscriptions to scientific societies; after correspondence with the government minister of finance, the Association succeeded in making subscriptions to scientific societies tax deductible. Beginning with a National Development Conference in July 1969, NZAS also developed a new trend in sponsoring public meetings, including a 1976 special meeting on secrecy in science, organized by the current NZAS President, John Offenberger. Government restrictions on scientists' freedom of speech were viewed as a key concern of the Association, the "secrecy in science" symposium emphasizing the conflicts between the scientists' duty to their employers and duty to the public. Curiously, the 1976 symposium was closed to news reporters, although copies of the papers were later published in The Listener, a popular New Zealand paper. The Listener's introduction stated:

> How do New Zealanders come to know so much about the half-life of nuclear wastes, about chemical pollution of our air and water, about the rights and wrongs of milling native bush? The short answer is that scientists talk. For the scientists, such talk may be dangerous. The Crimes Act, the Official Secrets Act, the State Services Act, all limit what may be freely told. And -- more insidiously -- both government and industry can curtail the careers of scientists who make public "inconvenient" (sic) facts.

* Rosemary Chalk attended these meetings as a representative of the American Association for the Advancement of Science. Author's address: AAAS, 1515 Massachusetts Avenue, N.W., Washington, DC 20005.

During this symposium, Mr. Offenberger suggested that NZAS might exercise a role in protecting scientists who believed their professional responsibility required them to speak out on public issues, and that "there is room for a neutral repository of dissentient opinions and a legal framework that allows it to function effectively, whether it be a tribunal or a sort of scientific ombudsman." In later writings he further developed this concept of the role of the tribunal:

> We do not want to romanticize the dissentient scientist. His reason for disclosure may be malicious, mischievous, or just irresponsible. There may be people other than the dissentient scientist who need protecting. This the tribunal must also do. Often the political advantage gained by a Government withholding information temporarily from the public lies in the delay achieved; a policy decision may become binding, before all critics have been heard. Therefore a tribunal must be able to act swiftly, and it must be politically neutral.
>
> Its composition may differ from case to case, but a member of the judiciary should preside. There is a tradition of impartiality of judges, accepted by most, and the effectiveness of such a tribunal will depend on the acceptance of its findings by all parties, the dissenting scientist, his employer and the public. With some tradition as a starting point there is hope for its success.
>
> The Association will suggest the setting up of a tribunal as an institution to safeguard the freedom of scientists and science, and for the protection of the public interest.[1]

In early 1978, in addition to continuing projects on salary surveys and other professional concerns, the NZAS Council adopted several policies on scientific responsibility, including vigorous emphasis on (1) encouraging public participation in science ("we should consider a policy of refusing to participate in inquiries, etc., from which 'lay' people are excluded"),[2] (2) drawing attention to the nature of scientific developments and their possible consequences, and (3) pointing out the misuse of scientific information. The Association has been generally impartial over specific issues in science, although in 1978 it took a stand on genetic engineering, believing that "the public has a right to be fully informed about possible risks and a right to be involved in decisions about them."[3] The Association views this position as an implementation of the UNESCO recommendations on the Status of Scientific Researchers -- that scientists have "the responsibility and the right to express themselves freely on the human, social, or ecological value of certain projects."[4]

The NZAS Council also re-emphasized its concern about the freedom of scientific information, and in late 1978 expressed its positions in a lengthy submission to the government's newly appointed Committee on Official Information.

The January 1979 Symposium

The symposium organized for the January 1979 meeting represents NZAS' expression of these continuing concerns. Accordingly, Dr. Wren Green, current President of NZAS, organized the meeting about three general themes:

1) Scientists as Citizens: The Issue of Involvement;
2) Research: Support the Structure or Restructure the System;
3) Silence in Science: The Dissemination of Knowledge.

In his presentation "Sounding the Alarm," Mark Diesendorf, representing the Society for Social Responsibility in Science (Australia), reviewed the alerting role of scientists with respect to warning the public about health and safety hazards:

> Who is qualified to alert the public to the social, environmental and health implications of a medical drug, pesticide, radiation standard, mining operation, manufacturing process or energy policy? Should scientists concern themselves with 'crude' political and social action? What channels should be utilized? Should action be taken while evidence of harm is incomplete?

The historical tendency to rely upon scientific experts to sound alarms and point out the problems caused by their own specialty of science is often aggravated by the fact that the expert "belongs to a professional organization which has the goal of advancing that specialty." Diesendorf argued that it was important for scientists who were not specialists in a particular field to play the role of alerting the public to potential hazards from other areas of science. He further commented that although this was a necessary condition of social responsibility in science, it was not sufficient to protect the public from unnecessary risks, and criticized the trend toward defining risk assessment as a scientific problem rather than a social and ethical decision. Areas of significant risk are often presented to the public as if they were chosen by mathematical formulas, he argued, rather than in ways that could inform the public of the assumptions and values that constitute the baseline for such risk assessment.

Diesendorf suggested substituting the concept of "beyond reasonable doubt" for that of "absolute proof" of potential harm as a basis for scientists acting to inform the public, and cited decisions by the U.S. Supreme Court upholding the validity of the Environmental Protection Agency's regulations on lead in gasoline as an example of such a shift in the legal structure. The public responsibility of the scientist, he concluded, requires providing public information and encouraging public discussion on new technical developments. He suggested that the professional organizations encourage member scientists to advise citizen groups that discuss social developments involving science and technology, and that scientists be compensated for such involvement in order to increase such valuable contributions to public information and discussion.

Alan Mark, a botanist from the University of Otago (New Zealand), highlighted the difficulties encountered by New Zealand scientists in "sounding alarms" or providing information to the public in the area of environmental issues. Availability and interchange of information is essential for "both the practice and progress of scientific research." Dr. Mark cited several professional seminars and journals that emphasized the scientists' responsibility to express their views to the general public on matters relating to their area of expertise as a sign of concern within science. He then contrasted this activity with actions by New Zealand government agencies which had taken steps to curtail public involvement by their scientist-employees. In 1971 the government's scientific research organization had permitted only official spokesmen to make public statements "in order to present a 'balanced view of the scientific aspects of the topic' to 'avoid confusing the public on these complex issues'". Dr. Mark noted that in July 1975 the same agency issued a departmental newsletter on the topic of professional ethics, which emphasized the scientist's "client relationship" to his employer and stated that a government scientist is not free to offer public criticism on government policy in areas related to his own expertise or that of his division. In Dr. Mark's recommendations to alter the "present unsatisfactory situation for Government scientists" and to improve the public information process in environmental areas, he included the development of "a tribunal system to receive submissions and adjudicate on cases of conflict or other grievances between scientists and their employers, with freedom to publish findings considered to be in the public interest." He further encouraged professional societies to include in their ethical codes provisions preventing the retention of information whose release would be in the public interest, as well as provisions for preventing unauthorized release of "appropriately" classified information.

The role of the scientific profession -- as compared to that of the individual scientist -- was further developed by Ron Johnston of Manchester University (England), currently on leave and serving as Policy Advisor to the Australian Department of Science and the Environment (Canberra, Australia). Dr. Johnston cited several outstanding individual examples of social responsibility in science, particularly in the context of the recombinant DNA public policy debate, and the role of professional associations in sponsoring debates on controversial issues and in responding politically to proposals for public regulation of science; however, "In the area of science education, where one might expect the inculcation of new attitudes of responsibility to be most important," Dr. Johnston concluded, "there has been almost no change." He then discussed several potential causes for the limited effect of the social responsibility movement on the basic values governing scientists' behavior: for example, the Western tradition of interpreting responsibility on an individual rather than collective basis, the diverse socio-economic forces and political beliefs within the scientific community that preclude the development of a "higher order" of responsibility, the difficulty of directly linking responsibility for adverse impacts of science or technology with either the creators of the knowledge or the product; and, finally, various historical cultural and social forces within the present structure of science itself, which "preclude any movement towards greater social responsibility" of scientists. This structure, designed to encourage collegial control and to promote the primary reference of scientists to other scientists who

judge each other's work on their own community standards, has "effectively cushioned" the individual scientist from issues of responsibility for the implications of his or her work. And although the collective representatives of the scientific community -- the professional academies and associations -- are a "real enough sociological phenomenon, in legal terms they do not exist at all" as representatives of the profession. Recent changes in the scientific institution -- such as increased reliance on government funding, the growth of the scientific enterprise, the emergence of "Big Science," and the growing body of regulations on the safety of research -- have created a system of "bureaucratisation in science." Other forces have served to undermine the traditions of collegial control, resulting in the need for a new contract between the scientific community and the public. Dr. Johnston suggested several features of this new contract, including a greater responsibility role for the professional associations "to promote evaluations of new research areas, highlight new needs, and encourage their members to contribute to these issues."

In the session debating whether the research system structure should be supported or changed, Keith Ovenden (University of Canterbury) described the overall political, social and economic factors affecting scientific research funding in New Zealand. In the four settings of scientific research (the universities, government, private industry, and individual entrepreneurs), the government finances almost 80% of all science, and the bulk of this money is actually spent by government departments. Expenditures of the Department of Scientific and Industrial Research (DSIR), almost half of the government's entire expenditure on scientific research, dominate the science budget. DSIR also employs about 35% of the scientists working in the public sector in New Zealand. Dr. Ovenden pointed out that less than 10% of New Zealand scientists work in the "relatively free environment of the universities, where they can choose their own areas and projects for research," a significant factor to consider in assessing the impact of "secrecy in science" regulations in New Zealand.

David Baragwanath, a private barrister in Auckland, New Zealand, continued the discussion of secrecy in science in his presentation "Freedom of Information: The Case for Openness." Proposing a Freedom of Information Act for New Zealand similar to that applicable in the U.S., Mr. Baragwanath urged that scientists (and other government employees) be allowed to make public any information relevant to public policy issues. "If it is suggested we need to cut down forests, or dam rivers, or import uranium. . ., why not release the estimates? If they are right their validity is confirmed, if they are wrong they can be corrected. Public servants do not own public knowledge; the public has paid for it; and should have access to it unless there are exceptional reasons why not." He concluded that scientists should actively lobby for the passage of such an act.

Other speakers dealt with diverse aspects of the social responsibility in science issue, including the need for holistic approaches to real world problem-solving and the inappropriateness of disciplinary knowledge when applied to social problems such as hunger or poverty (Georg Borgstrom), the value assumptions implicit in scientific research (Lois Bryson), barriers to women's career advancement in science and the portrayal of women in social science theory (Penny Fenwick), and the need for individual scientists to

involve themselves in debates involving environmental issues (Bob Mann).

NZAS publishes a bi-monthly journal titled Science Review. A special issue of the journal including abstracts of the social responsibility symposium papers was distributed to ANZAAS registrants and a book containing the symposium proceedings is scheduled for publication this fall.[5] The Association is directed by elected officers in New Zealand. For further information about NZAS activities, write: New Zealand Association of Scientists, P.O. Box 1874, Wellington, New Zealand.

NOTES

1. H. Offenberger, 34 Science Review 3 (1977): 64.

2. 35 Science Review 2 (1978): 26.

3. F.B. Shorland, 36 Science Review 1-2 (1979): 10.

4. 33 Science Review (1976): 58.

5. Additional references on the social responsibility of science activities in New Zealand and Australia:

H. Offenberger. "Some Thoughts -- Mainly Unscientific." 32 Science Review 6 (1975): 115-118.

"The Scientists's Dilemma -- An Experimental Approach." 33 Science Review 6 (1976): 117-121.

H. Offenberger, et al. "Science and Secrecy in an Open Society" (report of an NZAS forum). 82 The Listener 1901 (15 May 1976): 20-22.

"The Case for a Special Tribunal." 34 Science Review 3 (1977): 61-64.

NZAS Submission to the Committee on Official Information (tribunal proposal). 35 Science Review (1978): 115-120.

Symposium on Social Responsibility in Science (abstracts). 36 Science Review 1 and 2 (1979), and Proceedings (in press).

Biggins, David. "Social Responsibility in Science." 1 Social Alternatives 3 (1978): 54-60; (a comparative review of public interest service groups in the U.S., the United Kingdom, and Australia, with a detailed bibliography).

A.J. Southgate. "Professional Ethics and Secrecy in Science." 8 Search 9 (September 1977): 305-307.

THE DEMOCRATIC CONTROL OF SCIENCE AND TECHNOLOGY:

Presidential Address by the Rt. Hon. Anthony Wedgwood Benn, M.P.,
at the Inaugural Meeting of the
Science, Technology and Society Association,
Imperial College, London, 3 February 1979*

1. The Growing Influence of Science and Technology

The impact of science and technology upon society has long been a subject of public interest and academic study. The emergence of modern science with its independent and objective method of analysis had a profound effect upon the authority of the medieval church and state which, in pre-scientific days, relied upon a more mystical explanation of the forces of nature and used mysticism to retain political control. Technology in its turn challenged the old mysticism and thus the old order, and gave rise to the ideas of Adam Smith and the early economists of laissez-faire. Later, industrialisation on a mass scale promoted both capitalism and the organisation of labour and these have helped to trigger demands for full political and Parliamentary democracy. More recently the growth of science and technology, in what is called the Second Industrial Revolution, had advanced both the development of a new type of international capitalism which is expressed in the emergence of multi-national companies, and also international labour solidarity, and has led to the creation of international institutions intended to provide some framework of human control over events.

2. Internationalism and Interdependence

There are many examples to be found which illustrate the new internationalist and interdependent nature of society [in which] we are all locked-in to the same system. At the beginning of this century, political developments in the Middle East or Africa had nothing like the significance they do today, when they can mean, as they do, that vital links in our own economic well-being -- like the supply of oil or some other commodity -- can be broken or threatened. In matters of the environment we are also now international. We realise that it is not just a matter of our own district or country, but it is the resources of the planet itself which are finite, and that conservation has to be global in concept if it is to be effective.

The most widely publicised of our concerns about the impact of modern technology is that upon the environment. . .evidenced by the growing concern of thoughtful people about nuclear waste, about pollution, and major disasters in

* The Editors of Science, Technology, & Human Values wish to express their thanks to the Science, Technology and Society Association for permission to publish this speech, which is printed verbatim. A description of this new society follows at the end of the article. At the time he delivered this address, Mr. Wedgwood Benn was British Secretary of State for Energy.

industry, or the more generalised risk that the quality of life could suffer if technology is allowed to proceed without proper checks at every stage. Concern with the social effects of science and the threat to the environment has shown itself in our society today in the growing number of organisations and movements concerned with protection and conservation and with publicity for the effects of our own activity on our own natural surroundings.

3. The Issue of Democratic Control

I do not intend today to concentrate upon these environmental issues as such -- partly because they will be well known to most of you, but partly because I would like to look instead at some of the other, and less well-known ways, in which technology affects our society and to centre my thesis around one theme, the impact of science upon the democratic control of those decisions which affect our lives.

It is only quite recently that people have begun to express concern that there may be a price to be paid for technical development in respect of our prospects for the democratic control of our society, and our personal freedom within it. My own experience as a Minister* has persuaded me that this area needs just as much attention as we give to the more familiar problem of protecting the environmental heritage, indeed that heritage also depends upon the measure of control we are able to retain more widely over all aspects of our lives.

3.1 *The Democratic Control of Military Technology*

The most obvious example lies in the military field, where technologies financed entirely by public expenditure at the behest of governments have created huge armed forces, all of which operate under the military discipline of the various Chiefs of Staff throughout the world and are thus responsible for the application of defence policy. The world's armed forces together spend many billions of pounds a year on pay and equipment. They have between them sufficient destructive power to obliterate mankind many times over. But since there has been no major world conflict since 1945, most of these armed forces remain within the nation states that have created them. Their greatest impact is felt inside the nation state which they were created to defend, rather than in international expeditions [during] which fighting actually occurs.

There have been many wars since 1945, including the Korean War, the Vietnam War, the Algerian War and a mass of civil conflicts and border clashes, some of which have acquired an international dimension by virtue of big power intervention directly or by proxy. But for all that, the role of the military in the world needs to be studied most carefully where it is situated in its own respective home territory. It is the role of the British armed forces in Britain, the American armed forces in America, and the Soviet armed forces in the Soviet Union, and the world's other defence forces at home, of which I now wish to speak.

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* Editor's Note: From 1966-1975, Mr. Wedgwood Benn served in the British Cabinet as Minister of Technology; from 1975-May 1979, he was Secretary of State for Energy.

The armed forces have an influence that extends far beyond the air fields, naval bases and barracks in which they are situated. They are very big spenders, commanding a mass of industrial, scientific and academic expertise which works for them, and are equally committed to their continued budgetary growth. They operate in secrecy on the grounds that secrecy is inseparable from security. They are disciplined hierarchies, which alone among modern organisations explicitly and categorically deny to their employees rights of citizenship which any industrial, clerical and administrative worker would regard as his natural right. Servicemen have the vote, but no right to speak, to organise any trade unions, to criticise or discuss military decisions by their officers, or to enter into the normal processes of public argument about their own role or the direction of society. To this extent they are comparable in one sense with the medieval church and the monastic orders. . .[whose] political role. . .is not new in the history of civilisation.

When President Eisenhower spoke of the "military-industrial complex" in his farewell address he pointed a finger at one aspect of this very issue. The military has established a position within every modern society that must necessarily impinge upon the role of elected governments, even where the generals hold their hand and accept that they are under political control. Yet we cannot know, because these things are secret, what are the influences brought to bear by the military upon political leaders in the development both of international and domestic policy. We do not know what the British military advice at the time of the Suez invasion was, what the Red Army was saying to Brezhnev before the decision to invade Czechoslovakia, or what the Pentagon was urging the White House to do towards the end of the Vietnam War.

The control of the [British] military by democratically elected Members of Parliament and responsible government is an integral part of our own Parliamentary tradition. It goes back to the settlement of 1688, when William III came to the throne at the invitation of Parliament after James II had fled. From that time onwards the provision of money for the armed forces was made by Annual Parliamentary Grant. The Army Annual Act* until recently was the means by which Parliament controlled the disciplinary powers of the armed forces [in order] to be sure that the military never seized power.

I am not sure that this ultimate safeguard is fully understood by everyone in this country. But it is important. It is as important now as it was in 1688 that the military should be under Parliamentary control and that we should know that the reason for it is internal and not external. No army in the world would contemplate a military expedition abroad without the consent of the government it served. But the internal role of the armed forces with its commanding power must be restricted by democratic control in any country that wishes to avoid the remote possibility of a military takeover at any time when that nation is facing difficulties. In saying this I am emphasising a hallowed and existing part of our constitution and not adumbrating any new development of our policy or democratic government. What has happened in the 300 years since the Glorious Revolution of 1688 is that technology has shifted the

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* Editor's Note: Under the Army Act of 1881 (the successor to the Mutiny Act of 1689), Parliament provides money for the armed forces annually.

balance of power more sharply towards the military in every country, and we must not allow it to displace democratic accountability.

3.2 *The Democratic Control of Civil Nuclear Power**

We must also consider the need for democratic control over Civil Nuclear Power. Its importance may be seen in the following considerations:

a) First, its close connection with military policy in regard to the development of nuclear weapons, which [represent one of the] most sophisticated technologies available, the most dangerous, and the one covered by the greatest secrecy. In this country we developed nuclear weapons secretly, without Parliamentary knowledge or approval, and in all its aspects nuclear power is covered by the tightest security procedures.

b) The link between the military and the civil use of nuclear technology makes it a matter of great public concern. The production of plutonium, the development of enrichment and reprocessing, all carry an attendant risk of proliferation or vulnerability to terrorism. These are also reasons for shrouding civil nuclear processes under conditions of top secrecy.

c) The wide gap between expert understanding and public knowledge of nuclear matters, which is used to justify the exclusion of laymen (even Members of Parliament and Ministers are laymen for that purpose) from the knowledge of what is really going on for fear that they might not understand.

d) The high rate of [spending], even in civil nuclear technology, creates powerful vested interests in the industries that live upon those budgets.

