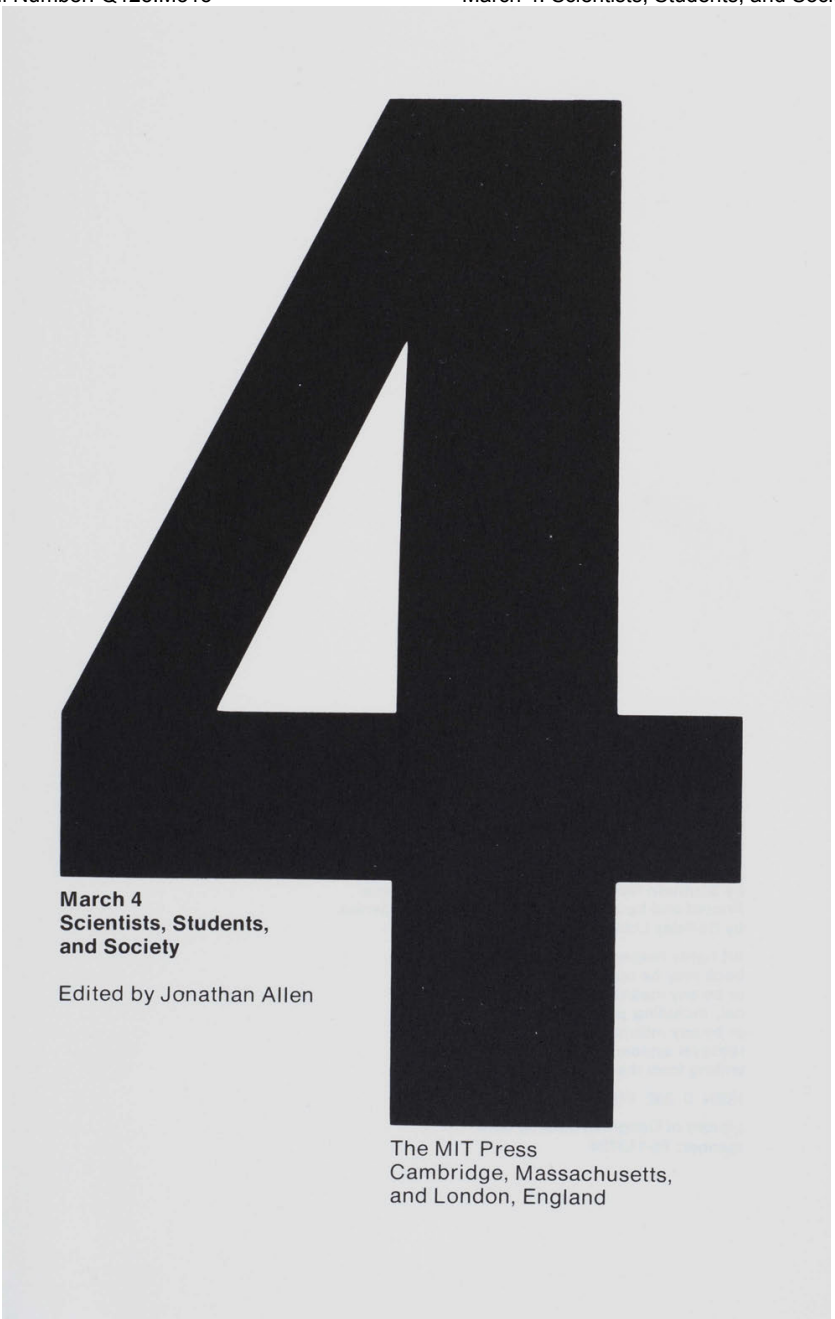
March 4
Scientists, Students,
and Society



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Preface

This book is the historical record of a series of talks and panel discussions that were sponsored by the Union of Concerned Scientists at MIT and held on March 3 and 4, 1969. The issues under consideration, relating science to government and society, had been steadily mounting in importance to the scientific community. Many scientists had begun to share the strong conviction that they should speak out on the national policies whose furtherance they served in one way or another. The meetings aroused considerable attention, even on the national level, before a word had been spoken.

As the dates for the talks drew near, plans for fairly complete press coverage became apparent, and the group of speakers grew to include many prominent men. It was decided to tape-record all of the talks, and some thought was given to the possibility of printing the transcriptions. After the meetings were over, their publication in book form was arranged in order to reach a wider audience.

To capture as much of the feeling of the occasion as possible, a minimum of editing has been done, and the printed versions are very close to the original transcriptions. The reader will not find here a collection of tightly phrased position papers but may, instead, find himself involved in grappling with the issues. Frustration, anger, and attempts to find methods to change the direction of national policy are evident throughout the book.

Many people helped to bring the March 4 discussions into being. Those involved in developing the original idea are mentioned in the historical introduction by Murray Eden. The arrangements for recording the original talks were made by Morris Halle, and he has been of invaluable assistance at all stages of the book's production. Elliot Lieb assisted with the early planning of the book. Deborah McPhail and Katrina Streif performed the difficult and lengthy job of transcribing the tapes. Astute editorial suggestions were furnished by Patricia Eden, and Ann Allen helped with all of the typing, editing, and proofreading. The speakers have all been most helpful and cooperative in preserving the style and delivery of their talks, a task that hasn't always been easy. Finally, Francis Low, Chairman of the Union of Concerned Scientists during the meetings, has been a great help at many points in the overall production.

Jonathan Allen, March 1970

Historical Introduction

It may appear to be somewhat pretentious to publish a history of the March 4 activities. After all, it is hardly novel for a university to be the setting for a day or even three days of speeches and discussions. Nor can we, at so short a time after March 4, 1969, claim that these events were especially influential, even though they were widely discussed before the fact and reported by the press—much more widely than any other campus activity unmarred by violence. Nevertheless, it is one of a few events in recent MIT history that engaged a large fraction of the MIT community. More important, it was a special facet of the current resurgence of intellectual excitement and spirit of social activism on American campuses. For these reasons, we feel it worthwhile to set down an account of the origin of "March 4."