I must say that I have the highest possible regard for the skill, expertise and public spiritedness of all those who work in and around the [British] atomic industry: the Atomic Energy Authority, British Nuclear Fuels, the National Nuclear Corporation, the Central Electricity Generating Board and all the scientists and engineers involved in nuclear work. And I am old enough to remember the "Atoms for Peace" initiative taken by President Eisenhower. This campaign was highly motivated and it attracted many thousands of young scientists throughout the world into the development of civil nuclear power which was to turn "swords into ploughshares" and "spears into pruning hooks."

What I now want to say is not a criticism in any way of them, but is a comment upon the implications for democracy of the use of a technology as complex as nuclear power. It is that the information necessary for democratic control is not as readily available as it should be. And I want to give some concrete examples that have caused me concern [as I have] been, over a period of nearly 13 years, a Minister with responsibility for nuclear power, first, as Minister of Technology from 1966, [and] Secretary for Energy since 1975.

A Minister is not just a Manager who got there by election. He is a representative of the public in the heart of Government. He is a member of the public at the top. He is in this sense a "worker on the Board" and to do

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* Editor's Note: That is, controlled by the civil, rather than the military, authorities.

his job he must know what is going on. I want to give some examples of the problem of gathering information. None of them are new. They have all been publicly discussed, but they are collected together to indicate the reasons for my concern.

Around 1957 there was a major Soviet nuclear accident. It was recently announced by Dr. Roy Medvedev, a Soviet scientist, and became the subject of public comment not so long ago. This was known at the time to the United States authorities, and I believe to the Atomic Energy Authority, but I understand that the Cabinet was not informed.

In 1968, or thereabouts, 200 tons of uranium then under the safeguards of Euratom disappeared and were thought to have gone to Israel. This very important matter was also known and understood by the Atomic Authority at the time, but was not reported to the Cabinet or the Minister most concerned.

In 1969 there was a problem of corrosion in the Magnox* power stations. A serious risk developed that if the bolts that had become corroded had fallen into the reactors it might not have been possible to shut them down. I was informed at that time, but there was very strong pressure not to reveal the full extent of this problem for fear of creating alarm. I did insist that from that moment on every single incident, however minor, at every power station in the United Kingdom was to be reported personally to me and invited Sir Alex Merrison of Bristol University to set up an inquiry into these circumstances.

In 1970 a contract was signed with RTZ at Rossing in Namibia before the Cabinet had been informed.**

In 1976 there was a major leak at Windscale.*** Some weeks had elapsed before its full extent was brought to my attention. Since then I have established a procedure that every single incident, however small, should be reported to me. We now publish. . .quarterly a list of all accidents in the nuclear industry (which are far less serious, I might add, than the casualties in other fuel industries).

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* Editor's Note: Magnox is a magnesium oxide alloy used as cladding material in certain nuclear power stations; the term is often used, therefore, to refer to a type of British nuclear power reactor containing the alloy.

** Editor's Note: RTZ is Rio Tinto Zinc, a London-based multinational corporation that has extensive holdings in worldwide mineral rights including the large Rossing uranium mine in Namibia (South-West Africa). Mr. Wedgwood Benn refers here to the case in which Great Britain, through one of the government departments, signed a contract to buy 7500 tons of uranium from the Rossing mine without either the knowledge or approval of the Cabinet. In view of Britain's relations with the Union of South Africa, this action was in direct conflict with national policy.

*** Editor's Note: A nuclear reprocessing plant in Britain.

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The last example relates to nuclear waste disposal. The environmentalists have a very strong case when they argue that the public were never kept informed that the technology to process, by vitrification, highly toxic nuclear waste has not yet, even now, been fully perfected.

Information is the key to democratic control. The publishing of information, except for sensitive technical data which might encourage the spread of nuclear weapons, or make terrorism easier, must be regarded as the heart of democratic control. We should all welcome President Carter's initiative. . .which led to the International Nuclear Fuel Cycle Evaluation Programme (INFCEP), and the determined effort made in Washington to reassert Ministerial control of nuclear policy.

Before we consider. . .any Fast Breeder [Reactor] as the next item on the agenda, all the facts must be brought out. If I am very doubtful about the Fast Breeder Reactor (as I am) and believe that any proposal to build one should be delayed (as I do), it is because I am not yet satisfied that our democratic machinery is strong enough to control this new development and because I doubt the technical competence of those in the industry to construct and operate one.

3.3 *Vulnerability, Security and Civil Liberties*

I now turn to the third item on my agenda, an area of concern which derives from the examples given, but which has much wider implications. I am speaking about vulnerability, security and civil liberties.

Technology, Buckminster Fuller said, means that we can get "more and more of less" by doing so raise living standards. But we now know that there is a price to be paid for these higher standards. There is the environmental cost. There may be an employment cost if this technology is wrongly handled in the interests of a few rather than the community as a whole. There may be a safety cost which the threat of human obliteration by nuclear weapons must rank as of the first importance.

But there is also a vulnerability cost which we have not adequately studied. For it would appear from our experience that technology seems to require a bigger scale of operations, and greater specialisation, it creates greater interdependence and involves a higher risk of dislocation, and a higher cost. Thus it may encourage a fear that what may seem to be secure is in fact not at all secure.

A man who keeps warm by burning logs from his garden and then finds that logs are not available is better placed than a whole community cut off by the failure of a 1300 Megawatt [power] station. Those who depend upon craftsman for their tools are less likely to suffer an interruption in supply than we [who] now are [dependent] upon mass production on a multi-national basis. The face-to-face of one man with another is much easier than the complex problems of communication in huge organisations, whether they be privately or publicly owned. If you tear one page out of a book, or lose one copy of a large print to a book, this will not really interfere much with the capacity of that book to be read and understood widely. . .whereas cutting the copyright

wire in an international satellite communication will black out millions of screens throughout the whole of the world.

This vulnerability has been brought to our attention by some important recent incidents. One is the impact of industrial disputes upon a complicated industrial society. Then there are the technical disasters, whether it be at Bantry Bay or the Torrey Canyon, which remind us of the scale of the loss if a mistake occurs. The third area of vulnerability lies in the possibility that some natural disasters, such as an earthquake at [a nuclear power facility], might overturn all the carefully prepared plans of those who designed the plant. And the impact of modern war upon a modern society would quickly remind us of how vulnerable we were.

Where you have high living standards, and high risk, you create insecurity and fear. Insecurity and fear are additional arguments for tougher central control over human activity. Such arguments may reinforce those who, throughout the whole of human history, have in any case believed in tougher central control and the prime duty of the citizen to obey orders. If we are driven by these problems to introduce new security measures then we can quickly drift into a situation in which democratic freedoms are in danger.

I first visited Dounreay* in the summer of 1966 with Sir William Penney, a former Rector of Imperial College. It was a lovely research establishment in the countryside like any Oxbridge college. When I went back with Sir John Hill over ten years later it was an armed camp with barbed wire, guard dogs, arc lights and a constabulary armed under the authority of an Act of Parliament. I am not arguing (who could) that it was wrong to protect Dounreay's plutonium by modern security devices. But once you start depending upon high technology and have to protect it by these methods, you are driven beyond a concern with terrorism.

In some countries environmentalists, who are hostile to nuclear power, are themselves seen as subversive, so are protesters. Could we be driven on to examine more carefully the thoughts of students that might reveal, at an early age, a basic "unsuitability" to work in these areas? That could be a product of high technology.

. . .[T]echnology also provides the ways and means to enforce security by the tapping of telephones, the collection of personal information, the computerising of dossiers,. . .together with the whole army of dirty tricks which have been brought to light recently as a result of Watergate and other events. [These possibilities] remind us that technology can be used as a back-up to security, to protect high technology. There is a simple question we have to ask ourselves. Could we back into a Police State because of high technology? . . .Could this vast machine of supervision, created by the state to safeguard itself, become a machine outside democratic control? Security, like military technology, requires secrecy to permit it to operate. And secrecy makes accountability more difficult.

* Editor's Note: A British nuclear research facility that performs a great deal of military research.

I ask these questions because my experience as a Minister has aroused in me, along with many others who have observed developments over the last generation, a growing anxiety that merits some sort of consideration. What weight should we give to the importance of tolerating a wide range of ideas about nuclear power, or society, or about anything else? What value do we attach to criticism, openly argued, and strongly pressed? What value to human freedom? What value to open debate? What value, in assessing our living standards, should we give to our democratic rights as part of our civilisation, and to the freedom that science needs in order to develop its objective study of society? The question is this. Is 1984 really just a nightmare of the left, or is it a nightmare for all societies arising from an unheeding or unthinking application of technology without considering democratic control?

This is not a call for the return to the Golden Age of Rural England that never was. Nor is it a rejection of technology and what it can offer, nor even a reassertion of some of the ideas of John Ruskin and William Morris. It is a solemn warning about the need to examine the impact of technology upon the social and political structures of society.

3.4 *The Importance of Values*

Now I turn to another question, intimately connected with these matters: the values of society. Life is not about machines, but about values, about what we believe in, how we see our duty to our fellow men, how we act, and what values we seek to inject into the professional, the industrial, social and political decisions that we make.

This is a much neglected subject. Whether it is described as Moral Philosophy or Theology is a matter perhaps of academic definition. But it is fundamental. The quality of a society is the sum of the decisions of its members and is not made up of the personal qualities of its leaders.

Values change. Primitive societies, ignorant of the laws of nature, were fearful of natural phenomena and sought to propitiate them by curious rituals from which science has now liberated us. The Christian idea of one God uniting all human tribes at least acquitted us of the concept that we had a religious duty to kill those who worshipped different gods. Out of monotheism came ideas of human brotherhood. The Humanist morality was constructed by those who believe not that God made man, but that man invented God, [and] also [who] base themselves upon a moral responsibility of brotherhood.

There have also, throughout the whole of history, always been those who believed that society should rest upon the ideas of discipline, and that it was the duty of the citizen to obey and that upon that all civilisation rested. We now live in a period of history when economic ideas are prominent, and in many areas of life incline to the view that Cash will tell you whether something is worth doing or not, based upon the values of the marketplace. We are told that the profitable firm must prosper, and the unprofitable firm must fall under the axe of bankruptcy; that cost benefit analysis must determine everything we do.

There is also another very different school of thought, to which I confess that I adhere. Socialists believe in the supremacy of social

responsibility and social action guided through political democracy. You cannot discuss technology in isolation from the values of society. We must choose to which values we wish to attach ourselves. It is the values of a society which shape its very nature. Scientists and technologists cannot only inject their social and political values into their decisions at the ballot box. They must inject them directly through their own work, and the choices that they make in their work, even if it involves dissenting on certain occasions from the discipline of the firms or organisations, public or private, national or international, from which they draw their incomes.

3.5 *The Importance of Democratic Structures*

This brings me to my last point of all. That is about the way in which we can fashion democratic structures strong enough to control technology in its application. Institutions are needed. Nobody now would argue that "good kings" are a substitute for political democracy. A mass society, created in very large part by technology, needs mass institutions of democracy to see that power is not abused.

All power must be accountable. The greater the power the greater the need to fashion institutions capable of controlling it. If we wish our quality of life and our living standards to remain high, then we must see that a central part of those living standards and our quality of life will depend upon the maintenance and safeguarding of the right of free expression, the right to know, the right to be strongly represented through Parliament and the right to break down the new feudal patronage that has grown up in the heart of a democratic society. We need industrial democracy and democracy in all our institutions, especially in the mass media -- the media claim to speak for us but do not actually do so. I fear that if we cannot strengthen democracy we shall find we have traded our liberties for colour television sets, for cars, for all the hardware of modern society and the technology and energy we need to retain them.

4. Conclusion

May I, as President, invite the Association to include on its agenda some of the issues I have raised. First is the need to preserve our old tradition of the democratic control of the military. Second, the need to extend that democratic control to all high technology and especially to nuclear power. Third, to see the relevance of all this to the defence of individual freedom against erosions in the name of security and the need to win democratic control of all those services which have been set up to guarantee our security. Fourth, a new look at the importance of values in our society governing the use we make of technology. Finally, a strengthening of our democratic institutions and a radical attack upon unacceptable power.

All these issues are, no doubt, a part of a proper academic study of mankind's problems. But the training of a new elite who understand these problems, in order to confront those who may be abusing power, is not enough. If a "good king" is not enough, the pouring out from our universities of people who understand that a "good king" is not enough, or who could advise a "good king" to be even better, is itself not enough. Everybody is involved, and I

see no prospect whatever of controlling the power of science and technology unless we can liberate the people as a whole and help them to provide the humanising force necessary both to protect us from a new serfdom and to harness the power that man's genius has created for the benefit of man.

SCIENCE, TECHNOLOGY AND SOCIETY ASSOCIATION FOUNDED IN BRITAIN

The new Science, Technology and Society Association (STSA) in Britain was developed out of the interests and associations spawned by the SISCON project. [SISCON was an association of British universities to produce teaching materials for the introduction of "Science in a Social Context" topics into science degree schemes.] As the new Chairman of STSA has written, "from the start it was apparent that SISCON was fulfilling a role which extended beyond its strict terms or reference. For many academics and teachers in the several sectors of education, SISCON provided a basis of association, a means of establishing and maintaining contact with those who shared similar aims, ambitions and problems." STSA, which was formally organized on 3 February 1979, seeks "the advancement of the education of the public by promoting the study of and research into the social implications of scientific and technological development and publication of the results of such study and research."

The association is open to all interested persons and is committed to two initial activities: publication of a newsletter and the organization of an annual summer school. The constitution and other information is contained in Issue Zero of its Newsletter. The following persons will assume elected office on 9 June 1979: Chairman -- Clive Morphet, Newcastle Upon Tyne Polytechnic; Secretary -- Gordon Lake, Newcastle Upon Tyne Polytechnic; Membership Secretary -- Bill Mathews, Manchester University; and Treasurer -- Mick Worboys, Sheffield City Polytechnic. Anthony Wedgwood Benn, M.P., is the Honorary President.

Association dues outside the United Kingdom are $7.00 or £3.00 (individual membership) and $50.00 or £20.00 (institutional membership). Institutional members receive three copies of the newsletter. Membership inquiries should be addressed to the Membership Secretary, STSA, Department of Liberal Studies in Science, The University, Oxford Road, Manchester M13 9PL, U.K.

UNITED STATES-JAPAN COOPERATIVE SCIENCE PROGRAM JOINT SURVEY SEMINAR ON SCIENCE AND SOCIETY, 29 JANUARY - 2 FEBRUARY 1979: RECOMMENDATIONS FOR RESEARCH

Under the United States-Japan Bilateral Cooperative Science Program, cross-national cooperation in the field of science education has addressed many important and timely issues; but recent changes in the relationship of science and society and in international affairs seem to mandate the introduction of new aspects. Therefore, at the Third Co-Chairmen's Meeting of the Cooperative Program (held in Tokyo, October 1976), participants discussed the idea of revitalizing cooperation on matters of science education. Following this meeting, representatives from the implementing agencies, the U.S. National Science Foundation (NSF) and the Japan Society for the Promotion of Science (JSPS), confirmed this renewed interest. As a consequence, Professors Yoshinobu Kakiuchi and Keiichi Takahashi toured several United States institutions involved in science education and presented a report on their visit to the Joint Committee Meeting in Washington, October 1977, which recommended development of a seminar on Public Understanding of Science. The resulting seminar, coordinated for Japan by Dr. Kakiuchi and for the United States by Dr. Arthur Livermore of the AAAS, was held in Honolulu, 29 January through 2 February 1979.

At this seminar, participants concentrated on five general topics that compared the cultural, social, and educational backgrounds of the two countries in an effort to determine the most fruitful areas for possible collaboration:

1) The nature of the relationships between science, technology, and society;
2) Present attitudes of the public toward science;
3) Science for the public: starting points and goals;
4) Strategies and mechanisms in a) the psychology of learning, b) continuing education, c) the print media, and d) radio and television; and
5) The responsibilities of scientists for public understanding of science.

Finally, working groups were organized to recommend for possible consideration by the executive agencies, cooperative research objectives that could be substantially advanced by more effective cooperation between scientists in the United States and Japan. The following sections are the verbatim conference summary of discussions and recommendations from the working groups for cooperative activities, as submitted to the sponsoring agencies.

* * * * *

RECOMMENDATIONS OF THE U.S.-JAPAN JOINT SURVEY SEMINAR ON SCIENCE AND SOCIETY

I. Overview

Because of the marked increase in the varieties and the degree of the impacts of science on society that have taken place during the past two decades, there is an evident and imperative need for deeper and broader understanding of

the relationships among science, technology and society in all the industrialized countries of the world. The Japanese and American specialists who participated in the Survey Seminar on Science and Society recognized the urgency of this need. They also agreed that specific, well-conceived projects in the area of public understanding of science carried out jointly between appropriate individuals and institutions in Japan and the United States could be of great value in both countries:

* First, because insights and methods shared between colleagues benefit the individual efforts of collaborators on both sides.
* Second, because comparative studies of the differing cultural and political context of science and society-related issues can broaden both individual and mutual understanding.
* Third, because comparative studies can serve to illuminate the transnational character of those issues.

While there was a general consensus about the need to improve the public understanding both of science itself and of the social context of science, the phrase "public understanding" remains ambiguous and its meaning difficult to define. For example, there may be disagreements about what sectors of the public should be targets for better understanding, what areas and perspectives of science ought to be understood, and also, what levels of understanding are appropriate as well as attainable. Thus it was agreed that in planning any projects and activities in this area, the question of "Why should the public understanding of science be improved?" must be addressed and answered in specific terms.

Certainly, in considering the complex issues that arise out of the relationships among science, technology, and society, scientists and engineers are themselves not authorities. Rather, the successful exploration of these issues requires that scientists and engineers cooperate with other specialists, including social scientists, humanists, philosophers, mass media experts, and policy makers. Furthermore, the perspective of non-expert members of the general public on these issues needs to be understood and needs to be incorporated into studies of science in its social context. For these reasons, scientists and engineers are themselves also members of that public whose understanding of the social contexts of science and technology needs to be improved.

It was the consensus of the specialists at the seminar that the primary goal of public understanding of science activities should not be to convince the general public that science and scientists possess undisputed and ultimate wisdom. Rather, it should be to increase the understanding of all sectors of the public, including scientists and engineers, of the relationships among science, technology and society.

Two different project modes can be pursued in an effort to fulfill this goal:

* First, projects to share information, materials and methods can be discussed.
* Second, comparative research projects can be encouraged.

It was also agreed that there are three related substantive areas in which projects could be carried out:

1) Studies of specific public issues that illuminate the effects of science, technology and society on one another;
2) Projects to disseminate the insights gained in these studies to as broad a segment of the public as possible; and
3) Projects to improve the understanding by non-scientists of those areas of science that will illuminate the interactions among science, technology and society.

In discussing the rationale for undertaking such projects, the participants agreed on the special responsibility of scientists. The Director of the U.S. National Science Foundation has written about this responsibility:

> Scientists. . . .have an additional responsibility to science besides the classical one to pursue excellence. They have the responsibility to assist the public to understand the complexities of scientific research and the uncertainties in estimating its risks and benefits. And they have a responsibility to try to deepen their own understanding of the ethical and social implication of their work. . . .These responsibilities. . .derive from the best traditions of both science and our democratic society.*

But the participants also agreed that the responsibility for the improved public understanding of science in society cannot be that of scientists alone. Rather, it must be shared by all citizens who are concerned with the health of science in modern industrial societies, and thus also with the health of society itself in both Japan and the United States. Ultimately, then, the basic challenge to be addressed by projects growing out of the Japan-U.S. Survey Seminar on Science and Society is to find effective ways to share that responsibility with all the citizens of their two countries.