Julius Stratton, a former president of MIT has characterized the Institute as "a university polarized around science." The major part of MIT's students and faculty are to be found in the Schools of Engineering and Science. The stereotype of an MIT student is that he studies hard and has few, if any, concerns other than his career. As with many other stereotypes, this one is overdrawn. It remains true, nevertheless, that many MIT students have fairly definite career goals in mind and recognize that they may need to work hard to reach them.

The MIT faculty may also be characterized as work-oriented; the ambience is not one of leisurely intellectual contemplation. Furthermore, many faculty members have served as advisers to agencies of the federal government and many, perhaps even a majority, supplement their incomes by consulting. Undoubtedly, the faculty's cast of mind and extracurricular activities have an influence on their political attitudes. Until very recently the faculty, as a body, has preferred to avoid the formal consideration of issues that might have overt political aspects.

Members of the MIT faculty concerted in political action in two recent presidential elections. In 1964, they helped to form an organization called "Scientists and Engineers for Johnson-Humphrey"

and, in 1968, a smaller organization called "Scientists and Engineers for McCarthy." *

Individual faculty members have also expressed opposition to a variety of governmental policies. These are the "outside" men, defined by Professor Victor Weisskopf in his presentation included in this collection of papers. In 1961, a group of professors in the Boston area, drawn primarily from MIT and Harvard, formed BAFGOPI (Boston Area Faculty Group on Public Issues). At that time BAFGOPI contributed to the campaign against the construction of fallout shelters by providing speakers, testifying before federal and state legislative committees, and publishing antifallout-shelter advertisements in *The New York Times*.

The academicians who established BAFGOPI did not intend it to become a membership organization with a well-defined set of objectives. It has remained a loose association of university people who can be called together quickly when need arises to discuss ways in which they can act to influence the political decisions at issue.

Left-wing student groups have existed at MIT for at least a decade, but they have been very small and no more influential than the radical student groups in most other American universities. But, at MIT, student attitudes toward social action had begun to change by 1965. The growth of student dissatisfaction with the shortcomings of our existing political and social institutions is not easily understood. The sources of discontent are complex, but the overriding issue has been the American military adventure in Vietnam, and the critical irritant was the draft. Several groups were formed to support resistance to the draft and to defend young men who were prosecuted for their refusal to serve.

The first large-scale actions taken on the MIT campus were part of the wave of demonstrations against the war in the fall of 1967. They took the form of a protest against recruiting students to work for Dow Chemical Company, supplier of napalm to the U.S. Armed

* Not unexpectedly, virtually the entire membership of Scientists and Engineers for McCarthy had been members of "S & E for J-H." The converse was not true. However, polls conducted by students in the spring of 1968 indicated that the majority of faculty favored McCarthy as Democratic candidate and for president.

Forces. It is clear that by this time the spirit of student activism had spread beyond the small group of radical students. More than one hundred and fifty students attended a planning meeting, which was held on the evening prior to the visit of the Dow interviewers on November 6. These students voted to hold a "nonobstructive" sit-in at the placement office during the next day. Several hundred students sat in all day Monday.* Of course, even these students and the faculty joining them in the demonstration were only a fraction of the MIT community, and whereas the majority of the community may have been reluctant to take an action so jarring to conventional behavior, they were certainly not apathetic.

A group of faculty wanted to demonstrate that they shared the students' dissatisfaction with America's role in Vietnam, and their demonstration took a more conventional form: a public discussion of the issues was organized in great haste to be held during the lunch hour on the day of the demonstration. The meeting was entitled "An Inquiry into Social Responsibilities; Napalm, Vietnam, and the University." Dr. Frank Ervin of the Massachusetts General Hospital who, with a panel of physicians, had recently toured Vietnam, spoke about napalm and gasoline burns. Professor Philip Morrison spoke for the opponents of the American presence in Vietnam. Strenuous attempts were made to obtain representation from supporters of the official Vietnam policy. Ithiel Pool, Professor of Political Science and frequent adviser to the U.S. agencies in Vietnam, agreed to speak; the Dow Chemical Company sent Mr. Max Key, Director of Industrial Relations, to present the company's view about the manufacture of napalm. The Defense Department, however, refused to participate. Whereas MIT's President Johnson and other administrators would not speak publicly on the question of the war and the issues it had raised, they were strongly in favor of the idea of open discussions. President Johnson introduced the November 6 meeting; Professor Walter A. Rosenblith, at that time Chairman of the Faculty, acted as chairman of the meeting. Attendance exceeded the wildest hopes of the organizers. Kresge Auditorium, which seats about 1200 and has a capacious outer lobby, was filled

* The Young Americans for Freedom held a counterdemonstration; only a handful showed up.

to the fire doors. The audience was attentive and largely sympathetic to the convictions of the meeting's organizers, but it was hardly an assembly of partisans.

November 1967 was also the time that Senator Eugene McCarthy began his presidential campaign. The students' labors in his behalf are well known. Students at MIT shared the general enthusiasm and dedication; hundreds worked for his candidacy. On one occasion that winter, seven bus loads of students left Massachusetts Avenue for a long weekend of door-to-door canvassing in New Hampshire.

The story of the way in which the students' idealism was soured by party politics and Mayor Daley's police is also well known. Here at MIT, as elsewhere, many students felt that the conventional political ways had become pallid and—in the students' terminology—irrelevant; the war in Vietnam went on as before.