II. Comparative Studies of the Interactions Among Science, Technology and Society

Most citizens in Japan and in the United States are aware, at least in a general way, that science and technology play key roles in many issues of public concern. As a result, conflicts over specific public issues are frequently deeply rooted in the application of science and technology. Enlightened discussion and successful resolution of these issues requires, therefore, an understanding of their scientific and technical components. It also requires an understanding of how these components are related to non-scientific components, and an understanding of the various ways in which the conflicts themselves develop.

It follows from these considerations that well-conceived cross-national research on controversial issues with appreciable scientific components can be of significant value in both Japan and the U.S. Such studies would eventually serve to illuminate transnational aspects of the conflicts related to science. In order to be fruitful, these studies should be problem-oriented and should focus on specific substantive issues of concern in both countries.

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* Richard C. Atkinson, "Rights and Responsibilities in Scientific Research," Bulletin of the Atomic Scientists (December 1978): 13.

A number of questions should be explored in the context of specific comparative case studies. These include:

a) What are the scientific components of the issue of concern and what are its political components? To what degree can those components be separated? How can they be separated?
b) What is the character of the underlying ethical, ideological and symbolic components of the issue?
c) Through what mechanisms (both formal and informal) do scientists and engineers, the mass media, policy makers, and the general public become involved in debates about these issues; and how do they interact with one another?
d) How is scientific information obtained and how is it used by the different parties in a public debate over such issues?
e) How do the various parties assess and weigh the relative risks and benefits involved in implementing a new technology?
f) What determines the outcomes of conflicts over the issues? By what mechanisms is consensus reached?
g) What do these considerations imply for the question of participation in a democratic society?
h) What levels and types of understanding of science and technology could broaden and improve the level of public debate?
i) By what means can these types and levels of understanding be achieved?

The most important criteria for selecting specific substantive issues for cross-national studies is that they be of concrete public interest in both countries and that there exist scholars in both countries who are willing to collaborate in studying them.

Several examples of specific substantive issues that might be addressed from these perspectives follow. These are given for illustrative purposes only. The list is not intended to imply that these are the only possible issues:

* Toxic substances;
* Nuclear waste management;
* Power plant or airport siting;
* Earthquake prediction;
* Computers and privacy;
* Genetic manipulations;
* Medical ethics, including the prolongation of life; and
* The meaning of professionalism and responsibility.

Since the political and social issues associated with these types of scientific developments are complex, the perspectives of various disciplines can often yield significant insights into them. In particular, many of these issues could lend themselves to historical and philosophical studies.

It should be clearly understood that the purpose of conducting these studies is to illuminate the social and political contexts of science and technology in society, rather than to advocate a particular political or ideological point of view. For that reason, comparative research of this type must meet the highest standards of scholarly objectivity.

Finally, the objective of pursuing research of this kind is to improve the level of understanding among the public of issues involving science and technology. Therefore, results must be in a form which is accessible to broad segments of the general public in both countries, and mechanisms must be developed to disseminate the results to that public.

III. Comparative Studies of Mass Media and the Public Understanding of Science

In Japan and in the United States, the methods and approaches in communicating science to the public and also the reactions of the public to that communication may be quite similar or quite different. Yet both the similarities and the differences reflect the nature of each culture. Comparative studies of the ways science is communicated to the public in each country can lead to the improvement in the individual methods of communication and, in a larger sense, can enhance mutual understanding between the countries as well as between science and the public. The following cooperative projects are suggested:

1) *A Cross-cultural Study of Science Reporting in the Mass Media.* The study would include such projects as:
   a) Exchange programs for both print and electronic media and for science journalists who would reside in the host country for several months, reporting on science in that country and observing the reporting techniques, and
   b) Exchange of examples of science reporting on research and policy issues, and evaluation of the success of the communication, however that "success" is defined. These examples could be compiled in some appropriate format for distribution to working journalists, students, and public information officers who specialize in science. The types of issues that could be addressed in these or similar projects are:
      * Comparison of information-gathering techniques;
      * Attitudes of editors and journalists toward science;
      * Issues of ethics and values that arise in reporting on science;
      * Who decides the type and amount of science news in a particular medium;
      * How the media ascertain and respond to their audiences' feelings about science; and
      * How science journalists are trained in the U.S. and Japan.

2) *Communicating Prediction of Scientific Issues to the Public.* For example, the study of the prediction of the social impact of micro-computers or of earthquakes would increase understanding of the nature of the relationships among science, the mass media, and the public. Such a study could be made from the perspective of historical and ethical differences among media, or of analysis of existing communication procedures between science and the media.

3) *Cross-cultural Comparison of How Scientific Information is Disseminated to the Public.* The comparative studies would examine, for example,
   a) The motives of scientists in communicating to the public,

b) The avenues of dissemination (especially books, popular magazines, continuing education courses, and newspaper columns written by scientists),
c) What pressures on U.S. and Japanese scientists may either encourage or discourage direct communication to the public, and
d) Ethical questions that may arise for the individual scientist when he or she communicates to the public.

4) *Studies of the Appropriateness of Science Textbooks.* Cooperation between U.S. and Japanese projects studying the appropriateness of science textbooks, at all educational levels, with particular reference to individual differences in cognitive processes.

5) *Joint Television Production.* A joint television production venture between, for example, NHK and a U.S. public broadcasting station focusing on some scientific subject of common interest to Japan and the U.S. (for example, earthquake prediction). The television groups would share in the background research, and cooperate during the production stages, but each group would create its own final version of the program in format and language appropriate to its audience. Throughout the project, an effort would be made to collect and preserve records of the collaboration for later comparison of production techniques, attitudes, and other pertinent subjects.

6) *Cross-cultural Examination of the Communication Approaches Taken by Science Film-Makers in Japan and the U.S.* Such a project could survey and identify existing repositories of science films in the two countries and develop mechanisms for the exchange of film footage.

IV. Educational Perspectives: Science and Society and the Public Understanding of Science

To explore ways to improve public understanding of science through education, the working group considered how this might be achieved in formal education in schools and universities as well as in informal settings for preschool children and for out-of-school adults pursuing activities for continuing education.

The areas considered appropriate for collaboration are the following:

1) *Fear of Science* (an emotional block against approaching science). Both in the U.S. and in Japan, the non-scientific majority . . .values science for its achievements but fears science as something very difficult and forbidding on the other. This generates an emotional block against science, and makes people try to avoid opportunities to get acquainted with science.

This image of science is a result of accumulated negative learning. Parental attitudes, the way science is represented in school curriculum and how it is taught, and the image of science

and scientists in popular writings, all contribute to the shaping of this fear of science. Unless something is done to remove this fear, other efforts to familiarize the general public with science will not have far-reaching effects.

It is proposed to investigate possible causes for this fear at various age levels and settings to find out how to prevent and/or relieve it. Materials might be developed to approach people who otherwise will not be an audience for scientific information.

The task will require close cooperation of research scientists, teaching-learning process specialists, media specialists, and social and behavioral scientists. The extended range of background conditions to be provided by cross-national cooperation should make it easier to pinpoint conditions influential in forming the "fear of science."

2) *Science Appreciation.* The impact of "appreciation" courses in art and music is well-known. This suggests the development of science appreciation courses for formal and informal education to promote better understanding of science through an appreciation of the "joys" and "sorrows" as well as the strengths and limitations of science. Such courses could sample scientific concepts, methods and discoveries from different viewpoints in order to reach some conclusions on questions such as a) what is "good" scientific evidence, and b) what are the roles and interactions of theory and experiment.

The science appreciation courses could utilize several approaches including multiple modes of representation, demonstrations and conversations with scientists. Specifically it is suggested that a multidisciplinary curriculum in a given subject be developed to illustrate the "appreciation" concept in one country and have it adapted and tested in the other.

3) *Interactive Science Museums.* Museums, science centers and exploratoriums are places in which people of all ages, young and old, can participate firsthand in activities promoting a better understanding of science. They are particularly effective if they permit the visitor to interact with the exhibit materials. Some of the activities of interactive science museums may include:

* Travelling exhibits -- A combination driver, teacher, demonstrator takes a van equipped with interesting science teaching materials to schools where little science experimentation is available;
* Health activities -- Exhibits have been produced to link science activities with concepts for a better awareness of the factors related to improvement of health;
* Outdoor Biology Instructional Systems (OBIS) -- Much science can be learned in outdoor areas with the help of well-illustrated guide materials;

* Earth, energy and environmental activities;
* Physical science activities including astronomy in the planetarium and in the field;
* Science activities for minority groups;
* Science activities accessible to the handicapped;
* Computers and calculators used to stimulate interest in science; and
* Interactive science exhibits in shopping centers.

Specific suggestions for U.S.-Japan cooperation include the following:

a) A U.S.-Japan meeting on the activities, problems and operation of science centers and musuems, and
b) An exhibit for interactive science centers designed and built in one country to be shown in the other.

4) *Science and Parents.* Parents' attitudes and styles of communication are found to be highly influential in forming children's cognitive and affective styles. Thus, parents are a particularly important segment of the general public which must be reached in order to foster sound understanding of science in the society.

Japan and the U.S. share a great deal of similarity in the variables related to the study of science and parents, such as reasonably high achievement of school pupils in science, high proportion (more than 90%) of the age group receiving education beyond the 10th grade, etc. On the other hand, there is also a significant difference in the patterns in which family members relate to each other, and in the pressure of entrance examinations or career patterns. The wide range of variability of parents' behavioral patterns coupled with controlled level of education and knowledge will provide a natural setting for comparative studies or experiments. Such studies will shed light on how to work with varying socio-cultural strata within each country.

It is suggested that cross-national studies be made on what parents know about science, how they think of science, how they prepare a cognitive environment for children and how they respond to a child's potentially scientific questions. The relationship of parents to the children's cognitive development in scientific problem areas might also be assessed, and advice to the parents be formulated. Materials to help parents to understand the process of development of scientific concepts and attitudes and to familiarize themselves with the most exciting aspects of scientific investigation, will be developed.

5) *Science Teaching.* A very significant determinant of public understanding of science is the content, method and other characteristics of science teaching in schools. It is proposed to study school science in terms of its durable effect in shaping concepts and images of science at adult years. Activities will include:
a) Identification of cognitive styles and other personal traits

which affect the effectiveness of different teaching approaches;
b) Critical examination of curricula, instructional materials, including TV and film programs;
c) Studies on modes of presentation with their possible interaction with personal factors; and
d) Joint development of effective teaching methods and materials.

Cross-national cooperation is particularly desirable because of the similarity between the U.S. and Japan in the level of school science achievement, school attendance and the need for manpower with sufficient understanding of science, and because of the heterogeneity in the degree of educational centralization, teaching methods and school cultures. Cooperative studies will open up new insights and produce a wider variety of teaching methods.

6) *Conversations with Scientists.* High school students seldom have the opportunity to meet scientists and talk with them. One purpose of such meetings is to demonstrate that scientists, even outstanding scientists, are often interesting, humane and approachable individuals. Encounters of this kind may rectify the impression that high school students may have concerning scientists, and may actually motivate some students to become scientists. Specifically it is proposed to compare existing programs in the two countries for interactions between students and scientists, as well as to develop new programs for trial in either country.

V. Further Recommendations

The preceding recommendations were agreed on by the participants in the seminar in Honolulu. Following the seminar the co-coordinators, Dr. Yoshinobu Kakiuchi and Dr. Arthur H. Livermore, agreed to recommend to the implementing agencies -- the National Science Foundation and the Japan Society for the Promotion of Science -- that the two agencies support cooperative Science and Society programs that would be specifically concerned with the public understanding of science. They recommend the following:

1) The program would consist of specific projects in the following three major areas: a) Ethical and Social Aspects of Science, b) Science and Mass Media, and c) The Process of Learning Science and the Effect of the Milieu.

2) An initial phase of the program would be to exchange between the two countries teams of specialists involved in the three major areas, including natural scientists, engineers, social scientists, science reporters and others as appropriate. The teams would not be large -- possibly two or three persons expert in each area of concern. The team members would be actually engaged in, or would be likely to engage in, specific cooperative projects.

3) Specialists in the two countries will be encouraged to seek domestic resources to support specific projects in the three major areas, and to coordinate their work by seeking support from the two implementing agencies.

4) Each group engaged in a cooperative project should exchange at least one visit during the course of their project.

5) Results of cooperative studies should be reported after two years for evaluation by the respective implementing agencies.

CONFERENCE REPORT:
Humanistic Science Education in Japan and the United States -- Notes and Observations from Two Recent Meetings

> Schooling is the occasion where most of the people first come across . . . the systematic presentation of science and, as things stand now, for many it is the only occasion . . . Therefore, the attitude of average citizens toward science will have its roots in their experience with school science.[1]

Influence on human learning does not occur only in the classroom; it may take place in the home, at work, via the mass media, via religious or cultural authority. However, where science is concerned, formal education constitutes the most prominent source of systematic presentation of scientific information. Although new programs in continuing education have brought systematic instruction in crafts, economics, the arts, history, politics and literature to the adult populations of many nations, science is largely neglected in these and other out-of-school educational efforts. There are also many serious criticisms of the efficacy of present science education in the schools, particularly in regard to its applicability in later life. At two recent conferences on public understanding of science and science education,[2] Japanese and American delegates shared their views on recent activities and changes in the way in which science is presented in and out of school in these two countries.

I. Japanese Efforts

Recognition of the importance of an integrated approach to science education has been slowly taking place in Japan, manifested by a coordinated national reform instituted in 1971 by the Central Council for Education.[3] Hideo Ohashi, Director of the Science Education Research Center of the National Institute for Educational Research, explained to the January 1979 U.S.-Japan Survey Seminar on Science and Society that the Council started with the idea that "education should actively aim at promoting learning consistent with the general process of human development." The reforms emphasize the complementary roles of three categories of education -- home, school, and social.

The Japanese view the home as the "basic foundation of spiritual development as a human being;" but in Japan, as elsewhere, television and significant changes in the social climate have brought about conflicts and changes in both family structure and communication patterns. It may not be surprising, therefore, that some Japanese educators have begun to focus on the role of mothers in early science education. As Dr. Ohashi commented:

> In view of the fact that mother's influence is enormously great on . . . development of the children, one of the most decisive means for their better understanding of science would be first of all to improve mother's appreciation for science.[4]

However, the Japanese mother may not easily accept this idea because, although she recognizes the importance of science, she nevertheless "expects the school to cover the deficiencies of home education."

Central Council reforms within the school system have been made easier by the fact that Japanese education is controlled by the national government, which announces courses of study and programs that teachers must take into account when planning curricula. The new national courses of study will be put into practice in elementary schools in 1980 and in the secondary schools in two phases in 1981-82. The revised science courses described by Ohashi emphasize basic concepts of science and general attitudes toward nature, but pay little attention to technology, perhaps because the Japanese regard technology as more closely related to politics and economics and because technology, to a greater extent, comes out of the country's traditional culture (unlike science, which was introduced to Japan in an "established form").

Curriculum Council reforms lean toward efforts that would make school life more "free" and "enjoyable" without lowering educational standards. Delegates at both conferences cited national concern with the considerable pressure on Japanese students to excel academically and to achieve admission into the best schools. Certainly, concern about these pressures must be taken into account when considering the new emphasis on "humanism" in Japanese science education, especially when it is expressed as nature study or out of school activities that strive for deeper understanding of "the relationship between man and nature." In general, the curriculum reforms are aimed toward improving not the teaching of data or equations, but the understanding of key concepts in science. As one speaker noted, "the quantity of knowledge does not mean anything." The Japanese also stress the importance of helping teachers to convey (and thereby elicit) enthusiasm for science; workshops for teachers are being held in Research Training Institutes run by each prefecture's Board of Education.

These Institutes form part of a significant Japanese effort toward what one participant termed "life-long integrated education" -- that is, "when, where, and how to provide educational opportunities to meet the important problems of human development throughout the lives of individuals"[7] and to carry out such programs in some relation to formal school-based education for both youth and adults. In Japan, an extensive network of museums aid informal education in science. There are three large comprehensive museums of science and technology: in Tokyo (the Private Museum of Science and Technology), in Nagoya City (municipal), and the National Science Museum, also in Tokyo. At the National Museum, exhibits, botanical gardens, study rooms, courses, and many other activities are used by more than 1% of the total population of the country each year. This museum publishes over 11 scholarly and general periodicals and sponsors considerable research projects. Elsewhere in Japan, there are 78 specialized museums of science and technology -- e.g., museums of transportation and communication, agriculture, industry and local heritage, and facilities sponsored by private industry. Sixty-seven museums and other culture facilities for children sponsor out-of-school science activities specifically for youth. There are also over 75 natural history facilities -- zoos, botanical gardens, aquariums, and outdoor museums. Programs in the Citizens' Public Halls, public libraries, youth houses and culture centers, and Women's Halls also may involve nature study or discussion of science-related topics, and these facilities join educational television and radio, science clubs, films,

and a large number of popular science magazines, in providing established avenues for communicating science to the Japanese public.

II. Science Education in the United States

In the United States, the movement toward "humanizing" science education is less centralized (i.e., not controlled or coordinated at a national level) and seems to be less concerned with the improvement of the individual than with achievement of eventual improvement in society. Interestingly enough, this represents a departure from natural tendencies in the two countries: that is, Japanese concern with maintaining the stability of society and America's historical preoccupation with the lot of the individual. The United States efforts are largely concentrated in STS/STV* courses or programs, or with inserting more STS/STV discussions into science courses or textbooks. As William Blanpied, Director of the NSF EVIST Program, has noted, there are now "well over 100 U.S. colleges and universities that offer formal programs of one sort or another on science, technology and society, and a growing interest in extending these ideas to instruction at the pre-college level."[6]

In a panel discussion at the education conference in Washington, Patricia Graham, Director of the National Institute of Education, described the current goal of contemporary American education as the development of "literate" citizens who have a well-developed sense of judgment and the ability to make well-reasoned decisions, ends clearly linked to the advantage of society.[7] Current NIE funding, for example, emphasizes first, "what makes a good school," and then, "how to improve literacy in society." In science education, this goal of literacy can take on several different meanings. Harvard physicist and science historian Gerald Holton has posed four "levels" at which we might discuss problems of public understanding of science and science literacy and education in an international context.[8] Level I is the epistemology of science -- "the facts, concepts, theories and techniques of sciences, and how they may either be presented to the public for its improved understanding, or used in the solving of social problems other than scientific illiteracy." Level II moves beyond this basic information:

> If anything has been learned about the teaching of science, it is that the traditional way of drilling the "facts" of science for their own sake has only a very limited appeal to students, at least in the U.S. Teachers now insist that some study of the social context and consequences of science be made part of the science curriculum; that the humanistic side of science can be neglected only at the risk of mis-training our future scientists and boring or offending the nonscientists; and that the main themes that have long guided scientific research be used as prominent beacons in what otherwise would become a labyrinth of disconnected elements.
>
> For these, and other, reasons we may wish to look at a second level of problems, those concerned with the way

* Science, technology, and society/science, technology and values.

> the scientific imagination works, above all the way science is actually learned (by nonscientists as well as by the scientists themselves), and is actually done.

At Level III, we ask about the purpose of the scientific pursuit, including: What are the aims, powers, and limits of science? What is the connection between, for example, science and technology, science and society, or science and ethics? Holton points out that Level IV "may be the one most difficult to deal with," yet, to him, "it is clearly the most fascinating in terms of cross-cultural cooperation":

> It is what might be called the modern, scientific world view -- that is, what Weltbild our best scientists have; how much of it the nonscientific citizen shares; and what might be done to improve both.

In a presentation to the NSTA Washington meeting, James Rutherford, NSF Director of Science Education, gave his list of "what constitutes a humanistic science education":[9] a) It "makes some connection between science and the humanities" in an effort to "make sense" out of the world; b) It "pays some attention to the realities of our world," in that it looks to people and asks how science can be made amenable to them, can be made to meet their needs; c) It "emphasizes the human-ness of science," that is, the dynamism of science that depends on the human element; and finally, d) It considers the needs of all people, not just the specialists, and makes the value of education in the sciences available to more than scientists (or science students). Rutherford suggested several routes to achieving a humanistic approach: "continuing scholarship on the nature of science in its social context;" such "helpful trends" as the increase in STS/STV sessions at science meetings; informing teachers in colleges and secondary schools about STS/STV issues and encouraging the discussion of these issues in secondary schools; and improvements in teacher education and teaching materials on STS/STV issues.

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Participants at both conferences suggested a variety of ways in which the questions of improving science education, at all levels, might be fruitfully explored in collaborative efforts between the U.S. and other countries. For example, increased support for exchange programs and international conferences (NSF funding of the First International Conference on Mathematics Education was cited as an example of such an effort); exploration of new ways in which the Unted States might help the less-developed countries in their science education efforts; and cooperative efforts in sharing knowledge on STS/STV education efforts, with an eye to incorporating more cross-national materials in such programs.

Judging by the discussions at these two conferences, Japan and the United States appear to have similar aims regarding science education, but to be moving for solutions on different levels. The Japanese, coming out of a rigid social structure and a strict formal educational system, see a need for what they also characterize as "humanizing" their science education. However, they define this as injecting more human elements into the classroom and as improving

"the relationship between man and nature." The United States, on the other hand, is attempting to sharpen and focus its general educational efforts. Consequently, discussions of humanizing American science education involve ways to improve the teaching of science and society issues and, particularly, to formalize the discussions of values and ethics within traditional modes of presenting information on science.

- Marcel C. La Follette

Notes

1. Hiroshi Azuma, "School Teaching-Learning of Science as a Determinant of Public Understanding of Science," presented at the U.S. - Japan Survey Seminar on Science and Society [See Note 2, below].

2. The U.S. - Japan Survey Seminar on Science and Society was held at the East-West Center, University of Hawaii, Honolulu, 29 January - 2 February 1979, and was co-sponsored by the U.S. National Science Foundation and the Japan Society for the Promotion of Science. The U.S. - Japan Conference on Humanism in Science Education was held at the National Academy of Sciences, Washington, DC, 2 April 1979, and was sponsored by the National Science Teachers Association and the Sony Foundation of Science Education.

3. Hideo Ohashi, "School Education and Continuing Education," U.S. - Japan Survey Seminar on Science and Society [See Note 2].

4. Ibid.

5. Hideo Ohashi, "Report on Out-of-School Science and Technology Education in Japan," UNESCO Regional Office for Education in Asia, Report on Out-of-School Science and Technology Education in Asia (in press). The discussion of museums in Japan also relies on Mr. Ohashi's UNESCO report.

6. William A. Blanpied, "Responsibilities for the Public Understanding of Science," U.S. - Japan Survey Seminar on Science and Society [See Note 2].

7. Patricia Graham, "Humanizing Science Education in the U.S.," panel presentation, U.S. - Japan Conference on Science Education [See Note 2].

8. Gerald Holton, "Levels for Collaborative Work on Science and Society Problems," U.S. - Japan Survey Seminar on Science and Society [See Note 2].

9. F. James Rutherford, "Humanizing Science Education in the U.S.," panel presentation, U.S. - Japan Conference on Science Education [See Note 2].

PRE-CONFERENCE REPORT:
World Conference on Science, Faith and the Future
Organized by the World Council of Churches, 12-24 July 1979.[1]

Until the early 1970's, the thrust of the worldwide ecumenical movement was toward "a more just and socially responsible society."[2] In this context, social justice issues centered on changes in political and economic institutions and more equitable distribution of wealth; thus, efforts on behalf of racial justice, political liberation, and workers' rights all gained support from the world's religious movements. But the 1970's were also a time of increasing worldwide sensitivity to the exhaustibility of natural resources, the undesirable environmental impacts of technology, and the complex ethical questions raised by new scientific knowledge. There was audible questioning of both the authority of science and the old model of unlimited growth and undeniable progress. Aware of the validity of these concerns, the Working Group on Science and Society of the World Council of Churches in 1976 began to stress the interdependence of the issues of justice and "sustainability":

> The twin issues around which the world's future revolves are justice and ecology. 'Justice' points to the necessity of correcting maldistribution of the products of the earth and of bridging the gap between rich and poor countries. 'Ecology' points to humanity's dependence upon the earth. Society must be so organized as to sustain the earth so that a sufficient quality of material and cultural life for humanity may itself be sustained indefinitely. A sustainable society which is unjust can hardly be worth sustaining. A just society that is unsustainable is self-defeating. Humanity now has the responsibility to make a deliberate transition to a just and sustainable global society.[4]

Clearly, the "sustainability" concept is intimately associated with the processes, products and effects of science and technology. That concept has not, however, been received by the ecumenical community without debate or question. This summer, the World Council of Churches (WCC) will sponsor a major international conference to develop and debate the theological and ethical issues in current global problems. The World Conference on Faith, Science and the Future, which will take place at the Massachusetts Institute of Technology on 12-24 July 1979 culminates over seven years of WCC discussions and study meetings. At the end of this conference, official delegates* from over 100 countries will develop recommendations of actions for the member churches.

The conference is part of a ten-year WCC study plan aimed to bring new ethical insights to a range of issues normally seen as separate topics,

* Of the more than 400 official delegates, 40 will be American. Although most delegates will represent the member churches of the World Council, the WCC Board also nominated delegates to represent other major religions and (indicative of the goal of increasing discussion among lay people) instituted a "quota" for the proportion of scientists who may be delegates.

and thereby to help the churches deal with complex and evolving contemporary issues. The original mandate to the WCC Working Group was somewhat less concerned with science or technology; however, as discussions began to be influenced by current events and emerging social issues, it became clear that science and technology represent an underlying, common denominator to most critical international problems and therefore cannot be ignored. Old themes associated with the presumed incompatibility of religion and science may be of concern to the delegates to the July conference, but only in an indirect way. The immediate topic of conversation will be, we suspect, the scientific or technological routes to a "just, participatory and sustainable society."

* * * * *

One of the conference background papers, "The Ideological and Theological Debate About Science," acknowledges that several important questions on the ethical and social implications of science and technology were brought to the attention of the discussants by "two kinds of development of secular thinking"; for example, "new views of science coming from studies in the history and philosophy of science" and "critiques of the social significance of science and technology coming from a) neo-Marxist groups. . .and b) writers on environmental issues and on the counter-culture."[5] The effect of these critiques and of other research and writing on science and society issues are clearly discernible in the conference's four central themes:[6]

1) Interaction Between Science and Faith. Although at first glance, this theme may seem to echo the traditional conflicts between the competing authorities of science and religion, it also takes note of many critical non-theological questions regarding science:

> Few scientists today hold the view that it would be possible to solve all the world's problems if only we had enough scientific and technological knowledge. What then are the limits of scientific enquiry and what precisely is the nature of scientific knowledge in comparison to other sorts of knowledge?

Moreover, "What are the values which should guide scientific and technological research? How are these to be determined?"

2) Ethical Issues Arising from Developments in Particular Scientific and Technological Fields. Conference delegates will examine ethical and social issues in several specific scientific fields, "especially those where the public demands clarification of the motivations and the ethical and social criteria guiding scientists and technologists working in these fields." Examples given in the program are: a) biological manipulation of life -- animal and human -- through genetic engineering or experiment; b) energy resources for the future and the consequences for society and the environment; and c) the social consequences of electronic communications and data processing developments.

> Cutting across all these types of experimentation is the issue of the motivation and the justification for various kinds of scientific investigation, and for what is generally

> called "pure research." What is the justification of knowledge for knowledge's sake? "Pure" research often leads to socially significant consequences which were not and perhaps could not have been foreseen. But today people are asking whether it is responsible to embark on such scientific and technological research where the possible positive and negative consequences for humanity cannot be predicted.

3) The Economic, Social and Political Context in Which the Know-how of Science and Technology may be more Equitably Used and Shared. This theme recognizes the differences in the way the industrially-developed world (which faces a "pattern of production and consumption. . .now thought to be unsustainable") and the developing countries (in which production is often poorly established and "consumption" means daily subsistence) view the proper future of science and technology:

> There are those in the developed countries who believe that economic growth must continue and that new developments in science and technology will make this possible. Others hold that because of dwindling world resources science and technology cannot maintain the Western pattern of affluence at existing or higher levels on a world scale.
>
> In the developing countries. . .some people, perhaps the majority, believe that through science and technology they can make a great leap forward in economic and social welfare to a level approaching that of the technologically developed countries. This implies of course a new distribution of resources and technology on a world scale. Others maintain that this kind of advance would require such large-scale economic and technological change that the social and cultural basis of community would be destroyed (already in some countries) by the adoption of life styles based upon a powerful science and technology with its associated set of material and economic values.

4) A New Formulation of Christian Social Ethics for the New Age of Science and Technology. Until quite recently, Christian social thought automatically approved of the benefits of science and technology and concentrated on issues of just distribution of those benefits. Now, it has turned to problems of costs as well as to the "confusion about how to relate the concern for justice and participation to sustainability."

At the conference, these themes will be first presented and discussed in plenary sessions; and, in working groups, delegates will develop a report recommending appropriate actions and study programs for the churches and the WCC. In addition, on July 7 - 11, 70 science students (many of whom are also delegates to the main conference) will convene at Wellesley College to discuss the values and ideological components of science education. Discussion groups at this auxiliary meeting will address such topics as "technology and militarism," "technology and transnational corporations," "technology and cultural alienation," as well as the "ethical/societal pressures on the science student" and the "need for interdisciplinary studies."

In an interview with Gordon Schultz, WCC National Coordinator for the Conference, STHV asked what the conference aimed to achieve. Schultz indicated that the conference would be successful if delegates were able to reach some consensus on several issues, notably:

1) Clarification of the types of economic policy by which a Third World Country could increase technological development "without destroying existing culture or damaging existing human values" -- that is, develop some way to balance the concerns of those who advocate progress and those who stress goals of a "just, participatory and sustainable society," and

2) Some "helpful directions" for the churches and some clear recommendations for church action on nuclear energy.

Energy issues have occupied a significant proportion of the preparatory readings and the preliminary Working Conferences. In an official position paper in 1977, for example, the Council stressed 1) the need for open public debate on "the social and ethical implications of long-term energy choices," 2) the importance of "facing the long-term risks of adopting nuclear technology," 3) the "access versus security" issue ("concern for the security of sensitive nuclear technologies has produced the secretive nuclear club"), 4) the military implications, 5) the social implications of nuclear energy as a fuel choice, and 6) the need for acknowledging "the validity of underlying presuppositions of faith and values" that appear in the debate over nuclear energy.[7] In this and subsequent documents, the first point -- the need to keep discussion open -- is emphasized over and over again, as are also the tremendous difficulties the churches will face in attempting to decide questions "in which ethical and technical issues are closely interrelated" and of which church members have "limited understanding" of the technology.[8]

* * * * *

In a recent discussion of "The Human Dimensions of Science," Arnold Thackray pointed to several social indicators of a "shift in sensibilities," which, at the very least, question the "attribution of a special high status to our ideas of nature -- the labeling of them, and them alone, as science" and, hence, the reassessment of the "proper" relationship of the sciences to the humanities.[9] Science, he wrote, is modern "in the deeper sense that a future-affirming vision, a presentist orientation, and a progressivist faith have been central to the social processes by which science was invented and articulated."[10] It is useful to compare a discussion such as Thackray's to the ideas presented in the final chapter of the WCC Faith, Science and Society book, which makes an ardent plea for a "post-modern society" -- calling for reassessment of the belief in "continuous upward progress," and advocating "an equilibrium economy as the only sound and sustainable form of human society."[11] This proposal does not push for an end to all growth, but it does approve "a sharp limit upon those forms that damage our life-support base,"[12] an idea that definitively challenges many current economic assumptions and practices.

Although the conference organizers tend to de-emphasize the element of conflict between science and religion, it may well be that in choosing to focus on contemporary science-linked social and ethical issues, the ecumenical movement has steered toward another arena in which conflict could occur. On the other hand, the theological debates (as well as similar activities and

discussions within the secular humanities) are taking place at the same time that science is re-assessing its own models of progress. Simultaneous assessment could prove enriching and enlightening to all concerned. Certainly the parties should not ignore each other.

- Marcel C. La Follette

NOTES

1. This report was prepared by STHV from books and periodicals published by the World Council of Churches, Working Group on Science and Society, Geneva Switzerland: Facing Up to Nuclear Power: Risks and Potentialities of the Large-Scale Use of Nuclear Energy, edited by John Francis and Paul Abrecht (Philadelphia, PA: The Westminister Press, 1976); Faith, Science, and the Future, Preparatory Readings for a World Conference Organized by the World Council of Churches at the Massachusetts Institute of Technology, Cambridge, MA, U.S.A., 12-24 July 1979 (Geneva, Switzerland: World Council of Churches, 1978); and these issues of Anticipation (an occasional periodical published by WCC): "Energy for a Just and Sustainable Society," No. 23 (November 1976); "The Churches and the Nuclear Debate," No. 24 (November 1977); and "Burning Issues," No. 25 (January 1979).
2. Faith, Science, and the Future, op. cit. (Note 1), p. 1.
3. The World Council of Churches is an ecumenical alliance of over 300 church denominations in over 100 countries. WCC headquarters are at 150 route de Ferney, Geneva, Switzerland.
4. Faith, Science, and the Future, op. cit. (Note 1), p. 5.
5. "The Ideological and Theological Debate about Science (Papers from the Consultation in Cambridge, June 20-26, 1977)," Anticipation 25 (January 1979): 4. Published by the Working Committee on Church and Society, World Council of Churches, 150, route de Ferney, 1211 Geneva 20, Switzerland.
6. "Ecumencial Conference at M.I.T.," Anticipation 25 (January 1979).
7. "Papers from the Salzburg Conference on Nuclear Power. IV. The Position of the WCC: Public Acceptance of Nuclear Power -- Some Ethical Issues," 24 Anticipation (November 1977): 14-19. Official position paper presented at the International Conference on Nuclear Power and its Fuel Cycle, sponsored by the International Atomic Energy Agency, Salzburg, May 1977.
8. Ibid., p. 107.
9. Arnold Thackray, "The Human Dimensions of Science," 1 Humanities in Society 4 (December 1978): 261. Although Thackray has been singled out here, I do not mean to imply that there are not also other useful discussions of the visible indicators of this attitude shift.
10. Ibid., p. 261.
11. Faith, Science, and the Future, op. cit. (Note 1), Chapter 20 -- "Plea for a Post-Modern Society," pp. 226 and 231.
12. Ibid., p. 231.

CONFERENCE REPORT: "Government Control of Science," Opening Session of the Second National Symposium on Genetics and the Law, 21 - 23 May 1979, Boston, Massachusetts

The legal and ethical issues raised by the enormous increase in our knowledge of human genetics in recent years were the focal point of the Second National Symposium on Genetics and The Law, which took place 21 - 23 May 1979 in Boston, under co-sponsorship of the American Society of Law and Medicine and the Eunice Kennedy Shriver Center.[1] Most of the program was devoted to specific areas in which the use of techniques such as prenatal diagnosis intersects with questions in health care policy, ethical concerns, and legal issues. The opening session, "Government Control of Science," had a broader perspective, however, and addressed issues extending beyond genetics to all of scientific research. The six major presentations posed arguments for and against the imposition of controls on scientific research, analyzed the constitutional issues relating to freedom of inquiry, and attempted to assess the impact of legislation and executive regulations on medical practice and the individual physician.

To begin the program, Bernard Davis (Harvard Medical School) examined public concerns about recombinant DNA research, "genetic engineering," and research on genetic determinants of behavior, and equated these with the "Three Specters" of his title: "Dangerous Products, Powers or Ideas." Painting with a broad brush, Davis argued that, although the technical grounds for apprehension are weak in all three areas, exaggerated public fear and mistrust present what he regards as a serious threat to traditional scientific freedom.

Davis' concerns about the inefficiency of procedures employed in the case of rDNA research regulation were echoed by DeWitt Stetten, Jr. (National Institutes of Health) in his talk on "Research and Regulation." Drawing on his four years as head of the NIH committee charged with developing guidelines for rDNA research, Stetten asserted that "regulation is antithetical to creativity." Initially sympathetic to the concerns about gene splicing raised at the 1975 Asilomar meeting, Stetten's experience with the guidelines committee convinced him that the development of the regulations required too much work by scientists who could have been "better occupied with scientific work instead of administrative detail." Regulations impede creativity, he said, because they are rigid, difficult to amend, and unresponsive to new findings. He sharply disagreed with those who maintain that regulations can be flexible, claiming that "a regulation that is flexible ceases to be a regulation."

Stetten advocated the imposition of regulations only when the need is clearly evident. When the need is demonstrable, he argued, as it is for handling radioactive materials, scientists accept constraint willingly and without complaint. Problems arise only when regulations are "directed against anxiety instead of hazard." To set an economical and rational agenda for regulatory action, Stetten suggested that need be determined by assessing how likely it is that a catastrophe will occur, how much damage will result if it does occur, and whether there is anything that can be done to reduce the probability that it will occur. He expressed skepticism that rDNA experimentation warranted regulation under these criteria.

Daniel Callahan (The Hastings Center) recognized the pragmatic arguments of Davis and Stetten but adopted a more philosophical approach in his talk on "Ethical Issues in the Control of Science." His analysis rested on two fundamental assumptions: 1) that freedom of inquiry is essential for science, but, like all other freedoms, it is not absolute and is subject to competing claims; and 2) that no activity that affects the public should be controlled solely by its practitioners. Noting that de facto constraints on research have existed for some time, Callahan attributed the upsurge of interest in regulation to the increased proportion of research funded by the public purse, to demands for accountability in all domains, and to the recognition that science is a "double-edged sword." In addition, he maintained that since research entails active intervention in nature, it must be subject to the same moral rules that govern all other forms of human action.[2] Recognizing that freedom is a necessary condition of scientific research which may, however, occasionally conflict with other freedoms, Callahan suggested several substantive criteria and procedural steps to prevent unwarranted and capricious restriction without precluding open debate. He proposed that: 1) limits to inquiry be considered only when there is "clear and present conflict with other rights" and 2) freedom of inquiry be regarded as a "prima facie right" with the burden of proof to be placed upon those who wish to restrict it. He recommended that any constraint be open to later reversal, and be established by due process after full and open public discussion.

John Robertson (University of Wisconsin Law School) began by observing that scientists are fond of using the "rhetoric of rights" to support the freedom of inquiry. Although the Supreme Court has never faced the issue directly, Robertson believes that the history, logic, and precedent of the First Amendment suggest that research is protected because it is an essential precondition to the flow of scientific information.[3] However, he also drew attention to the limits of Constitutional protection, emphasizing that First Amendment rights are "negative rights," in that they make governmental interference with the exercise of that right difficult but not impossible, and do not guarantee access to the resources or environment necessary to exercise the right. A First Amendment right to research imposes no duty on the state to fund any particular research; the state is free to decide priorities, and at any moment may decide "to promote one line of scientific inquiry and starve another." This power is generally beyond the reach of the Constitution. The First Amendment provides considerably more protection against restrictions on privately funded research, but the scope of protection is related to the kind of harm that government intervention presumes to prevent. According to Robertson, "the greatest protection is provided against government restriction in the content or topic of research;" there is greater leeway to restrict research methods because of threats to the health, safety and welfare of subjects and third parties.