There is ample evidence of the increase of student disillusionment and cynicism. It is also clear that all over the United States, student groups began to seek other more direct ways to change their world. One device that the antiwar student activists hit upon was the offer of sanctuary to soldiers who refused to continue in military service. On October 1, 1968, an ad hoc association of MIT student groups offered sanctuary to John M. (Mike) O'Connor, a soldier who was AWOL. A large hall in the Stratton Student Center was occupied for six days, during which several thousand people (mostly, but certainly not entirely, MIT staff, faculty, and students) came and went, some to participate in nonstop discussions, others simply to observe. After a week the hundreds of young people who had lived in the Sala de Puerto Rico with Mike, eating peanut butter sandwiches and sleeping on the parquet floor, had dwindled to perhaps sixty or seventy. Of course, the sanctuary came to an anticipated conclusion when Mr. O'Connor was seized by the authorities in the early hours of Sunday, November 10.*

There are a number of MIT faculty and administrators who have participated in the political process by serving as advisers to agencies of the government. A very few have run for public office. How-

* Mike O'Connor was sentenced to four months of hard labor, which he served at the Ft. Devens stockade. (He had feared that he would be returned to Ft. Bragg in North Carolina.) He has been discharged from the Army and is living in Cambridge.

ever, faculty members have in large measure restricted their political activities either to signing statements to be published in the newspapers or responding to student initiatives. A small group of professors have expended a great deal of time, effort, and money in defending students whose efforts to resist military service put them in jeopardy. Many young Americans have tried to express their resistance at every point of the drafting process, while the civil and military authorities have used as many devices in overcoming or punishing the resistance as they could muster.

During the early fall of 1968, some of the MIT faculty who might be characterized as holding a liberal, antiwar position proposed to form a group ("Group Delta") that might be able to anticipate crises and not simply respond when they arose. Group Delta was able to raise a substantial sum of money to defend Michael Zygmond, a Research Associate in the Department of Nutrition and Food Science, who had refused induction and was being prosecuted as a draft evader. After a few meetings Group Delta lapsed into quietude. Members of the MIT faculty are busy people, and in the absence of crisis the priorities of teaching and research become too pressing. However, the mood of these professors is reflected in an extract from a Statement of Purpose prepared by Group Delta:

All of us are aware of the atmosphere of frustration, confusion, and hostility pervading America. We are in a crisis manifest in many ways and many places: in Vietnam, in Chicago, in Roxbury, in Wellesley, in East Cambridge, in Neighbourhood 4, in our laboratories and classrooms. It is affecting our attitudes, our work, our relations with students and colleagues.

The idea for the March 4 action originated in the dinner table conversation of several graduate students in physics. The dinner guests at Joel Feigenbaum's house talked of what would happen if scientists refused to work at research until the Vietnam war was over.* The physics students' speculations became more realistic, and the idea evolved that scientists could indeed stop their research for one day in order to emphasize the depth of their concern

* Opponents of wars have long thought and, occasionally, acted extravagantly in the face of their powerlessness. Unfortunately, few possess that citadel of power which Aristophanes conferred on the women of Athens. If all basic research were stopped, it might be a source of acute embarrassment to the government in power, but it has little economic force. The industry and the technology supplying the needs of war are not at all affected, at least in the short run.

as well as to protest against the direction in which our society is going.

On November 20, Feigenbaum, Alan Chodos, and Ira Rubenzahl took the statement they had prepared to Professor Kurt Gottfried, a visiting professor in the Department of Physics, to ask for his reactions. Before the weekend was over, they had discussed the draft with Professors David Frisch and Bernard Feld. At the same time Gottfried discussed the statement with Professors Herman Feshbach, Francis Low, and Steven Weinberg. Gottfried rewrote the statement and showed it to Feshbach and Low who agreed with the basic ideas.* Thus far, it had not moved out of the Physics Department. Then a number of other faculty were brought in: Philip Morse, Victor Weisskopf, Jerome Lettvin, and myself.

The students were also recruiting at this time, beginning, as might be expected, in the Physics Department. Jonathan Kabat, a graduate student in Biology, joined the group. Kabat, in turn brought in Salvador E. Luria, Professor of Biology and Nobel Laureate, who is his thesis adviser. Noam Chomsky, Professor of Modern Languages and Linguistics, agreed to sign the draft. Chomsky is held in high regard by many student activists at MIT, for both his political attitudes and his intellectual integrity.

Plans for a program of speakers were started. Professor Hans Bethe of Cornell was called, and he agreed to speak.

The following days were spent in discussing the proposal with other potential supporters and in preparing draft after draft of the formal statement.

In some universities the faculty and officers of the administration hold each other in mutual distrust. The perils of such a state of affairs have been notably illustrated at Columbia University. This has not been the case at MIT. President Howard Johnson, a former Professor in the School of Management, has been assiduous in holding open lines of communication with students and faculty. Provost Jerome B. Wiesner, former Science Adviser to President Kennedy and Professor of Electrical Engineering, has worked hard on behalf of arms control and disarmament for many years. Wiesner had also worked with many of the faculty on political issues. It is not at all

* This statement after much further revision became the statement signed by the sponsors of March 4. The line of descent from the original students' draft is direct.

surprising, therefore, that the organizers felt it appropriate to inform the administration of their plans.

Wiesner set down his responses to the draft statement, in a letter of December 6, in which he questioned whether a single day's work stoppage with (as he saw it) little focus or follow-up would be very effective. He wrote,

. . . I believe that a continuing study and discussion of the problems of the arms race, the needs of developing countries and the problems at home would yield much more results. Of course, this would also take much more time. . . . If you could get the scientific community organized to make a continuing contribution to the arms control field, for example, it would really be worthwhile.

On December 19, the signers of the statement held their first meeting. Professor Feshbach was chosen as chairman, and Feld and Rubenzahl served as the program committee. The students (and a few faculty) had by this time formed the Science Action Coordinating Committee (SACC) with Chodos as chairman. SACC was to be their vehicle for organizing a succession of actions.

Feigenbaum suggested that the faculty might form a parallel organization to work jointly on the March 4 events. His proposal was turned down at the signers' meeting. At the time it was thought that faculty and students could plan the March 4 activities in a single body. (March 4 was the date set by the conjunction of the schedules of Bethe and George Kistiakowsky, a Harvard professor and former Science Adviser to General Eisenhower.) The program committee went to work during the Christmas recess, and an ad hoc steering committee with a shifting membership began to meet with increasing frequency.

Not many professors in science or engineering are familiar with the pressures and pace of political activity. For the faculty participants in the March 4 planning, the turmoil of preparation was complicated by their relation to their student collaborators on the one hand and to their academic colleagues on the other. In the beginning the working alliance between the students and their teachers had been an uneasy one. On more than one issue tempers had flared. While the respect for a professor in academic matters should rest on his greater knowledge and experience, in a political venture the professor might not have had any greater experience

than his students. In fact, many of the SACC students had acquired a considerable education in politics in the previous year during the McCarthy campaign for president.

The students had originated the plan for a work stoppage as a protest against the Vietnam war and the misdirection of America's resources. They had supplied a great deal of the work of preparation and publicity for March 4. Faculty were brought in for two reasons, one of principle and the other, pragmatism. The students wanted to include all segments of the MIT population in the gesture of protest and in the day's discussions. They also recognized that faculty members could provide prestige, enhance publicity, and help to persuade eminent men of science and politics to participate. The alliance with faculty was not achieved without some cost to the students' concerns, since only a small proportion of the faculty were in agreement with the political interpretation of the more generally radical students. To the students, many faculty appeared to be well-intentioned but timid liberals who were unwilling to confront the issues directly because they were reluctant to jeopardize their status in the university.

The faculty saw it differently and were wont to base their actions on another set of values. They saw little gain and great peril to MIT in polarizing the Institute on such emotionally charged subjects. Neither students nor faculty participants regarded the protest as an action against MIT, but the faculty was considerably more sensitive to the issue. Put baldly, faculty members were very reluctant to put their academic institution in jeopardy, even symbolically. Some students, outraged by what they saw as shameful indifference to the injustices of society to which the university is—at the least—a passive observer, placed no such high value on their university's stability.

Time and again the tension induced by differences of interest in the steering committee flared out in acrimonious argument. Two incidents in January epitomize the differences in style and attitude. In early January SACC prepared an open letter addressed to Dr. Lee DuBridge, President Nixon's new science adviser. SACC proposed that the letter be sent by the students and the faculty signers of the March 4 statement. The letter was critical of Dr. DuBridge's state-

ment to the press in which he opined that "in one way or another the university should assist the Department of Defense." The letter urged Dr. DuBridge

to call for closer university ties, not with the Department of Defense, but with the Departments of HEW, HUD, and Transportation; we urge you to promote scientific endeavor not for its spectacular achievements in space, not for its military potential, not "from the point of view of international prestige," but for its potential to alleviate human suffering and from the point of view of science as a cultural achievement worthy in its own right of public support.

Most of the faculty on the planning committee felt that the letter had raised new issues that were both peripheral and controversial. In any case the faculty members who were present insisted that the steering committee could not commit all of the signers. It was ultimately agreed that SACC would proceed to solicit signatures for the letter to Dr. DuBridge as a matter separate from the March 4 activities. The letter appeared in *The New York Times* on January 21. Dr. DuBridge did not reply directly.

In late January, the magazine *Science* gave prominent position to a report of the proposed March 4 activities. The headline read, "Scientists Plan Research Strike at M.I.T. on March 4." This report appeared before any formal announcement had been circulated within MIT. The organizers had intended to follow the intramural announcement with a press release, and a first draft for this release had been prepared. Now the news was out, and the press began to call for information. David Deitch, a reporter for *The Boston Globe*, arranged to talk with Chodos and Feigenbaum. The students gave Deitch the press release and a background interview. Some of the faculty organizers were apprehensive about the outcome of the interview at which there were no faculty representatives, but SACC had no reservations or fears on that score.

The story appeared on January 24. That morning Feshbach's telephone began to ring constantly, and his office took on the appearance of a city desk. The *Globe* report appeared to contain inaccuracies that some of the signers felt had distorted the purposes of the demonstration. The morning was spent in preparing a clarifying statement for the *Globe*. There may have been other communications to the *Globe* because its editor called to ask if March 4

was all off. It was clear that the faculty participants needed to review their position.

The steering committee met and made decisions on two crucial issues: it was agreed not to make any changes in the statement or covering letter, and it was agreed that there should be two organizations. Faculty and students would each have charge of their own sessions at the meeting, and March 4 would be sponsored by two groups: SACC (mostly students) and the Union of Concerned Scientists (mostly faculty).

It should have been clear earlier that there were two poles of interest among the organizers. The establishment of UCS was explicit recognition of these different interests; now the areas of agreement could be equally explicit. Once the membership of SACC agreed to these proposals, a meeting was called of the signers of the March 4 statement, and again there was agreement on the course of action taken by the steering committee. From this point on, cooperation between SACC and UCS went easily with little of the earlier sense of conflict and suspicion.

While the points at issue with the students in SACC had been resolved, there remained the need to clarify the intent of the March 4 activities for the other members of the faculty and staff. From the beginning supporters of the statement had been sought. As is the case with any political document of this nature when circulated among intelligent men, widely different reactions were observed. Many faculty members signed the statement with enthusiasm. Others signed but with expressed reservations about certain aspects of the contents. Some felt the statement to be objectionable in whole or in part and withheld their signatures, although not necessarily their support, for the overall objectives of the statement. Many revisions of the statement were made to remove ambiguities or to satisfy specific criticisms; for example, a sentence that suggested that the signers had lost confidence in the federal government was dropped. However, there was one central point at issue: the call for a research stoppage.

It is clear that the call for scientists to stop their research activities for a day evoked strong emotions. Most scientists regard the conduct of research as distinct in kind from most other occupa-

tions. To many, it is a way of life rather than a way to earn a living. The business of research goes on as much in the brain as it does in the laboratory and is rarely a nine-to-five activity. Furthermore, an academician who is also a scientist has many fixed demands on his time: classroom lectures, meetings with students, committees, and the like. Almost certainly, he regards the time set aside for his research as a possession to be zealously guarded. Viewed in this light, the UCS statement called on fellow scientists to volunteer a personal sacrifice as a sign of concern with the sharp, troubling social issues of our world. Some of us felt that the private gratifications of research, valuable though the research may be to both ourselves and society, cannot always take precedence over the concerns of a scientist as citizen. That the press occasionally characterized the action as a "strike" may reflect their lack of understanding of the significance that science holds for scientists.