Robertson concluded with an intriguing question about the limits of government intervention in privately funded research. Currently the government, and specifically the Congress, uses its funding power as a mechanism for regulating "nonfunded" (i.e., privately funded) research occurring within an institution receiving federal funds. For example, under the National Research Act, the Secretary of HEW requires institutions receiving federal funds for research with human subjects to create Institutional Review Boards to review all research with human subjects conducted or sponsored by the institution, whatever the funding source. A similar requirement has been imposed in institutions doing

federally funded recombinant DNA research. "Regulation through funding power," Robertson noted, "thus extends the government's hand over non-funded research considerably further." He expressed surprise "that the academic and scientific community has not litigated this issue, for the state's power to regulate non-funded research through funding power is far from clear, and involves extensive intrusion into research and institutional autonomy."[4]

Seymour Lederberg (Brown University) reviewed the spectrum of recent developments in genetic research and highlighted those that have come under public scrutiny, e.g., in vitro fertilization and prenatal diagnosis. He examined the range of control mechanisms proposed in various quarters and, like Robertson, recognized that the power to allocate funds and set priorities provides the government and presumably the public with a most effective means of influencing the direction of science.

Stanley Reiser's talk, "Serving Two Masters," created a link between the previous discussions of regulation and the meeting's subsequent emphasis on clinical practice. Reiser (Harvard Medical School) seriously questioned the value of institutionalizing, by legislation or other means, certain technological methods of diagnosis. Among these he cited routine testing for Phenylketonuria (PKU), automated screening of blood samples for a multitude of chemical compounds, and routine intraocular pressure tests for glaucoma. While acknowledging the utility of all of the procedures in appropriate circumstances, Reiser argued cogently that increasing dependence on technological aids to diagnosis will diminish the physician's observational and communication skills. Furthermore, the emphasis on machine-assisted diagnosis provides an illusion of certainty and of the superiority of this kind of evidence to the information obtained by traditional techniques of history-taking and clinical acumen.[5] Reiser maintained that regulation applied to diagnostic techniques is an unsatisfactory substitute for more effective ways of improving the practice of medicine, such as requirements for continuing education, more stringent peer review, and greater use of disciplinary procedures.

While this session explored rather than resolved the issues before it, it was marked by unusually thorough and careful preparation by each of the six participants. Few claims were left unchallenged in the probing questions raised by moderator Charles Fried (Harvard Law School) and members of the audience. This report represents only the barest outline of the rich fare of the meeting. which may be sampled in the volume of proceedings to be published by Plenum Publishing Corporation within the next 12 months. - Vivien B. Shelanski

NOTES

1. The Symposium was supported by grants from the National Endowment for the Humanities and the National Foundation - March of Dimes.
2. This position is developed in Hans Jonas' article, "Freedom of Scientific Inquiry and the Public Interest," Hastings Center Report (August 1976): 15-17.
3. Quotations are from Robertson's presentation to the Symposium. For a detailed analysis, see Robertson, "The Scientist's Right to Research: A Constitutional Analysis." 51 Southern California Law Review (1978): 1203-1279.
4. Ibid., p. 20.
5. These are among the central arguments in Reiser's recent book, Medicine and the Reign of Technology New York: Cambridge University Press, 1978.

News Items

A. New Periodicals Address a Variety of Science, Technology, and Human Values Topics

* IRB: A Review of Human Subjects Research was launched in March 1979 by The Hastings Center and will be published ten times a year. It is designed as a forum for information and ideas about the ethical aspects of research involving human subjects. Both institutional and individual subscriptions are available. Address: IRB, The Hastings Center, 360 Broadway, Hastings-on-Hudson, NY 10706.
* Knowledge: Creation, Diffusion, Utilization will be launched as a quarterly journal in September 1979, to provide "a forum for researchers, policymakers, R&D managers, and practitioners engaged in the process of knowledge development." Inquiries should be addressed to the Editor, Robert F. Rich, Woodrow Wilson School of Public and International Affairs, Princeton University, Princeton, NJ 08540.
* Science 80 will be published bi-monthly by the AAAS beginning in Fall 1979. Described as a "magazine of science for an educated popular audience," Science 80 will be edited by Allen L. Hammond, who developed the Research News Section of Science, and will be available only by subscription. Address: Science 80, AAAS, 1515 Massachusetts Avenue, N.W., Washington, DC 20005.
* SciQuest (Formerly known as Chemistry) is published 10 times a year by the American Chemical Society, which describes the publication as a "generalized, interdisciplinary magazine [that] takes in the world of science at the laymen's level." Address: SciQuest, ACS, 1155 16th Street, N.W., Washington, DC 20036.
* Technology In Society is a new quarterly publication from Pergamon Press. Edited by George Bugliarello and A. George Schillinger, the journal will focus on "the economic, political, and cultural dynamic of technology." The inaugural issue, Vol. 1, No. 1 (Spring 1979) includes articles by: Harvey Brooks, Harlan Cleveland, Edward Wenk, Jr., Edward Teller, Hans Mark, Peter E. Glaser, Mario Bunge, and Langdon Winner. Vol. 1, No. 2 (Summer 1979) will be devoted to the August 1979 U.N. Conference on Science and Technology for Development (UNCSTD). Address: Pergamon Press, Fairview Park, Elmsford, NY 10523.

Special Interest Newsletters

The following newsletters are either new or resuming publication after a hiatus of several years:

* Business & Professional Ethics (Published by the Human Dimension Center at RPI). This new quarterly newsletter/report attends to current research and discussion of the ethical questions raised by business and professional practice, including the sciences, engineering and other technical professions. The Winter 1979 issue includes a succinct but insightful essay on some aspects of "information processing ethics." Editor: Robert Baum.

Address: Center for the Study of the Human Dimensions of Science and Technology, Rensselaer Polytechnic Institute, Troy, NY 12181.

* Clearinghouse on Science and Human Rights Newsletter (Published by the AAAS Committee on Scientific Freedom and Responsibility). This newsletter reports efforts on behalf of foreign scientists whose human rights have been violated. It includes notes on Clearinghouse activities, news of cases referred by the Clearinghouse, excerpts from pertinent speeches, and news of publications. No charge. Editor: Bruce Alan Kiernan. Address: 1515 Massachusetts Avenue, N.W., Washington, DC 20005.

* Environmental History Newsletter (Published by the American Society for Environmental History). EHN contains news of organizations, announcements of academic programs, publication notices, and reports of projects, all of which focus on environmental concerns. No charge. Editor: Keir Sterling. Address: Department of Social Sciences, Dyson College of Pace University, Pleasantville, NY 10570.

* Energy History Report (Published by the U.S. Department of Energy). This publication serves as a forum for discussion of the history of energy, and includes brief articles, book reviews, research notes, and news of recent appointments and new projects. No charge. Editor: Ethan B. Kapstein. Address: 7G-033 Forrestal Building, Department of Energy, Washington, DC 20585.

* U.S. - U.S.S.R. Science and Technology Newsletter (Published by the Joint Commission Support Staff of the Division of International Programs of the National Science Foundation). This newsletter reports on the U.S. - U.S.S.R. science and technology workings groups: computer applications, chemical catalysis, electrometallurgy and materials, forestry, metrology, microbiology, physics, science policy, scientific and technical information, and water resources. No charge. Address: Barbara Joyce, Division of International Programs, National Science Foundation, 1800 G Street, N.W., Washington, DC 20550.

B. Information on Annual Meetings of SHOT, HSS, and PSA

1) Society for the History of Technology 1979 Annual Meeting -- Newark, New Jersey will be the site for the 1979 annual meeting of the Society for the History of Technology (SHOT). The October 17-20 meeting has been timed to coincide with the celebration of the centenary of the invention of the incandescent lamp, and will be co-hosted by the New Jersey Historical Commission, the National Park Service, and the Thomas A. Edison Papers. Suggestions for papers, sessions, or events may be sent to the meeting chairperson, Professor Reese V. Jenkins, Editor, Thomas A. Edison Papers, Rutgers University, 1 Richardson Street, New Brunswick, NJ 08903.

2) History of Science Society 1979 Annual Meeting -- The 1979 annual meeting of the History of Science Society will be held in conjunction with the annual meeting of the American Historical Association in New York City during the last week of December. Persons wishing to present brief reports on works in progress should send abstracts of their papers to Arthur Donovan, Program for the History of Science and Technology, 388 Birch Street, West Virginia University, Morgantown, WV 26506. Graduate students are particularly encouraged to make use of these sessions.

3) Philosophy of Science Association: 1980 Meeting -- The Philosophy of Science Association (PSA) will hold its Seventh Biennial Meeting

in Toronto, Canada, 16-19 October 1980. The History of Science Society, the Society for Social Studies of Science, and the Society for the History of Technology are also making plans to hold their meetings in Toronto at the same time. Each society will plan its own program, but some combined sessions and social activities are being arranged.

The PSA program will include contributed paper sessions, symposia, and other special sessions. Contributed papers will be preprinted as Volume 1 of PSA 1980; other papers will be published later as Volume 2. Contributed papers may address any topic in the philosophy of science, from any philosophical standpoint. Maximum length is 3500 words. Two copies, typed double-spaced, each including a 100-word abstract, should be sent to the chairperson of the program committee. To allow for blind refereeing, author's name and institution should appear on a separate cover page. Closing date for submission: 15 January 1980. Suggestions for symposia should be sent to the program chairperson by 1 October 1979, with enough supporting material for the program committee to judge the quality and general interest of the proposed symposium. Drafts of all papers are preferred, but detailed abstracts, research proposals, or other descriptions may suffice. Vitas of all participants are also requested. The Program Committee is also particularly interested in receiving suggestions for topics, participants, and format for a session on the teaching of philosophy of science. Suggestions should be forwarded by 1 October 1979. Program committee chairperson: Professor Ronald N. Giere, Department of History and Philosophy of Science, 130 Goodbody Hall, Indiana University, Bloomington, IN 47401.

C. Syllabus Exchanges Established by HSS and SHOT

The History of Science Society (HSS) and the Society for the History of Technology (SHOT) have independently established clearinghouses for the exchange of course information.

The HSS Syllabus Clearinghouse will maintain a record of available course outlines. Instructors requesting outlines in a given area will be sent the names and addresses of those who are willing to make their syllabi available. To cooperate in this project, contact: Professor Stephen C. McCluskey, Program in the History of Science and Technology, West Virginia University, Morgantown, WV 26506.

The SHOT Syllabus Exchange is also open to members and non-members of the society. Anyone interested in participating should send course outlines to: Stephen H. Cutcliffe, Administrative Assistant, HPT Program, 327 Maginnes Hall #9, Lehigh University, Bethlehem, PA 18015. A list of available syllabi, including the instructor's name, address, course title, and a one-line description will be published in a future SHOT newsletter and updated as necessary.

D. Visiting Scholar Program in the U.S. Department of Energy

The Historian's Office in the U.S. Department of Energy annually offers course development and research opportunities in the history of

energy systems, policies and technologies through its Visiting Scholar Program. Participants are selected under the provisions of the Intergovernmental Personnel Exchange Act of 1970 and receive support to work for up to two years, at DOE Headquarters, on original projects that are related to, but independent from, the DOE historical program. While in residence at DOE, Visiting Scholars are expected to interact with the Historian's staff, interested DOE officials, and other professionals through informal discussion, seminars, and conferences.

The Historian's Office has a special interest in assisting in the establishment of college level courses on the history of United States energy policy, production, and use. Applicants are therefore encouraged to submit proposals for developing undergraduate and graduate courses on the history of energy (including the political, economic, technological, and social aspects of energy development and distribution), as well as proposals for research in the history of U.S. energy. Although applicants should have assurance that the courses as developed would be taught at their home institutions, the courses and course materials should also be appropriate for a wide number of institutions including universities, liberal arts colleges, technical schools, and community colleges.

Preference will be given to proposals for research on topics relating to the utilization and development of energy systems, policies, and technologies in the 20th century. For further information, contact: Dr. Richard G. Hewlett (Chief Historian), Historian's Office, Room C-478, U.S. Department of Energy, Washington, DC 20545; (301)-353-5431.

E. Mathematics Historian Sought for Oral History Project

The American Mathematical Society's Committee to Monitor Problems in Communication is considering the possibility of beginning an oral history program to preserve the immediate past history of mathematical developments. The project would consist of interviews with mathematicians who have played key roles in the development of institutions, organizations, research programs or national efforts involving mathematics. To manage the program, the Committee is seeking a person trained in both mathematics and history, and anticipates that funding for the project could be found if an appropriate person were available. Qualified persons who might wish to work on this project are invited to write to Professor George Seligman, Department of Mathematics, Yale University, New Haven, CT 06520. Please include a curriculum vitae, other supporting material, and a description of particular projects or subjects that might be studied.

F. Bell Laboratories Science, Technology, and Society Program Hosts Visit by Graduate Seminar in History of Technology

On 20 April 1979, the Bell Labs Science, Technology, and Society Program hosted a visit by Professor Thomas Parke Hughes and a dozen graduate students from his history of technology seminar in the Department of History and Sociology of Science, Technology, and Medicine (University of Pennsylvania). The day's activities included: an overview of the history

of the Laboratories and discussion of the origin and development of the history project [A History of Engineering and Science in the Bell System, two volumes published, one in press], and the nature and organization of Bell's archival holdings.

In the second part of the program, heads of several departments spoke to the group on the nature and evolution of their fields at Bell Labs. Arthur Keller, who holds the U.S. patent for the single-groove stereo disc recording system, discussed the 1920s and 1930s research in high fidelity sound recording and reproducing. The group visited the fiber optics lab where Suzanne Nagel (of the Crystal Growth and Glass Research and Development Department) surveyed the history of attempts to use light for communications, explained how fiber optical communications works, and noted several possible social implications of the spread of this technology in the coming decades. Ralph Johnson (Mobile Phone Field Studies Department) reviewed the history of mobile telephony, including its regulatory context. The program concluded with a talk by James Falk, the Director of Anti-Trust and Regulatory Matters, on the historical background of and recent developments in anti-trust and regulatory activities pertaining to Bell Labs work. For further information about or suggestions for similar STS activities, contact Robert E. McGinn, STS Program, Bell Laboratories, 3B-315, Murray Hill, NJ 07974; (201)-582-2723.

G. Special Commission on the Humanities Formed by the Rockefeller Foundation

The Rockefeller Foundation Commission on the Humanities is currently conducting a major assessment of the role of the humanities in American society, fifteen years after a previous blue-ribbon group recommended establishment of the National Endowment for the Humanities. The present Commission will also look toward the future and suggest particular directions "for strengthening the humanities in American education and public life over the next decade."

Under Chairman Richard W. Lyman (President of Stanford University), the group will examine three major topics in detail: 1) formal humanities education in elementary and secondary schools, colleges and universities; 2) non-formal modes of humanities learning such as adult education, museums, libraries, and the electronic and print media; and 3) public and private support for the humanities. The Commission's 32 members include the presidents of major academic institutions, foundations, and research corporations, as well as television and publishing executives, humanities scholars, and museum and library directors. A special four-member sub-committee has also begun to explore questions associated with the relationships between technology and the humanities, particularly in regard to the application of technology to scholarship and communications. Three other subcommittees will address special issues in formal and non-formal education. The commission expects to complete its final report by early 1980. Executive Director is Gaines Post, Jr. Commission staff is based at Stanford University (Building 600T, Stanford, CA 94305).

H. FY1979 NEH Grants in Science, Technology, & Human Values

A list of FY 1979 Awards by the National Endowment of the Humanities in fields dealing with science, technology, and human values was published in 4 Science, Technology, & Human Values 26 (Winter 1979): 24-28. To update that list, the following recently awarded grants are included:

1) Joint Funding Awards (NEH Program of Science, Technology and Human Values)

a) NEH/NSF:

"A Survey and Workshop on Professional Ethics Activities in Scientific and Engineering Societies" - Rosemary A. Chalk, American Association for the Advancement of Science, Washington, DC, April 1979 - April 1980.*

"Study of the Regulation of Drugs: Medical and Health Models" - Willard Gaylin, Institute of Society, Ethics and the Life Sciences, Hastings-on-Hudson, NY, September 1979 - September 1981.*

"Study of Ethical Issues for Scientists and Engineers Designing New Electronic Media for Interpersonal Communication" - Robert Johansen, Institute for the Future, Menlo Park, CA, July 1979 - December 1980.

"Study of Intergenerational Moral Obligations and Their Application to National Energy Policy" - Douglas McLean, University of Maryland, College Park, MD, July 1979 - December 1980.*

"Research Conference and Dissemination: Ethics and Values for Environmental and Resource Conservation Scientists: Historical Perspectives" - John H. Perkins, Miami University, Oxford, OH, September 1979 - September 1981.

"Pedagogical Issues in the Teaching of Ethics in Science Courses: A Conference-Workshop" - Morton A. Tavel, Vassar College, Poughkeepsie, NY, July 1979 - December 1980.*

"Study of the Question of Support, by their Professional Societies, of Engineers who Raise Ethical Issues" - Stephen Unger, Columbia University, New York, NY, July 1979 - November 1980.*

b) NEH/DOE -- Summer Faculty Workshops on Energy Education, July 1979:

Philip L. Taylor, Case Western Reserve University, Cleveland, OH.

Robert Baum, Rensselaer Polytechnic Institute, Troy, NY.

Abdal H. Raoof, State University of New York at Buffalo, Buffalo, NY.

Lauren McKinsey, Montana State University, Bozeman, MT.

2) Division of Research Grants

"National Conference on Genetics and the Law" - Aubrey Milunsky, Eunice Kennedy Shriver Center for Mental Retardation, Boston, MA, March - June 1979.

3) Division of Fellowships

Support for four post-doctoral fellows in the Centers for Advanced Study category: Daniel Callahan, Institute of Society, Ethics and the Life Sciences, Hastings-on-Hudson, NY, September 1979 - August 1981.

"The Genre of Science Fiction" - Mark A. Rose (Professor of English), University of California, Santa Barbara, CA, 1979 - 1980.

"The United States and the Antarctic Since World War II" - Lawrence J. Baack (Department of

* For a more detailed description of this project, see News Item I in this issue.

History), Mississippi State University, 1979 - 1980.

a) Summer Stipends, 1979:
"A Study of the Process of Discovery and the Nature of Scientific Rationality" - Richard M. Burian (Department of Philosophy of Science), Drexel University, Philadelphia, PA.
"Objectivity in Social Science" - Sandra G. Harding (Department of Philosophy), University of Deleware, Newark, DE.
"The Uses and Abuses of Science in Constitutional Law" - Gary J. Jacobsohn (Department of Political Science), Williams College, Williamstown, MA.
"The Mind-Body Problem in Enlightenment Physiology" - Shirley A. Roe (Department of History of Science), Harvard University, Cambridge, MA.

b) Fellowships for the Professions -- Seminars for Physicians and Other Health Care Professionals, Summer 1979:
"Profession in Crisis: Historical Perspective on Current Criticisms of Medicine" - John C. Burnham (Professor of History), Ohio State University.
"Individual Rights and the Public Good in Medical Treatment" - John Lachs (Professor of Philosophy), Vanderbilt University.
"Human Being and Citizen" - Leon R. Kass (Professor of the Liberal Arts of Human Biology), University of Chicago.
"Democratic Society in a Technical Age: Historical Perspectives" - Robert H. Kargon (Professor of History of Science), Johns Hopkins University.

c) Summer Seminars for College Teachers, Summer 1979:
"Contemporary Moral Issues" - Richard A. Wasserstrom (Professor of Philosophy), University of California, Los Angeles.