The word "strike" in the *Science* article alarmed a number of the faculty. One prominent faculty member was sufficiently exercised that he wrote to President Johnson expressing his fears of the consequence of a political polarization within the faculty. He also wrote to Dr. Bethe urging him to retract his agreement to talk under the auspices of the March 4 Committee. Members of the organizing committee met with President Johnson and other members of the administration and reiterated that the symbolic act of the research halt was not directed against the Institute. There appeared to be general acceptance of the position presented by the March 4 organizers with respect to this issue. Later, however, the issue was raised again, this time at the Faculty Council,* and this forum expressed concern about the interpretation the public might put on the call for a research stoppage. That afternoon, Feshbach, as chairman, received the first of a series of calls urging that the research stoppage be called off.

Meanwhile March was only a few weeks away, and the mechanics of organizing the activities were continuing. The next days were spent in almost continuous discussion; there was the premature press release, what its consequences would be and what to do about it, as well as many other issues. The *Science* article had

* This body comprises the chief administrative officers, laboratory directors, deans, and heads of departments.

alerted scientists all over the country about our plans. Other schools began to plan similar actions. Telephone calls about further information and consultation poured in to members of the organizing committee. There were rumors that several of the faculty signers were being pressured to withdraw (none did). The moral propriety of a scientists' work stoppage was debated with many otherwise sympathetic colleagues.

There are faculty members at MIT who support the American war in Vietnam. However, the principal objections to the March 4 plans were not related directly to the war. They were rather that a work stoppage was improper for a scientist and that a canvass would divide the faculty on an issue unrelated to the educational process. Several faculty members who expressed general agreement with the goals of the meeting but who held to this latter view proposed that a compromise be sought so as to enlist a greater proportion of the faculty. It was also suggested that in such a case President Johnson might agree to call an official MIT convocation to discuss the issues raised by the UCS statement.

In early February several "truce" meetings were held to discuss these proposals.

The notion of a convocation had a number of potential advantages. It would clearly eliminate open conflict, and the day would have official sanction. The question of a work stoppage would become moot, since the day would in effect become an Institute holiday. But there would be certain costs. The program would probably take a more neutral form. One proposal of a joint statement called for a meeting "designed to initiate a critical examination of the major political, military and social consequences of scientific and technological research, (and) springs from a very deep concern about the uses to which the results of scientific research may be put." This statement carried none of the tone of protest and action orientation of the UCS call for the March 4 meeting.

But there was a much more important objection to such a course. The discussions with the administration and with those other colleagues who objected to the planned course of action were initiated to exchange information, to maintain contact with other faculty not committed to the UCS position. The UCS steering committee had moved imperceptibly, but steadily, from conversation to nego-

tiation. And whereas the other parties to the negotiation were representing only themselves, the UCS steering committee was responsible to the colleagues who had signed the UCS statement and had no authority to negotiate in their behalf. Finally, in the dealings with colleagues and professors, somehow the students who had originated the idea and with whom the plans were developed had not been consulted. The practical consequences of such cooperation probably would have forced SACC to organize a rival meeting, and the real loss would be in the division of faculty from students. The faculty often felt uneasy in the face of some students' apparent lack of self-discipline throughout the period of planning, and more than once a student-proposed action was called "irresponsible" because the students, it was feared, would act unilaterally. It looked at this point as if the faculty side of the alliance was itself guilty of similar "irresponsibility." One more truce meeting was held, and both sides agreed that no satisfactory middle ground had been found. Probably both sides were relieved.

The truce meeting had further delayed the time schedule, a proposal to canvass MIT faculty had been shelved, but the symbol of a work stoppage was retained. Following these meetings the UCS decided not to enclose a returnable card in the mailings in order to avoid any appearance that the faculty was being asked to choose sides. Indeed, the steering committee had almost a month earlier decided to list only the forty-eight original signers in the mailings. The letter that was sent out with the statement was so cautiously worded that a number of irate people called to complain that they were not being given an opportunity to identify themselves in the March 4 statement. Without a canvass or a poll, no one knew the relative size of the supporting group.

The program for March 4 had now progressed to the point that one day was simply not enough time to schedule all of the events. Therefore, it was agreed to hold the first lectures on the evening of March 3. Even this was insufficient time, and March 4 was extended to include Saturday, March 8. Saturday was chosen to make it possible for people who objected to the notion of a research stoppage to participate on a nonworking day.

Comments in the press followed the same lines as the controversy at MIT and at other campuses. The scientific news journal

Chemical and Engineering News, in an editorial on February 3, wrote,

We read of plans for a research strike at Massachusetts Institute of Technology. Its object reportedly is to focus attention on the threat to the existence of mankind that appears as a result of the misuse of scientific and technical knowledge. The symbolic strike is probably a good idea. Action that requires effort or involves inconvenience shows conviction that amounts to something. . . .

Farther on the editorial stated,

Continuous and convincing demonstration of humanistic idealism by scientists can reinforce world-wide standards and convictions and in turn can exert powerful influence over a period of time. Their lying down and withdrawing their support immediately from some of the less idealistic contributions to defense could bring great harm. But to make clear their strong feelings about what is for and what is against humanity might gradually bring some improvement. . . .

An editorial in *Industrial Research* (March 1969) was adorned with a cartoon of a lab-coated, placard-bearing, middle-aged man. It began with the paragraph, "The Extremist Elements have struck again. This time they threaten to disrupt the research community with work stoppages, antiwar rallies, and other forms of militant protest on and off the campus. . . ."; and ended with

Research demonstrations could have an adverse effect on the federal funding of R&D and particularly basic research. Militant actions by a handful of scientists also could enflame the public, Congress, and the research community. They even might lead to such irresponsible moves as sit-ins, laboratory seizures, and outright violence. Let us hope that the faculty members have more maturity and foresight than their students.

The March 4 meetings themselves went smoothly, even though the size of the project put a severe strain on the available manpower. The only potentially disruptive event occurred when a well-known character at Boston meetings seized the microphone during a question period and, after a short speech, sang two verses of "God Bless America." He left to general applause for his contribution to lightening the tone of the meeting.

Murray Eden, February 1970

Union of Concerned Scientists
Faculty Statement

Misuse of scientific and technical knowledge presents a major threat to the existence of mankind. Through its actions in Vietnam our government has shaken our confidence in its ability to make wise and humane decisions. There is also disquieting evidence of an intention to enlarge further our immense destructive capability.

The response of the scientific community to these developments has been hopelessly fragmented. There is a small group that helps to conceive these policies, and a handful of eminent men who have tried but largely failed to stem the tide from within the government. The concerned majority has been on the sidelines and ineffective. We feel that it is no longer possible to remain uninvolved.

We therefore call on scientists and engineers at MIT, and throughout the country, to unite for concerted action and leadership: Action against dangers already unleashed and leadership toward a more responsible exploitation of scientific knowledge. With these ends in mind we propose

1. To initiate a critical and continuing examination of governmental policy in areas where science and technology are of actual or potential significance.
2. To devise means for turning research applications away from the present emphasis on military technology toward the solution of pressing environmental and social problems.
3. To convey to our students the hope that they will devote themselves to bringing the benefits of science and technology to mankind and to ask them to scrutinize the issues raised here before participating in the construction of destructive weapons systems.
4. To express our determined opposition to ill-advised and hazardous projects such as the ABM system, the enlargement of our nuclear arsenal, and the development of chemical and biological weapons.
5. To explore the feasibility of organizing scientists and engineers so that their desire for a more humane and civilized world can be translated into effective political action.

As a first step toward reaching these objectives, we ask our colleagues—faculty and students—to stop their research activity at

MIT on March 4 and to join us for a day devoted to examination of the present situation and its alternatives. On that day we propose to engage in intensive public discussions and planning for future actions along the lines suggested above.

If you share our profound apprehension, and are seeking a mode of expression that is at once practical and symbolic, join us on March 4.

Faculty Sponsors of Activities on March 4

Hayward R. Alker
Professor of Political Science

Warren Ambrose
Professor of Mathematics

Gene M. Brown
Professor of Biochemistry

John W. Cahn
Professor of Metallurgy

Jule G. Charney
Alfred P. Sloan Professor of Meteorology

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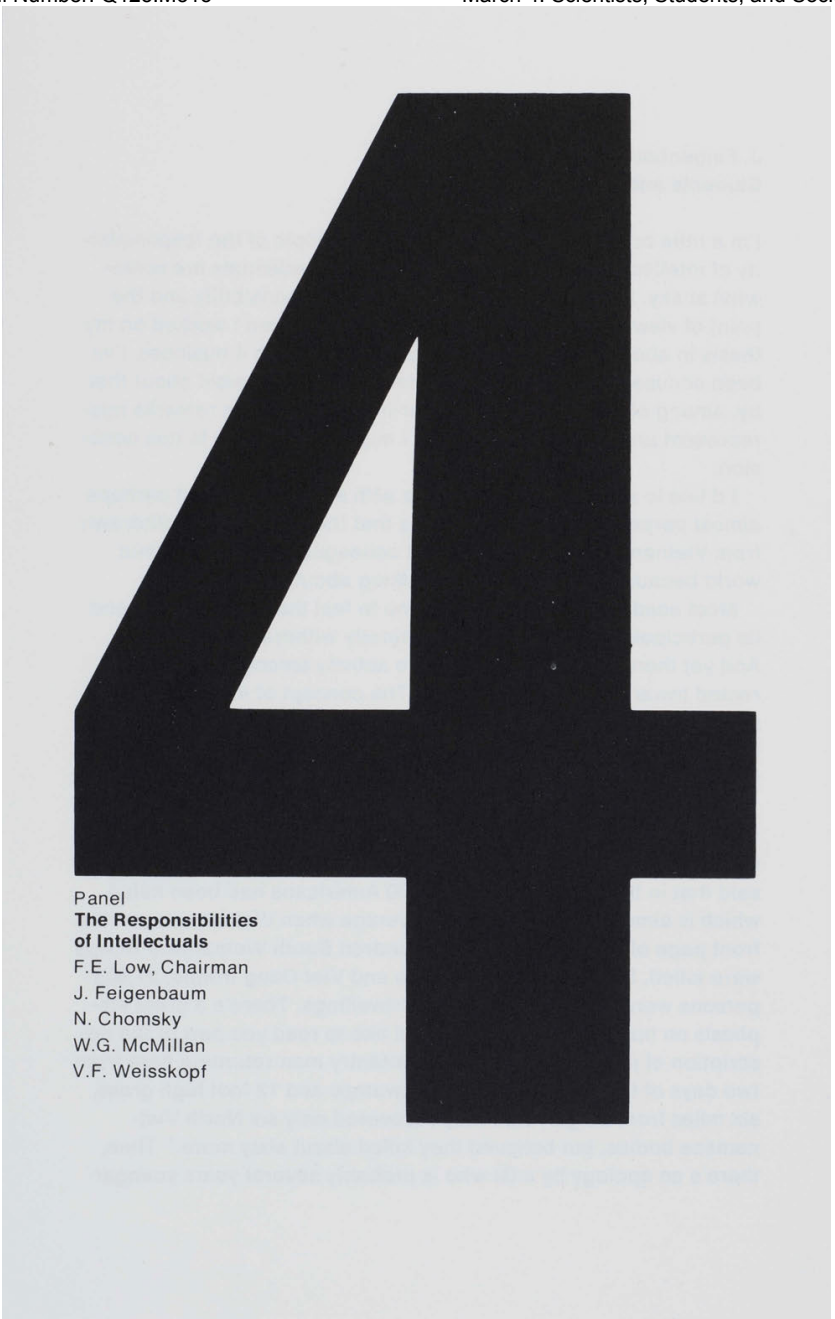


Panel
The Responsibilities of Intellectuals
F.E. Low, Chairman
J. Feigenbaum
N. Chomsky
W.G. McMillan
V.F. Weisskopf

J. Feigenbaum

Students and Society

I'm a little bothered about speaking on the topic of the responsibility of intellectuals, because I think that my credentials are somewhat shaky, from both the point of view of responsibility and the point of view of being an intellectual, since I haven't worked on my thesis in about four months because of this March 4 business. I've been accused of being somewhat less than responsible about that by, among other people, my mother-in-law. But these remarks misrepresent any feeling of levity that I might be bringing to this occasion.