4) Division of Education Programs
Northwestern State University, Natchitoches, LA; To prepare and test two courses: Health Care and Humanity -- Images of Health and Disease in History, and Conflicts of Technology and Human Values in Recent Health Care; Fraser Snowden and Maxine Taylor.
Fairfield University, Connecticut; To establish a year-long seminar on bioethics for pre-professional students in medicine and nursing; Lisa Newton.
Rush University, Chicago, IL; To test the feasibility of establishing a permanent humanities module in the biomedical curriculum; Maynard M. Cohen.
University of Lowell, Lowell, MA; To create a new humanities program, Culture and Technology, which will serve to unite the traditions of both; Shirley M. Kolack and Veda Cobb-Stevens.
Columbia University, New York, NY; To design, evaluate, and disseminate curriculum materials based on study, by physicians and humanities scholars, of value conflicts in the clinical setting; Bernard Schoenberg.

5) Division of Special Programs

a) Program Development:
"Energy and the Way We Live: A National Issues Forum" - Diane U. Eisenberg, American Association of Community and Junior Colleges, Washington, DC, February 1979 - July 1980; and March 1979 - June 1980.

b) Youth Programs:
"An Oral History of the Environmental Movement in the State of Florida" - Thomas Trevor Ankerson, Tampa, FL, June - August 1979.
"Study of the Influence of Aging on Values Relating to Euthanasia" - Jennifer Sandson, Boston, MA, June - August 1979.

I. Additional FY1979 Funding by NSF and NEH

For the third quarter of FY1979, the NSF Ethics and Values in Science and Technology Program, in cooperation with the National Endowment for the Humanities, will jointly fund the following grants:

* Workshop on Ethics Activities in American Scientific and Engineering Societies (Principal Investigator: Rosemary Chalk, American Association for the Advancement of Science, 1515 Massachusetts Avenue, N.W., Washington, DC 20005), 12 months starting 15 April 1979. Many scientific and engineering societies have recently developed and adopted principles and practices addressing the ethical implications of their members' professional activities. This project's overall goals are to assess the present status of ethical codes and guidelines and related enforcement mechanisms within American scientific and engineering societies; and to determine feasible future courses of action for the societies with regard to their ethics activities, including possible cooperative actions. A conference whose participants will include representatives from the societies, individual scientists and engineers who have dealt with significant ethical problems in their professional work, scholars, and journalists, will take advantage of a detailed survey and analysis of the ethical codes and practices of the AAAS's 240 affiliated societies.

* Ethical Issues in the Regulation of Drugs (Principal Investigator: Willard Gaylin, Institute of Society, Ethics and the Life Sciences, 360 Broadway, Hastings-on-Hudson, NY 10706), 24 months starting 1 September 1979. Present schemes for classifying and regulating drugs define drug use as acceptable when it brings an individual's physical condition or behavior up to an agreed-upon normal level, but unacceptable when it enhances or optimizes an individual's state or capacities. This project will analyze the ethical, legal and social implications of this norm and of alternative norms that define health in terms of total physical, mental and emotional optimization. It will focus attention on the endrophines (opiates produced by the human body), and performance-enhancing drugs. Project methodology will include meetings of expert consultants whose deliberations will be based on commissioned papers, and research by the project staff, culminating in a workshop in Washington, DC, at which the study's conclusions will be discussed with officials from relevant Federal agencies and key Congressmen.

* Intergenerational Ethics and National Energy Policy (Principal Investigator: Douglas MacLean, Center for Philosophy and Public Policy, University of Maryland, College Park, MD 20742), 18 months starting 1 July 1979. This project will develop a set of ethical principles for aiding policy analyses involving obligations to future generations, and will demonstrate the applicability of these principles in the determination and evaluation of national energy policies. Principles of intergenerational justice will be applied to: the production of toxic substances as byproducts in energy production, and the use of non-renewable resources. Three two-day meetings of a working group of scientists, social scientists, philosophers, and policy makers will review commissioned papers. These papers and manuscripts of the group's discussions will then be the basis for a book that will critically examine the grounds for justifying principles of intergenerational justice, and will explore their implications for energy policy.

* Pedagogical Issues in Teaching Ethics in College Science Courses (Principal Investigator: Morton A. Tavel, Department of Physics and Astronomy, Vassar College, Poughkeepsie, NY 12601), 18 months starting 1 July 1979. This project seeks to delineate and analyze the pedagogical problems of introducing ethical issues into college science courses, and to produce a source book addressed to pedagogical problems encountered in specific disciplines. A four-day conference at Vassar College in June 1980 will build on a preliminary needs assessment conference held in October 1978. Participants will include approximately 100 science teachers from two- and four-year colleges and from a range of disciplines. The conference agenda will include presentation of refereed, contributed papers, and a workshop on special problems in the teaching of ethics.

* Ethical Responsibilities of Professional Engineering Societies (Principal Investigator: Stephen H. Unger, Department of Electrical Engineering and Computer Sciences, Columbia University, New York, NY 10027), 18 months starting 1 June 1979. In this project, the ethical dilemmas experienced by engineers who work in industry and by their employers will be examined by an interdisciplinary group including an engineer, a philosopher and a legal scholar. They will analyze the ethical, legal and institutional problems associated with "whistleblowing"; develop strategies that will enable professional engineering societies to evaluate the claims of potential whistle blowers, help employees and management resolve ethical conflicts, and assist engineers in cases where resolution is not possible; and encourage the implementation of such strategies. Project results will be based, in part, on a survey, and on in-depth interviews with officers and staff of professional societies, and with engineers and managers. The final project report will be disseminated to the engineering societies, to engineering schools, and to other concerned groups and individuals.

J. New Association for Computers and the Humanities

The goal of the newly-formed Association for Computers and the Humanities is "to encourage. . .the appropriate uses of computers and related technologies in the study of humanistic subjects." Charter members and officers of ACH represent a wide base of disciplines, including the humanities, social sciences, the arts, information technology, and computer science. Temporary officers are Joseph Raben (Queens College/City University of New York) -- President; Antonio Zampolli (Laboratorio di Linguistica Computazionale, CNR, Pisa) -- Vice-president; and Donald Ross, Jr. (University of Minnesota) -- Executive Secretary. For further information, write the Association for Computers and the Humanities, Queens College, Flushing, NY 11367.

K. Franklin Pierce Law Center Program on Government Regulation

The Program on Government Regulation of the Franklin Pierce Law Center (Concord, NH) offers faculty and students the opportunity to investigate various aspects of government regulation, particularly on issues involving science and technology. Program activities include research projects, and clinical and educational studies in four broad subject areas:

1) Improving government regulation of risks to health, safety and environmental quality, 2) Developing alternatives to government regulation for the management of risks arising from scientific and technological developments, 3) Assessing the regulatory and non-regulatory approaches of other industrial nations to the management of risks, and 4) Improving state and local regulation. In the past year, the program has sponsored (in cooperation with Carnegie-Mellon University) a simulated hearing of the Public Utility Commission of Pennsylvania on a 765 kv transmission line case, and completed a study on the regulation of health, safety and environmental quality and the use of cost-benefit analysis for the Administrative Conference of the United States. Students are currently engaged in independent research studies and clinical education programs on: regulatory policies of EPA, OSHA, FDA, and CPSC for controlling carcinogenic substances; federal programs for radioactive waste management; decision processes pertaining to radiation from high voltage transmission lines (with Carnegie-Mellon University's Program on Engineering and Public Policy); protection of beach and intertidal zones in New England from oil spills; and administrative law reforms for New Hampshire agencies (with the state Office of Administrative Procedure). Further information, including publications and reports of ongoing activities, are available from Professor Michael Baram, Director, Program on Government Regulation, Franklin Pierce Law Center, Concord, NH 03301; (603)-228-1541.

L. RPI Computer Ethics Course Development Project

The Center for the Study of Human Dimensions of Science and Technology at Rensselaer Polytechnic Institute has begun development of a series of course materials on ethical issues in computer science. Designed primarily for integration into the computer science curriculum, the materials will 1) introduce students to the broad range of ethical issues in the fields and 2) provide conceptual tools to help students to identify and characterize ethical issues, reason about them, and justify particular ethical positions. The interdisciplinary program involves computer science faculty, staff members from the Office of Computing Services, and faculty from the Human Dimensions Center, who will join in development of teaching modules for introductory courses and a one-semester course on Computer Ethics. Primary resource materials, which will undergo testing and modification in the RPI pilot project, are being adapted from the final report of an NSF-funded project on Computer Ethics conducted in 1975-77 by Donn B. Parker (Stanford Research Institute). For additional information, write the Computer Ethics Project, RPI Center for the study of Human Dimensions of Science and Technology, School of Humanities and Social Sciences, RPI, Troy, NY 12181.

Late News Announcement: NSF EVIST Program Position The NSF Office of Science and Society has announced that Dr. William A. Blanpied, Director of the NSF EVIST Program, will be leaving that Office this summer to take another job within the Foundation. The announcement regarding the position of EVIST Program Manager will be issued in June. Interested persons are urged to get in touch with Dr. Alexander J. Morin, Director, Office of Science and Society, NSF, Washington, DC 20550; (202)-282-7770.

Bibliography

Bibliography format for periodical articles -- Author. "Article Title." Volume number Periodical Title Issue number (Date): Pages.

Beauchamp, Gorman. "On the Welfare State as Dystopia." 1 Alternative Futures [The Journal of Utopian Studies] 3 (Fall 1978): 96-109.

Beauchamp compares America's former faith in and current disillusionment with government to similarly held attitudes towards technology: "Faith in the modern state and faith in technology have grown up together. Though it is best not to confuse the two, these faiths have overlapped and even merged in. . .many ways... ." As technological answers to the problems of technology often only create new and more complex problems, so do bureaucratic answers to the problems of bureaucracy serve only to expand and de-humanize the bureaucracy, making the social service it should provide less available. Beauchamp also comments on the inevitable loss of personal freedom which is the result of making either the government or modern technology responsible for fulfillment of human needs.

Beauchamp, Tom L., and James F. Childress. Principles of Biomedical Ethics. New York: Oxford University Press, May 1979.

This major work moves beyond the case studies and controversial issues that have dominated the discussion of biomedical ethics in the past few years toward "a systematic analysis of the moral principles that should apply to biomedicine." Biomedical ethics is treated as one type of applied ethics and thus open to general discussion on certain common principles of justice, autonomy, beneficence, nonmaleficence, truthfulness, confidentiality, and the various ideals of a moral life. Twenty-nine brief case studies and an appendix of relevant codes of ethics provide additional useful material for teachers or scholars in other fields who may be seeking a sound discussion of this topic.

Berkovitch, Israel. "Building a Science Magazine Within Prestel." 10 Physics Technology [Great Britain] (1979).

Since September 1978, the British Post Office has been offering Prestel, a commercial, rapid-access, video information system, to a test group of subscribers, and will open the service to the general public in 1979. This brief article describes a Prestel science news information service developed by the Institute for Scientific Information. The service, Scitel, allows a subscriber to request current news and information on topics ranging from energy, medicine and health, and natural resources, to science books and science news headlines. The designers consider the service to be a "magazine" that complements existing services on, for example, business or leisure activities.

Bowen, Mary Elizabeth, and Joseph A. Mazzeo, eds. Writing About Science. New York: Oxford University Press, 1979.

The publishers call this "the first textbook anthology compiled especially for the student of scientific and technical writing," but we question whether the book's usefulness is quite so clear. Are the students learning how to communicate science to the non-specialist? to the general public? via periodical articles or in trade books? Or are they science students being given models of good writing from a variety of different fields and with differing purposes? Although the examples included in the anthology are from some of the best popular writers on science (Asimov, Lewis Thomas, George Gamow, Loren Eiseley) and from scientists respected for their clear expository prose, the book lacks the definition, direction, and analysis so badly needed on this subject. There is little discussion of the techniques or construction of particular essays and no real sense of why these particular essays were chosen over the many others on the same subjects. Moreover, this is an elite group of essays--how do they relate to the type of writing, either popular or professional, most students will be expected to produce in their careers? Are there any adaptable, universal methods or approaches to science communication? Perhaps the editors intend for such questions again to be answered by the teacher. If so, then we are left with an anthology that resembles a photograph of exotic animals gathered around the watering-hole. Personally, we'd prefer a little more technical information on the animals.

Brooks, Harvey. "Technology: Hope or Catastrophe?" 1 Technology In Society (Spring 1979): 3-17.

In the lead article of this journal's inaugural issue, Brooks examines the range of attitudes of contemporary scientists towards the human future. At the extremes of the scale are the "pessimists, who believe that the salvation of the world is impossible, largely because of human addiction to science and technology," and the "optimists, who believe that the salvation of the world is inevitable because science and technology will always come to our rescue." Observing that until recently most scientists were "almost automatically" in the optimists' camp, Brooks then analyzes why, in the past decade, "the pessimists have begun to acquire some recruits" among even "establishment" scientists, and argues that political and institutional factors, rather than technical or material ones, present the greatest barriers to the solution of today's problems. He ends with the proposition that "science is more hope than catastrophe, though, admittedly it is nip and tuck."

Bunge, Mario. "The Five Buds of Technophilosophy." 1 Technology In Society (Spring 1979): 67-74.

While acknowledging the growth of interest in the philosophical problems raised by technology, Bunge suggests that this domain -- "technophilosophy" -- is still an "underdeveloped branch of scholarship." Here he sets forth a research program for technophilosophy, comprised of 5 main "chapters": 1) technoepistemology -- "The philosophical study of technical knowledge"; 2) technometaphysics -- "The philosophical study of the nature of artificial systems. . ."; 3) technoaxiology -- "The philosophical study of the valuations

performed by technologists in the course of their work"; 4) technoethics -- "The branch of ethics that investigates the moral issues encountered by technologists and by the public at large in connection with large-scale technological projects. . ."; 5) technopraxiology -- "The philosophical study of human action guided by technology." Representative problems in each domain are suggested.

Burrows, William E. "The Cancer Safety Controversy." The New York Times Magazine (25 March 1979): 82-87.

The levels of cancer-causing pollutants determined "acceptable" in our environment are often decided as much by economics as by scientific evidence. Burrows examines the trade-offs the federal regulators make to keep the costs of protection from overwhelming the economy, and reviews the difficult ethical and scientific considerations that should be faced in formulating the regulations by which potential carcinogens are limited.

Carter, Luther J. "Dispute Over Cancer Risk Quantification." 203 Science (30 March 1979): 1324-1325.

Whether, and to what extent, limitations on human exposure to carcinogens should rest on cost-benefit data is the focus of a disagreement between the Occupational Safety and Health Administration (OSHA) and the Environmental Protection Agency (EPA). OSHA's dim view of risk quantification for carcinogens is not shared by the EPA's Cancer Assessment Group. Last fall, however, the Fifth Circuit Court of Appeals rejected OSHA's rule on exposure to benzene precisely because the agency had not justified the rule with cost-benefit data. The court maintained that ". . .OSHA must have some factual basis for an estimate of expected benefits before it can determine that a one-half billion dollar standard is reasonably necessary." This article highlights the bases and potential implications of the case, which has been accepted for review by the Supreme Court.

Casazza, John. "The Engineer's Role in the Energy Crisis." 1 Technology and Society (December 1978): 5-9.

Outlines a "basic philosophy" for use in engineering and managerial decisions, and suggests ways for engineers and their professional societies to help ameliorate the energy crisis.

Cleveland, Harlan. "The Management of Weather Resources -- Proposals for a National Policy and Program." 59 Bulletin of the American Meteorological Society 10 (October 1978): 1267-1274.

The Chairman of the Department of Commerce's Weather Modification Advisory Board describes the work of the board and the summary and recommendations from its final report. The "centerpiece" of the recommendations is a 20-year research and development effort, but Cleveland carefully notes that "precisely because the science and technology of weather resources management are still at such an early stage, there is an excellent chance in this field to do things right -- that is, for policy to be made and institutions to be built in parallel with the scientific discoveries and technological innovations." Behind this gentle plea is the Board's assessment of the

current status of the Federal Government's weather modification efforts. They state that the existing "small pockets of interest activity" (the 38 persons among NOAA's 13,000 total employees being the largest "pocket") are "vulnerable to on-again-off-again budgets, bureaucratic rivalries, and the pluralism of Congressional jurisdictions." "As things stand," the Board writes, "we are tackling 20-year problems with 5-year projects staffed by short-term contracts and funded by 1-year appropriations. It is not good enough." Recommended reading for a stormy night. [Limited supplies of Volume I of the report, "The Management of Weather Resources," are available from NOAA, RD-Z, Science and Academic Affairs, Rockville, MD 20852.]

Cowan, Ruth Schwartz. "From Virginia Dare to Virginia Slims: Women and Technology in American Life." 20 Technology and Culture 1 (January 1979): 51-63.

Has the female experience of technological change differed significantly from the male experience? Cowan's suggestive essay shows that it has. "There are," she argues, "at least four significant senses in which the relation between women and technology has diverged from that between men and technology." Of the three ways in which technology can be specifically and differentially related to women's experience, one (based on biology) is virtually unstudied, another (women in the factory work force) is far from exhausted, and the third (women in the home) is widely misunderstood. A useful scheme for looking at the entire range of the subject "women and technology."

Crandall, Robert W. "Curbing the Costs of Social Regulation," 15 The Brookings Bulletin 3 (Winter 1979): 1-5.

"The single most important problem that pervades health, safety, and environmental regulation is the absence of a mechanism to compel the regulators to examine the economic tradeoffs among different ways of achieving a given regulatory goal. . . .Their principal goal is to improve environmental quality or human health and safety at minimum political cost, not necessarily at the lowest social cost." An article based on Crandall's testimony before the Administrative Practice and Procedure Subcommittee of the Senate Judiciary Committee. [The Brookings Bulletin, Brookings Institution, 1775 Massachusetts Avenue, N.W., Washington, DC 20036.]

Dean, Genevieve Catherine. Science and Technology in China. New Delhi, India: The Centre for the Study of Science, Technology and Development, Council of Scientific and Industrial Research, 1977.

Monograph reprint of six lectures presented on the implications of the political and social context of Chinese science, engineering, technological innovation, and the philosophy of science. Available from CSIR, New Delhi -- 110001, India.

Dittmann, Roger. "Two Contemporary Issues in the Politics of Scientific Research in the United States." 8 Physics and Society 1 (February 1979): 2-8; followed by commentary by Earl Callen, pp. 9-14.

Comments on a variety of issues raised in two current documents: "Guidelines to Professional Employment for Engineers and Scientists" (adopted by twenty scientific and technical societies and currently pending before the American Physical Society) and the National Academy of Sciences' "An Affirmation of Freedom of Inquiry" (which is being distributed by the APS for personal endorsement). The commentary is highly critical of the documents, and concludes that their message to scientists and engineers "is to give unquestioning obedience and loyalty to the rulers of science, to avoid joining with other workers to overcome the impotence of individualism, to be assured that knowledge itself is inherently good in its objectivity, to allow science to be used in any manner the establishment sees fit and thereby avoid interference with 'freedom of inquiry,' to remain ignorant of the tight reins exercised over the scientific enterprise." The commentary by Callen recounts the history of and reasons for APS use of the "guidelines" (which are also included in an appendix to the papers).

"The Einstein Century: Four Generations of Revolutionary Thought." 29 Impact of Science on Society (January - March 1979).