I'd like to say that I've come here with a continuing and perhaps almost perpetual feeling of sadness that the U.S. has not withdrawn from Vietnam. And I'm disturbed at colleagues in the academic world because I don't hear them talking about Vietnam.

Most academic liberals have come to feel that the U.S. must end its participation in the war by unilaterally withdrawing its troops. And yet there seems to be very little activity among liberals directed toward bringing this about. The concept of intellectual responsibility is really too abstract. I should like to pin down my discussion of this category by considering the responsibility of liberal intellectuals toward the question of Vietnam.

You've got to look pretty hard to find anything about Vietnam in the news media. But in Saturday's *Globe*, buried on page 8 there was a story about the mini-offensive that's being fought. The story said that in the previous six days 360 Americans had been killed, which is almost twice the pre-Tet average when Vietnam was on the front page of all the papers. Five hundred South Vietnamese troops were killed, 5,000 North Vietnamese and Viet Cong troops; 21,903 persons were displaced from 2,266 dwellings. There's a great emphasis on numbers in this report. I'd like to read you part of the description of just one small battle: "Infantry men returning here from two days of fighting in waist-deep swamps and 12 foot high grass, six miles from Saigon said they recovered only six North Vietnamese bodies, but believed they killed about sixty more." Then, there's an apology by a GI who is probably several years younger

than myself. He's apologizing because he couldn't determine that there were more than six Viet Cong killed in this action. He says, "Arms and legs lay splattered all over the place. But because of the swampy ground we couldn't count them." I think we see here a sort of elemental cojoining of scientific precision with military carnage. I can't help feeling that this is somehow symbolic of something that is going on in almost every level of our society. I think that it is difficult enough for us to come to terms with one death, but somehow Americans have learned to come to terms with almost any number of deaths—six or sixty—when they're expressed as casualty figures and the numbers are given precisely enough.

The commingling of technology and death is a continual theme. Consider for example this report of a Quaker worker in Quang Ngai, written in February 1969:

Several of us went to the roof about 3 A.M. The Americans unleashed the terrifying "Puff the Magic Dragon," a DC3 that spews forth 5,000 machine gun bullets per minute. As I watched it circle overhead last night, silhouetted against the low clouds in the light of the flares, flinging indiscriminate bolts of death earthward, I could vividly visualize the scene below. Men, women, children and animals, caught like rats in a flood. No place to hide, no way to plead their case of innocence to the machine in the sky, no time to prepare for death. The beating the civilians are taking in this war is beyond adequate description. Sitting behind the others on the roof, I felt tears welling up and was shocked as I became aware of feelings foreign to my conscious self, which surfaced under the indescribable strain of watching man slaughter man en masse. The cold, mechanical compassionless way that monster circled around and around and around, ruthlessly pursuing an unseen "enemy," stabbing viciously earthward again and again, probing, searching, killing and maiming all in its path. . . . I've seen all this before! Why can't I get used to it?! Each lifeless form, every scream of anguish, each blank stare of those who have suffered too much strikes pain in the pit of my stomach. Are there really those who can look at a scene like this and not suffer with the people?

The modern history of Western man is the story of atrocity justified by arguments about political expediency or national interest. The primary responsibility of intellectuals must be to come to terms with this phenomenon. In particular, how should we American intellectuals view our relation to the U.S. as the killing continues amid

only the most tenuous and often contradictory ideological justifications. Indeed, how must we view ourselves, as hundreds of thousands of American children are stunted by starvation in our "affluent society"?

I think we have to confront the contradictions of our lives and relate abstraction to material reality. We need to perceive clearly the relation between the number "6" and six violated bodies. Relevant to us at MIT, we must perceive the relation between our sparkling, expensive laboratories and the instruments of death produced by the fellow next door. We must perceive the relationship between our wealth and the *real* suffering of the poor. Without these perceptions, there is no responsibility.

Perhaps there is no way of defining responsibility. Perhaps there is no way of perceiving the relationships which I just mentioned. Or, even worse, perhaps we have become so cynical, so used to the atrocities of our time, so full of despair about the human condition that it has become a useless form of self-flagellation to dwell on the realities of human suffering.

Clearly this seems to be the drift of present intellectual activity. Our social scientists pride themselves on being value-free. Political science, once the province of philosophers such as Rousseau, Locke, Hobbes, Hegel, and Marx, has now become the occupation of those who predict election results and interrogate captured Viet Cong. Our natural scientists disclaim responsibility for the uses to which their work is put. Or else they accept, with little analysis, the ideological justifications tendered by the Johnsons and Nixons.

I am impressed by this kind of "intellectual" despair among my colleagues that makes impossible any conception of intellectual responsibility. There is a prevalent feeling of materialistic determinism, which tends to reduce people to automata. It produces that moral relativism in the face of which all humanistic pleas sound like sentimentalism. I recently had a lengthy conversation with a member of the MIT Political Science Department who said that we are all the product of our influences and thus all political advocacies are suspect because the closer one comes to a political community, the greater are one's influences. This reduction of human beings to stimulus-response pairings is a world view that is consonant with our times. It allows one to get along in a world of Vietnams and black

ghettos. Ultimately it leads to the feeling that our entire human experience with all of its anguish is merely a trivial part of the astronomic world—that what we feel and experience is only the self-delusion of a fleeting biological phenomenon.