This special issue pays tribute to the Einstein Centenary celebrations with articles on his scientific accomplishments (by Bronowski, P.A.M. Dirac, Povh and Barinberg, Demaret and Vandermeulen, and Mario Rodríguez Aragón), his philosophy (Mohammed Allal Sinaceur, and Hans-Jürgen Treder), and his humanistic outlook. See especially, Yuval Ne'eman's "Coherence, Abstractism, and Personal Involvement: Albert Einstein, Physicist and Humanist," and David Mathisen's "2079: A Century of Technical and Socio-political Evolution."

Elliott, Clark A., ed. Biographical Dictionary of American Science: The Seventeenth Through the Nineteenth Centuries. Westport, CT: Greenwood Press, 1979.

This one-volume reference work contains 300- to 400-word sketches of the lives of nearly 600 American scientists who made their major contributions before 1906. There are also shorter entries for about 300 scientists whose work began in the 19th Century and continued into the 20th. Each of the major entries supplies personal data and an outline of the individual's scientific career. Also included is information about the scientist's major publications and references to bibliographic information and the location of manuscript collections.

Environmental Policy Institute. Plutonium and the Workplace: An Assessment of Health and Safety Procedures for Workers at the Kerr-McGee FFTF Plutonium Fuel Fabrication Facility, Crescent, Oklahoma. Washington: Environmental Policy Institute, 1979.

This is part of the EPI's long-term health follow-up of nuclear workers. The report, which summarizes problems at the Kerr-McGee facility, is based on public AEC and NRC documents and on interviews with workers. ($3.00; Environmental Policy Institute, 317 Pennsylvania Avenue, S.E., Washington, DC 20003.)

Feld, Bernard T. "Einstein and the Politics of Nuclear Weapons." The Bulletin of the Atomic Scientists (March 1979): 5-16.

Feld begins by noting that "to the popular mind, Einstein was -- and to a large extent remains -- the 'Father of the atomic bomb'," and then proceeds, quoting extensively from documents and histories of the period, to present Einstein's views and establish what role he actually played.

Ferris, Timothy. "Navigators Who Probe the Mysteries of Deep Space." The New York Times Magazine (1 April 1979): 39-50.

This article examines the technological achievements of the Jet Propulsion Laboratory (the world's only full-time center of interplanetary exploration), the difficulties of funding future projects, and the philosophical rationale behind the exploration of outer space.

Frieden, Bernard J. The Environmental Protection Hustle. Cambridge, MA: The M.I.T. Press, 1979.

"Environmental opposition to homebuilding has almost no connection to mainstream conservation issues, such as reducing pollution and eliminating environmental health hazards. Housing proposals seldom conflict with these goals." What then? The author, a professor of urban studies, argues that the "no-growth" opposition is actually rooted in more basic social attitudes concerning the desire to maintain quiet, uncrowded suburbs for the fortunate few. Frieden's discussion goes beyond the housing question, however, to consider traditional American values and conflicts over increased Federal regulation. He believes that "understanding what the new regulations do to housing can help clarify an emerging national debate about the meaning of government regulation for American society."

Granger, John V. Technology and International Relations. San Francisco: W.H. Freeman and Company, 1979.

Analysis of the organization, regulation, and use of the technological enterprise by government and industry, particularly in an international context. To develop sound policy options in the areas of technology, politics, and edonomics "requires that the participants be adequately informed not only of the external political, economic, and technological realities that constrain the options but also of the goods and value systems of all those who are affected by the ultimate policy choice."

"Has Environmental Regulation Gone Too Far? A Debate on the Costs Versus the Benefits." 57 Chemical and Engineering News 17 (23 April 1979): 24-53.

A group of specially-commissioned articles that debate the general issues involved in the rising protest against governmental regulation, particularly environmental regulation. The representatives of government, industry, public-interest groups, and research organizations were asked to use air pollution as their case example, thereby lending a cohesiveness to the discussions. Participants were also given an opportunity to include rebuttals to the main papers. The articles are: "More regulatory action, not less, is called for," 25-28, Robert J. Rauch (EDF); "Environmental Control is

out of control," 29-33, Robert W. Crandell (Brookings); "Controversy plagues setting of environmental standards," 34-37, Walter C. Barber (EPA); "Health benefits exceed by 70% costs to control stationary source air pollution," 38-41, Lester B. Lave (Carnegie-Mellon) and Eugene P. Seskin (Resources for the Future); and "SO_2 regulation ignores costs, poor science base," 42-46, Cyril L. Cower (Electric Power Research Institute).

Henig, Robin M. "Animal Experimentation: The Battle Lines Soften." 29 Bioscience 3 (March 1979).

A spate of new organizations and publications -- many directed and/or written by scientists -- signals the mounting attention to animal welfare in scientific experimentation. One of the principal messages in the current debate is that badly treated animals make for bad scientific results. This article presents a useful guide to the groups, their positions, and the key issues.

Herring, Horace. "Walking on Two Legs (Usually the Easier Way)." Acorn (March 1979): 12-13.

In a strong, straightforward essay, the author argues that the concept of autonomy is crucial to appropriate, or alternative, technology (AT) and "is what distinguishes it from mainstream science and technology." Politically, there are two differing approaches to implementing AT: one, through changing social institutions; the other, through personal example (e.g., changing life-style or personal attitudes). People on each side of issues such as nuclear power argue that autonomy will be won or lost through the advocated action: "Either towards more consumer freedom with a loss of liberty (autonomy over work and resources) or less consumer freedom (a lower 'standard of living') with more autonomy over energy, food and work." Herring forcefully acknowledges that AT is, at heart, a political movement in that it challenges not only traditional values of the culture but also political institutions and assumptions. [Starting with the May 1979 issue, Acorn will be published as Outlook, a monthly loose-leaf format newsletter; Outlook, GSU, Park Forest South, IL 60466.]

Holden, Constance. "Scholarly Exchanges With China." 203 Science (16 March 1979): 1092-1094.

Scholarly exchanges between the U.S. and China have been proliferating rapidly since the normalization of diplomatic relations between the two countries. This article describes a few of the best established programs, emphasizes that the rules for contact are still tentative and developing, and assesses the different expectations of the Americans and the Chinese.

Human Values in the Health Care of the Elderly. Philadelphia, PA: Society for Health and Human Values, 1978.

A booklet reprint of the four winning essays in a student contest sponsored by the Society: "The Aged, Health Care, and Human Values," Martin James O'Connell; "Geriatrician: In Spite Of," Louanda McClure Kynhoff; "Attitudes

Toward the Elderly: The Role of Medical Education," Richard P. Shannon; and "Attitudes That Cannot Be Allowed to Continue," Teresa McKinley. The winning essay by O'Connell intersperses anecdotes from his experiences as a member of a geriatric nursing team with reflections on current social attitudes toward the elderly ("In direct contrast to the notion of survival of the fittest has emerged a value orientation to keep the survivors fit. In this case, the survivors are the aged -- refugees from twentieth-century technological warfare against fatally infectious and life-threatening diseases").

Ihde, Don. Technics and Praxis, Volume XXIV in Boston Studies in the Philosophy of Science. Boston, MA: Reidel Publishing Co., 1979.

The series editors write in their introduction to this book: "Typically, philosophy of technology has existed at, or beyond, the margins of the philosophy of science, and therefore the question of technology has come to be posed (when it is) either by historians of technology or by social critics." The Research in Philosophy and Technology series has represented one milestone in the effort to change the situation. This relatively brief book by Ihde may signal yet another milestone reached in, as he phrases it, the "philosophical inquiry into technology." The first section, which focuses on "a phenomenology of instrumentation," may appeal primarily to the specialists, but the sections on the implications of technology and on the pioneers in this field of study will provide interesting reading for others. For example, in a chapter on "The Existential Import of Computer Technology," Ihde discusses the relationship of computer technology to "non-technicians" and his belief in the human tendency to form an image of the world "according to frequent or dominant experiences" and ultimately to "reflect that back into one's own self-interpretation" of the technology.

Jense, Göran. The Swedish Academic Marketplace: The Case of Science and Technology. Lund, Sweden: University of Lund, 1979.

Part of the large UNESCO project on "International Comparative Study on the Organization and Effectiveness of Research Group," this study centers on the particular situation of academic researchers -- on their choice of research problems, skills development, patterns of collaboration and communication, time allocation, individual productivity, personal commitment, and their aspirations and hopes for the future. Book publication supported by the Committee for Science Policy Studies, Swedish Council for Planning and Coordination of Research (FRN), Fack, S-103 10 Stockholm, Sweden.

Joseph, Stephen C., and Stanley C. Scheyer. "A Strategy for Health as a Component of the Sahel Development Program." Washington, DC: Family Health Care, Inc., 1977.

In a report prepared for the U.S. Agency for International Development, two public health experts outline a proposal and strategy "for improving the health status of the population within the context of the more general development framework" of the countries in the Sahelian region of Africa. For improvement in even basic health care delivery to have effect in the Sahel, many different international agencies (e.g., WHO, the World Bank,

OECD, FAC, USAID) and many different nations must coordinate their activities (and goals) in efforts that must necessarily involve (and perhaps change) existing economic, social, political, and agricultural/industrial situations, as well as the values of the society. Chapters describe the current demographic/disease and health infrastructure patterns in the Sahel and outline the premises for the proposed strategy. A sensitive and exhaustive study that does not obscure the complexity and difficulty of the problem. [Final Report, May 1977, to Agency for International Development, Washington, DC 20523; prepared by Family Health Care, Inc., 1211 Connecticut Avenue, N.W., Washington, DC 20036.]

Judson, Horace Freeland. The Eighth Day of Creation. New York: Simon & Schuster, 1979.

Through interviews with the biologists and biochemists responsible for major breakthroughs (e.g., Watson and Crick), this book traces the discovery of the biochemistry by which species reproduce and evolve. [See the review by Jeremy Bernstein, "How Life Works," New York Times Book Review (8 April 1979 1979): 1+.]

Junta del Acuerdo de Cartagena. Technology Policy and Economic Development: A summary report on studies undertaken by the Board of the Cartagena Agreement for the Andean Pact Integration Process. Ottawa, Canada: International Development Research Centre, 1976.

The Andean Pact countries (Bolivia, Columbia, Chile, Ecuador, Peru, and Venezuela) face many serious and complex problems in the development or assimilation of technologies. They have begun to approach these problems via a series of reports, treaties and policy research. Initial chapters in this monograph analyze relevant conclusions from studies of some Western and Asian nations, but the greater part of the book presents research on the commercialization of foreign technology and the use of engineering and consulting services, in the Andean Pact countries. Finally, some necessary policies are recommended, many of which link the issue of technological dependence to the overall problem of economic development.

Kelly, Alison. Girls and Science. An International Study of Sex Differences in School Science Achievement. Stockholm: Almquist and Wiksell, 1978.

This monograph presents data, drawn from large samples from each of 14 countries, on the performance of 14-year-olds on achievement tests in biology, chemistry, physics, and practical science. Sex differences -- favoring males -- were consistently found. Reviewing the volume [in 204 Science (20 April 1979): 295-296], Leroy Wolins notes that "this preliminary report is intentionally more provocative than informative.... The analyses are usually neither complete enough nor sophisticated enough to permit any firm conclusions about the determinants of these observed sex differences."

Kennedy, Eugene. "Earthrise: The Dawning of a New Spiritual Awareness." The New York Times Magazine (15 April 1979): 14+.

An interview with Joseph Campbell, American scholar of mythology, who claims that the space age, the age when men have been able to stand on the moon and watch the earth rise in the sky, has made much of man's traditional religious symbolism and mythology inadequate. For instance, the notion of

the heavens as higher than, separate from the earth (and all the symbolism attached thereto) must be replaced by the knowledge that the earth is in reality set in the heavens. Kennedy and Campbell discuss the implications of a changing symbolism to the traditional religious celebrations.

Korein, Julius, ed. Brain Death: Interrelated Medical and Social Issues. New York: New York Academy of Sciences, 1978.

This conference volume includes both the papers presented and the open discussions. In addition to sections on clinical matters, there are also chapters on the quality of survival of patients in chronic comas; ethical, social, philosophical and religious factors; related legislative problems; and clinical and ethical issues related to the intensive care unit and organ transplantation.

Ladrière, Jean. The Challenge Presented to Cultures by Science and Technology. Paris, France: UNESCO, 1977.

Scientific development has "modified not only the content of culture. . .but also its very foundations." "There has been. . .a disintegrating effect on traditional values and forms of representation and. . .a progressive integration into the dominant culture. . .of the scientific mentality -- the values, content of knowledge and patterns of action which underlie scientific practice and are formed by it." Ladrière concentrates on the ethical and aesthetic dimensions of cultures with the ultimate goal of considering the "conditions required to make possible a reintegration of cultures incorporating the contributions of science and technology." [In the U.S., distributed by Unipub, 345 Park Avenue South, New York, NY 10010.]

Lave, Lester, and Eugene P. Seskin. "Epidemiology, Causality, and Public Policy." 67 American Scientist (March - April 1979): 178-186.

Taking as its example the studies on air pollution and human health, this article advocates increased use of carefully-drawn epidemiological evidence in addition to the theoretical data on physiology, air chemistry and diffusion modeling which are normally used. The authors are, however, realists: "What must be recognized is that while scientists can wait as long as necessary for unassailable answers to problems such as these, policymakers must make timely decisions even if the final word is not in." They plead for both policymakers and scientists to become conversant with the "strengths and weaknesses of analyses using observational data" and to understand the constraints on both sides.

Lefever, Ernest W. Nuclear Arms in the Third World: U.S. Policy Dilemma. Washington, DC: The Brookings Institution, 1979.

"For twenty years the United States has encouraged Third World governments to exploit nuclear technology for civilian purposes, while trying to discourage them from exploiting its military potential. Because power plants, which now generate electricity in many Third World states, can also provide the material and technical facilities needed to build nuclear weapons, the United States has helped develop physical and legal safeguards to prevent diversion of nuclear resources to military use." However, in the next

decades, several Third World countries will probably produce nuclear arms, despite the heavy cost and political risk. Lefever asserts that governments seek nuclear arms out of a sense of insecurity or a fear of being abandoned by a nuclear ally. He therefore concludes from his study of nuclear arms acquisition in nine nations, that the most effective preventive measure is for the United States to continue, and in some cases to strengthen, its security commitments to friendly or allied states that feel threatened, especially by a nuclear neighbor. [155pp.; $3.95 (paper), $9.95 (cloth); available from Brookings, 1775 Massachusetts Avenue, N.W., Washington, DC 20036.]

Lofland, Lyn H. The Craft of Dying: The Modern Face of Death. Beverly Hills, CA: Sage Publications, Inc., 1978.

In any society, the "complex of thinkings, believings, feelings, and doings" relative to death is not so much part of a culture of universal death as of "characteristic" death, that is, of what the culture expects. For example, in premodern society, primitive medical technology, social conditions, and, occasionally, social attitudes (e.g., facilitating the "natural" death of the aged at the time they choose) all meant that the time between the onset of "dying" and the actual death was very short. Trauma, accident, or plague claimed victims immediately. In modern industrialized society, advanced medical technology, public health activities, and improved social conditions extend (and are extending) that period. The result, the author argues, is increased public attention to death, evidenced by a multitude of publications, conferences, organizations, talk-show guests, and even legislation. Certainly, the ethical questions concerning definitions of death or the justice of differing forms of death dominate a significant portion of the medical ethics literature. The development of new social roles and social movements concerning death dominates most of this book; but the author does point out the degree to which contemporary proponents of what she terms "happy death" are another manifestation of general denouncement of the de-humanizing effect of technological dominance in the West. These movements also have particular relevance for establishment of attitudes for or against advanced medical technology, environmental carcinogens, and (we suspect) also nuclear power.

This brief book is well-written and draws from research in sociology, psychology, anthropology, and the history of medicine, all listed in an ample bibliography. Time and time again, the author trips over an interesting point and indicates that there is insufficient data to address the question. In this regard, the book makes a much larger contribution (by suggesting new agendas) than it might have made had it been a more polished treatise.

Luchins, Edith H. "Sex Differences in Mathematics: How Not to Deal With Them." 86 The American Mathematical Monthly 3 (March 1979): 161-168.

Argues that the way to deal with sex differences in math is to "not ignore or overlook or hide the achievements of one sex," but to "find out more about these achievements and make them known to our colleagues, our students, and the general public." Author describes some of the results in her NSF-sponsored survey of members of the Association for Women in Mathematics. More women than men recalled being discouraged by family and friends, and

three times as many women as men were discouraged by teachers or advisors, with the difference most marked at the graduate level. Many of the respondents indicated that the most important action, in various guises, would be to weaken "the notion of mathematics as a masculine domain," particularly among women. Luchins also notes the danger of wide publicity to the notion that women suffer from "math anxiety." "The findings suggest that differences in attitudes toward mathematics and in task- and ego-orientation may be more influential than sex differences in spatial visualization and restructurization." The author develops an interesting argument based on recent research and writings on this subject.

MacLeod, Roy, and Kay MacLeod. "The Contradictions of Professionalism: Scientists, Trade Unionism and the First World War." 9 Social Studies of Science 1 (February 1979): 1-32.

"The effect of the [First World War] on the ideology of internationalism among scientists, and on the changing normative values of scientific work are, by now, well documented. But in each of the belligerent nations, the experience of mobilization and war work also led to new economic and social arrangements." In Britain, the National Union of Scientific Workers (founded in 1917) and its successor, the Association of Scientific Workers, "represented the first step taken by British scientists to reconcile political idealism with professional aspirations." It was also greatly affected by the "inherent tension between the professional's traditional view of a life of science and scholarship, and the real difficulty of earning a living. . ." The uthors analyse the early history of the National Union and the conflicts that arose in shaping this association of scientists.

Murray, Bruce. "Now, Once a Week." 53 Yale Scientific 2 (Winter 1979): 4-5.

Perceptive analysis of the effect on a reader of The New York Times' new feature section, "Science Times." ". . .[T]he newspaper created the illusion that the business of science was the usual business of news." Murray, the Editor of Yale Scientific (published by undergraduate members of the Yale Science and Engineering Association since 1894), applauds the Times' decision to offer up science as another of "life's staples," along with "food, Saturday night, and the Pittsburgh Steelers." The similarity between journalism and science, he says, is that they both carry an air of incompleteness, an openness to revision. "Scientists and reporters speculate for a living, and the openendedness of scientific problems and newspaper stories caters to the common desire to be a temporary seer, to guess at what is going to happen next." The newspaper provides, therefore, an ideal arena for the repartee and "version-sharpening" of science, since revision (in current jargon, "updating") of news stories is automatic and ordinary in that context. [Yale Scientific Publications, Inc., 244-A Yale Station, New Haven, CT 06520.]

Nakayama, Shigeru. Characteristics of Scientific Development in Japan. New Delhi, India: The Centre for the Study of Science, Technology, and Development, Council of Scientific and Industrial Research, 1977.

Lectures on, in particular, astronomy, medicine, and mathematics in Japan. A fourth lecture attended to the problems of science and technology in the

context of modern development and post-war Japan. Available from CSIR, New Delhi - 110001, India.

National Academy of Sciences. Food Safety Policy: Scientific a Societal Considerations. Part 2 of a Two-Part Study. Washington, DC: Assembly of Life Sciences, National Research Council, and Institute of Medicine, National Academy of Sciences, 1979.

Report issued 1 March 1979 by the Panel on Food Safety Regulation and Societal Impact (Panel II), of the NAS Committee for a Study on Saccharin and Food Safety Policy. The Saccharin Study and Labeling Act directed HEW to request an NAS study on 1) saccharin and its impurities and risks and benefits of use, and 2) food safety and its evaluation in relation to underlying science, including risk-benefit studies, and regulatory regime. The second panel rests on the conclusions of Panel I re the carcinogenicity of saccharin and examined food-safety issues in the context of "a confusing legal framework, changing food technology, and the state of science and technology that must be brought to bear in assessing food-safety problems." The report recommends that there be a single policy applicable to all foodstuffs, food additives, and food contaminants and that officials be given sufficient flexibility in decision-making, in particular that there be options other than simply "to ban or not ban" and that there be an initial categorization of risks when an item is first under consideration.

In the NAS description of the study, several key issues are listed: 1) "The degree to which food should be regulated differently from other matters of safety;" 2) "The amount of discretion that should be given to a regulatory agency;" 3) "The relative values to be placed on risk and benefit;" 4) "The use of risk/benefit analyses and the concept of 'acceptable risk';" 5) "The gradation of risk;" and 6) "The special handling of the risk of cancer." [PB 292 069; 594 pp.; available from National Technical Information Service, Springfield, VA 22161.]

National Research Council. U.S. Science and Technology for Development: A Contribution to the 1979 U.N. Conference. Background study on suggested U.S. Initiatives for the U.N. Conference on Science and Technology for Development, Vienna, 1979. Washington, DC: U.S. Government Printing Office, 1979; Stock number 052-003-00546-8; no price listed.

At the request of the Department of State, the NRC prepared this report "to suggest activities that the U.S. Government might consider -- for increased support within available resources -- as a means of helping developing countries apply science and technology in support of their own development programs." Sections attend to, specifically, "Industrialization," "Health, Nutrition and Population," "Food, Climate, Soil and Water," "Energy, Natural Resources, and Environment," and "Urbanization, Transportation, and Communication," each with a list of "opportunities and proposed initiatives." The report relies on lists developed at a series of advisory panels and public forums held throughout the U.S.

Neville, Robert. "On the National Commission: A Puritan Critique of Consensus Ethics." Hastings Center Report (April 1979): 22-27.

Neville examines the work of the National Commission for the Protection of Human Subjects on research with the institutionalized mentally infirm as a case study in the development of public ethics. While he regards the use of commissions as "the proper way of establishing national policy," Neville's key argument in this article is that "this form of deliberation and policy-making exerts a conservative force in choosing among a variety of ethical options."

Newman, John and Donna Leflar. "Novels of Post-holocaust America: An Annotated Bibliography." 1 Alternative Futures [The Journal of Utopian Studies] 3 (Fall 1978): 110-116.

The 28 novels annotated in this bibliography are all set in the U.S. after a future nuclear war. They were selected from the 1000-volume "Imaginary Wars Collection" of the Colorado State University Libraries. The compilers welcome additions to their bibliography and can furnish further information about the "Imaginary Wars Collection," as well as citations to other dystopian literature. [Address inquiries to John Newman, Special Collections Librarian, Colorado State University, Fort Collins, CO 80521.]

Radiation Standards and Public Health: Proceedings of the Second Congressional Seminar on Low-level Ionizing Radiation. Washington, DC: Environmental Policy Institute, 1979.

The transcript and additional materials from a February 1978 discussion on the health effects of low levels of ionizing radiation. The meeting, sponsored by the Congressional Environmental Study Conference, Atomic Industrial Forum, and Environmental Policy Institute, gave a public forum for discussion and questions on the potential health threat. Contains a well-drawn, selected bibliography on low-level radiation issues.

"Researching Violence: Science, Politics, and Public Controversy." Hastings Center Report (April 1979): Special Supplement.

This is the edited transcript of a conference sponsored by The Hastings Center to examine the controversy generated by a proposal to establish a Center for the Study and Reduction of Violence at UCLA. The controversy lasted from 1972 to 1974, and the Center was never established. The purpose in bringing together the principals at this conference was to examine the dynamics of the controversy in a way that could shed light on anticipated problems in future attempts at research on violence and on similarly sensitive topics.

Restivo, Sal. "Parallels and Paradoxes in Modern Physics and Eastern Mysticism: I -- A Critical Reconnaissance." 8 Social Studies of Science (1978): 143-181.

This essay aims to establish a foundation for a study of the social origins and functions of the thesis that there are parallels between modern physics and Eastern mysticism. Restivo contends that although "parallelism is an important intellectual current at the interface of science and religion,

theology, and mysticism," it has heretofore not been subjected to critical analysis. In this paper, the first of a projected two-part series, the author outlines the parallelism thesis, emphasizing the claims for physics-mysticism parallels; identifies pitfalls in the parallelism arguments; and considers whether the skepticism suggested by the analysis of pitfalls is justified.

Richards, John, ed. Recombinant DNA: Science, Ethics and Politics. New York: Academic Press, 1978.

This volume includes edited papers from a University of Georgia conference, "Ethical and Methodological Dimensions of Scientific Research: Recombinant DNA, A Case Study," held in April 1977. There are also reprints of pertinent documents and an excellent brief annotated bibliography. Papers by Harold Green on the legal perspective, Susan Hadden and Tom Beauchamp on regulation, David Clem on the Cambridge regulation, and Daniel Callahan, Roy Curtiss III, and Mary B. Williams on the ethical issues, highlight this volume.

Rosenberg, Charles E. No Other Gods: On Science and American Social Thought. Baltimore: Johns Hopkins University Press, 1976.

A collection of the notable historian's essays, including a long introductory article which explores the complex relationships of science to social thought throughout the history of the United States.

Schuyten, Peter J. "Scientists and Society's Fears; Nuclear Accident Aggravates the Public's Distrust of Assurances from Experts on Technical Topics." The New York Times (9 April 1979): 1, D9.

Good example of the news interpretation of the social meaning of Three-Mile Island. Quotes a variety of scientists, engineers, sociologists, historians, and political scientists on their response to the questions "How much trust. . .should a nonscientific public place in the pronouncements of the scientific community? What are the limits of technological knowledge?"

Smith, R. Jeffrey. "Carter Privacy Bills Cover Research, Medicine." 204 Science (20 April 1979): 284-285.

Privacy legislation proposed by the Carter Administration would have important consequences for medical and scientific researchers. Major provisions of the two bills, developed from the 1977 recommendations of the Privacy Protection Study Commission, are reviewed in this article. Although the bills were devised to increase awareness of invasions of privacy and to limit official access to personal records, there are numerous (22) exceptions to the rule restricting access to medical records.

Stein, Jane J. Making Medical Choices: Who Is Responsible? Boston: Houghton Mifflin Co., 1978.

Expanding medical technologies have created unprecedented ethical decisions which must be faced by doctors and patients alike. The cost of some equipment and methods of treatment is so high that the economics of using them must be weighed against their life-saving potential. Additional questions

arise from the limited availability of some technologies: who should be chosen to benefit from them when not everyone can? How should such choices be made? Stein uses case studies to raise the ethical issues of a lifetime of medical choices, ranging from amniocentesis and fetal monitoring to the use of mechanical respirators for the dying. The final chapter reviews activity in medical ethics research by such groups as The Hastings Center and Georgetown University's Kennedy Institute for the Study of Human Reproduction and Bioethics, and gives a brief overview of the ways in which government, the courts, and insurance companies are affecting medical ethics.

Stokes, Bruce. "Local Responses to Global Problems: A Key to Meeting Basic Human Needs." Worldwatch Paper 17. Washington, DC: Worldwatch Institute, 1978.

The key to meeting basic human needs is not always "highly centralized national and international efforts" -- sometimes it is "through people doing more to help themselves." Home gardens, cooperative agricultural plots, community "barn-raising" approaches to housing, self-health care -- all exemplify proven and, the author argues, necessary approaches to help other people, and represent an approach that can be extended into policy decisions for helping other nations. Available from Unipub, Box 433, Murray Hill Station, New York, NY 10016; $2.00.

Thackray, Arnold. "The Human Dimensions of Science." 1 Humanities in Society (December 1978): 261-269.

". . .[S]cience is constituted in and through its human dimensions: they are not additional or ornamental measures of an otherwise available object." Thackray presents three aspects to his argument. First, that science is modern in the sense that it maintains "a future-affirming vision, a presentist orientation, and a progressivist faith," all of which are "central to the social processes by which science was invented and articulated." Second, in the United States, science has provided enormous service in "taming a continent, ordering a new world, assimilating a potpourri of peoples, and creating myths of meaning." And, third, this is "a historical moment of secular change," during which "Our understanding of nature is undergoing a profound shift."

"The Crisis at Three Mile Island: Nuclear Risks Are Reconsidered." 204 Science (13 April 1979): 152-158, 160-164.

This issue includes several articles on the nuclear accident and the political and scientific issues of the controversy over the dangers of low-level ionizing radiation. "H_2 Bubble is Unexpected Source of Trouble," by Eliot Marshall; "Political Fallout from Three Mile Island," by Luther Carter; "Low-level Radiation: A High-level Concern," by Constance Holden; "Low-level Radiation: Just How Bad Is It?" by Jean L. Marx. See also "A Preliminary Report on Three Mile Island," by Eliot Marshall, in 204 Science (20 April 1979): 280-281.

Thomas, William A. "A Report from the Workshop on Cross-Education of Lawyers and Scientists." 19 Jurimetrics Journal of Law 2 (Winter 1978): 93-99.

The National Conference of Lawyers and Scientists (which consists of seven ABA and seven AAAS representatives) convened this meeting to explore ways in which lawyers might become more familiar with the scientific method and scientists with the legal process. The participants developed many ideas for approaches to this problem via individual initiative, formal academic education, and continuing education programs for practicing professionals.

Turner, Frank M. "The Victorian Conflict Between Science and Religion: A Professional Dimension." 69 Isis (September 1978): 356-376.

Much of the conflict between science and religion in late Victorian England centered around epistemological differences over the role of theology as an intellectual authority. This essay examines other aspects of that conflict, arguing that "[The] extensive ongoing discussion about the character of the Victorian scientific community, its function in society, and the values by which it judged the work of its members. . . .largely determined why spokesmen for religion and science clashed when they did and as they did."

United Nations Educational, Scientific and Cultural Organization. Suicide or Survival? The Challenge of the Year 2000. Paris, France: UNESCO, 1978.

Contributions from an international smorgasbord of contributors asked to consider the challenges which today's society may or should feel from the society of the 21st century. The editors thoughtfully provided margin notes of cross-cultural explanation, giving readers brief biographies, citations to classical or literary allusions, and explanations of legislation or treaties, and also marginalia on the Periclean oration, Moby Dick, and Watergate. Available from Unipub, Box 433, Murray Hill Station, New York, NY 10016; 192 pp.; $12.75.

Walsh, John. "'Unfaculty,' A Growing Factor in Research." 204 Science (20 April 1979): 286.

A brief overview of a recent study of the demographics of academic science, which found that an increasing number of doctoral level scientists are holding open-ended, non-tenure track research posts. (Non-faculty Doctoral Research Staff in Science and Engineering in United States Universities. Commission on Human Resources, National Research Council, 2101 Constitution Ave., N.W., Washington, DC 20418.)

Warner, Deborah. "Science Education for Women in Antebellum America." 69 Isis (March 1978): 58-67.

This article provides a detailed overview of the variety of routes open to women by 1860 for involvement in America's scientific enterprise.

Wax, Murray L., and Joan Cassell, eds. Federal Regulations: Ethical Issues and Social Research, AAAS Selected Symposium 36. Boulder, CO: Westview Press, 1979.

Does increased federal regulation of social research mean higher costs and constricted research, or improved interaction between investigators and, hence, better research? The papers from the 1978 AAAS Symposium explore ethical and political issues in national/international research and laboratory or field settings -- for example, privacy, informed consent, review boards, and social custom.

Weart, Spencer. Scientists in Power. Cambridge, MA: Harvard University Press, May 1979.

A narrative of the early French research in nuclear physics--from laboratory on through working reactor and bomb--which captures the reader's attention from the first sentence. Weart's historical account is an intense analysis of the interaction of scientists and scientific power with politicians and political power: "Discussions at the homes of the Curies, the Perrins, and the Borels often turned to politics. This was not idle conversation, for in France science and politics traditionally interlocked. Scientists needed politicians, politicians needed scientists, and at the turn of the century these needs were growing stronger."

Webber, Melvin M. "Technics and Ethics in Transport Decisions," in Transportation Research Board (Commission on Sociotechnical Systems), National Research Council, National Academy of Sciences. Transportation Development and Land Use Planning: Conference Proceedings, Transportation Research Board Special Report 183, 1978.

What might be the implications for transit planning of a turnaround in the ethics of planning. "It has taken a long time for planners to internalize the cognitive style that compels them to look for potential outcomes and to pursue distributive justice. . . .[T]his style of planning has a built-in ethic, an ethic that contends the customer is right and that the larger community has to yield to individual customers' preferences, not the other way around as city planners have long maintained." The author believes that it is imperative "to widen the array of options that are open to the average customer and to the deviant customer, because a) everyone does not want the same thing and b) a lot of people cannot now get what they want." [49 pp; $3.60; Transportation Research Board, National Research Council, 2101 Constitution Avenue, N.W., Washington, DC 20418.]

Weiss, Charles, Jr. "Mobilizing Technology for Developing Countries." 203 Science (16 March 1979): 1083-1089.

This article emphasizes the need for a "holistic" approach to the introduction of technological innovations in developing countries. Close attention must be given to the institutional structures and social context, as well as the technical problem to be solved, if the technology chosen is to be appropriate to the local situation.

Meetings Calendar

12-24 July 1979	World Council of Churches Conference on Faith, Science, and the Future, Massachusetts Institute of Technology, Cambridge, MA. Contact: Gordon Schultz, Room 26-147 M.I.T., Cambridge, MA 02139.
12-20 July 1979	World Conference on Agrarian Reform and Rural Development, Rome, Italy. Sponsored by the United Nations Food and Agricultural Organization (North American Liaison Office, 1776 F Street, N.W., Washington, DC 20437).
18-23 July 1979	29th Pugwash Conference, Mexico City. Contact: Executive Office, Pugwash, 11A Avenue de la Paix, 1202 Geneva, Switzerland.
5 August 1979	Seminar on Innovations in Teaching Science Communication, held in conjunction with Association for Education in Journalism Annual Meeting, Houston, TX. Contact: Prof. Sharon Friedman, Journalism Div., UC #29, Lehigh University, Bethlehem, PA 18015.
19-26 August 1979	Fourth International Wittgenstein Symposium, Kirchberg/Wechsel, Austria. Theme: "Language, Logic, and Philosophy." Sponsor: The Austrian Wittgenstein Society, (A. Hubner, President) A-2880 Kirchberg/Wechsel, Markt 234, Austria. U.S. Contact: W. Leinfellner, Deparment of Philosophy, University of Nebraska, Lincoln, NE 68588.
20-31 August 1979	United Nations Conference on Science and Technology for Development, Vienna, Austria.
22-29 August 1979	International Union of History and Philosophy of Science Sixth International Congress of Logic, Methodology and Philosophy of Science, Hannover, Federal Republic of Germany.
27-30 August 1979	American Sociological Association, Annual Meeting, Boston, MA.
1-4 September 1979	American Psychological Association, Annual Meeting, New York, NY.
14-16 September 1979	Seventh Annual Biennial Convention of the American Studies Association, University of Minnesota, Minneapolis, MN. Program Committee Chairman: John Howe, Program in American Studies, 225 Lind Hall, University of Minnesota, 207 Church St., S.E., Minneapolis, MN 55108.

14-17 September 1979	Royal Institute of Philosophy Conference on Law and Philosophy, University of Lancaster, Lancaster, England. Contact: M.A. Stewart, Department of Philosophy, The University, Lancaster LA1 4YT, England.
11-13 October 1979	Fourth Annual European Studies Conference, Omaha, NE. Contact: Professors Anthony Garcia and Elvira Jung, Department of Foreign Languages, University of Nebraska at Omaha, Omaha, NE 68182.
17-20 October 1979	Annual Meeting of the Society for the History of Technology, Newark, NJ. Chairperson: Reese V. Jenkins, Rutgers University, 1 Richardson St., New Brunswick, NJ 08903.
25-27 October 1979	INTERFACE '79--Third Annual Humanities and Technology Conference, Marietta, GA. Conference Co-Directors: Drs. Roberta Gates and George Kennedy, Department of English and History, Southern Technical Institute, Marietta, GA 30060.
29-31 October 1979	Annual Conference of the Association for Computing Machinery, Plaza Hotel, Detroit, MI. Theme: "Advances of the 70's--Challenges of the 80's." Program Chairman: James L. Elshoff, Computer Science Department, General Motors Research Laboratories, Warren, MI 48090.
1-3 November 1979	Conference on Business and Professional Ethics, Western Michigan University, Kalamazoo, MI. Contact: Prof. Michael S. Pritchard, Department of Philosophy, Western Michigan University, Kalamazoo, MI 49008.
2-4 November 1979	Third Annual Meeting, Society for the Social Studies of Science, Washington, DC. Contact: Albert J. Teich, Graduate Program in Science, Technology and Public Policy, George Washington University, Washington, DC 20052.
late December 1979	Annual Meeting of the History of Science Society in conjunction with the American Historical Association, New York City. Program committee chairman: Arthur Donovan, Department of History, West Virginia University, Morgantown, WV 26506.
22-26 September 1980	Third International Congress on the History of Oceanography, Woods Hole, MA. Chairman: Daniel Merriman, Professor Emeritus of Biology (Yale University), 298 Sperry Road, Bethany, CT 06525.

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ARTICLE INDEX
(arranged by author)

BIBLIOGRAPHY INDEX
(arranged by author)

The ranks of articulate spokesmen in the United States for the sciences and humanities were severely depleted this spring by the untimely deaths of four persons--John Knowles, Ray Bowers, Andre Hellegers, and Charles Frankel. Each was a bridge builder who used his specialized expertise to make a contribution to public life. Knowles, a physician and educator, was president of the Rockefeller Foundation. Bowers was an expert in science policy and for several years led the Cornell University Program in Science, Technology and Society. Hellegers, also an M.D., was director of the Kennedy Institute of Ethics at Georgetown University. Frankel, whose specialty was philosophy and public affairs, was on leave from Columbia University to guide the National Humanities Center through its formative stages. Their achievements were large. Each man was widely admired, not simply as a professional but as a caring human being. They will be greatly missed.

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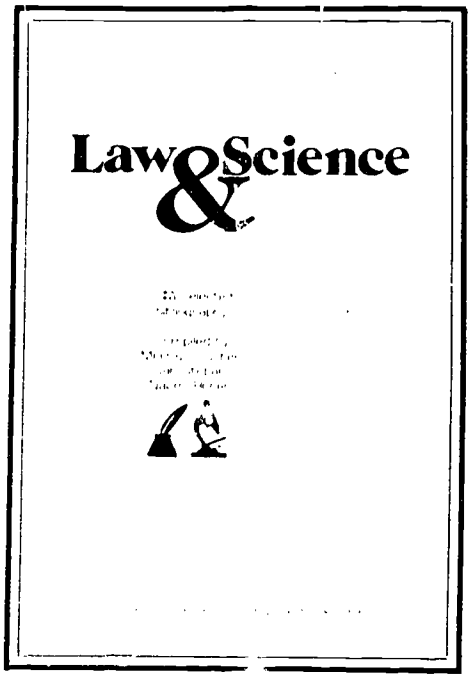

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Compiled by Morris L. Cohen,
Jan Stepan, and Naomi Ronen
(Harvard University Law School Library)

Law and Science is a selected and classified bibliography of the burgeoning literature on the interface of science and technology and the legal system. Books, periodical articles, monographs, and government documents from a wide range of fields--the sciences, law, political science, sociology, philosophy--demonstrate the multidisciplinary nature of issues such as privacy, public health or resource management. Special sections list serial bibliographies, periodicals, or loose-leaf services which can help the reader to uncover further references. An introductory essay by Morris L. Cohen sets the law-science relationship in a historical context.

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