Yet those who deny that there may be innate human capacities and values are usually inconsistent. Presented with visions of a new society based more nearly on the alleviation of anguish, they point to the omnipresence of human aggression and acquisitiveness, failing to apply their materialism, failing to understand that their debased view of people is the causal product of an increasingly debasing society. Denying intrinsic needs, values, motivations, you must allow that perfecting society will perfect individuals; or, accepting intrinsic properties, you must abandon your value-free social analysis and must ask whether our society is responsive to these fundamental, subjective traits. You can't have it both ways.

These are questions that must be dealt with if responsibility is to mean anything. Most academicians, faced with the complexity of the questions, seek the simpler world of their academic pursuits and the simpler cares of their careers and families. But given the prevalence of murder, the possibility of nuclear ecological catastrophe, the deprivation and humiliation of so many people, we must find our way out of the despair. We should try to establish some origin in the shifting intellectual stands of determinism and subjectivism. This is the primary responsibility of intellectuals. Some focus may be coming into view. For example, Noam Chomsky has drawn some relevant conclusions from his work in linguistics. In *Language and Mind*, he remarks,

> The normal use of language is not only innovative and potentially infinite, but also free from control of detectable stimuli either external or internal. It is because of this freedom that language can serve as an instrument of thought and self-expression as it does not only for the exceptionally gifted, but also in fact for every normal human.

Chomsky goes on to say that "this is a serious problem that the psychologists and biologists must face, and it cannot be talked out of existence by invoking habit or conditioning or natural selection."

But even without a comprehensive theory of modern man and modern society, it should still be possible for each of us to establish within himself the origin of ethical commitment. A phenomenologi-

cal approach might begin with the following experiment. Suppose one finds oneself with a child being tortured to death in the next room. You may fill in whatever grisly details you might imagine. I think that most of us would recognize a feeling of moral outrage. I think that very few would accept any ideological justifications for the atrocity. Most normal people are able to affirm, at least as a tentative hypothesis, that human suffering is more than a sequence of chemical reactions. One is affirming that life is better than death and that pain is not as good as its absence, but moreover, we are affirming, if you think about it, that one is responsible.

I now return to the point made earlier: How can we perceive the relation between the nature of our society, the nature of our activities at MIT, and the very real suffering that we cause and allow to continue? It is now relevant in this connection to ask as intellectuals: How near does the next room need to be? Must we see and hear the nature of the atrocity? As intellectuals, can't we extend our egos to encompass the suffering of people in Vietnam or Latin America or the degradation of black people or of Indians or of people in our prisons? Can we continue to abide by the disparities of wealth that exist between the few rich and the vast majority? Can we condone a system whereby a few gain increasing wealth through the labor of many? Fifty percent of American families earn under $7,000 per year. The top 2 percent hold 28 percent of the wealth. What ideological or structural justification can you provide for the continued killing in Vietnam or the living conditions in Roxbury?

Intellectuals, in their present despair, have forgotten their vocation. They have failed to analyze and criticize. They have failed to try to relate seemingly disparate elements. Intellectuals persist in imagining that the problems of the ghetto, the poverty in South America, and the war in Vietnam are unrelated phenomena.

Now, as a student I felt obliged to speak to my elders in the university community. What I want to ask is that you help to make the university a place where young people who want to question the necessity of present conditions can live comfortably. It will be necessary to confront the contradictions that exist at the university and to examine the view of mankind that the university fosters. We cannot live comfortably in a place such as MIT, which declares that

it is "apolitical" while producing MIRVs, ABMs, and weapons for Vietnam. It is hard to be comfortable at an institution whose Political Science Department is dominated by men who publish articles in *Reader's Digest* under the title, "How Firmness is Paying Off in Vietnam" and "Why Russia is Our Biggest Enemy." And when will the Institute question the wisdom of training young electrical engineers for whom employment is found only in weapons production?

Changes will occur or else the Institute will not survive. It will not be destroyed by violence or confrontation. It will die because it failed the tradition of the Academy; it failed to analyze and was content to "serve."

Even now many of the best students going through college are deciding not to join the academic community. Among graduate students it is more and more frequent that people are turning away from the paths of success that the academic community offers. New centers of learning are already being established.

N. Chomsky
Responsibility

At a very general and abstract level, few will disagree that a man is responsible for the foreseeable consequences of his acts—or of his failure to act. The real questions arise when we ask ourselves: How compelling is the need to act, what forms should action take? The path of least resistance is always to accept the distribution of power as it exists, to ratify and support it either by doing nothing or by lending one's talents to the implementation of policies that are not questioned or challenged. The cost of this passivity will be borne by the victims of American power—but they are far away, often of another race and culture, and powerless to strike back at us. So when we read, let us say, of the escalation of the American war against Vietnam since last November, of the intensification of bombardment and the sharp rise in U.S. air and ground attacks, of heightened efforts to destroy the political and administrative structure of the NLF, when we read such reports, the easiest course is to turn aside, to trust our leaders, to speak of tragic irony and the painful costs of world leadership.

Since World War II, we have spent over a trillion dollars in "defense." We have successfully defended ourselves against Guatemalans, Iranians, Dominicans, and all too many others who have sought to assert their national independence—to reconstruct their own societies in their own way and on their own terms. We have assigned to ourselves the role of international judge and executioner and have acted accordingly. Where nations have escaped our control—e.g., China and Cuba—we have striven valiantly to strangle economic development by boycott, blockade, and military force. We have sought the most effective mechanism to ensure the form of stability that we, in our wisdom and benevolence, know to be most desirable. Some feel that we may finally have found the answer. For example, the chairman of the Department of Government at Harvard, who is also chairman of the Vietnam study group of the State Department, believes that "in an absent-minded way the United States in Vietnam may well have stumbled upon the answer to wars of national liberation." The answer is this: ". . . if the direct application of mechanical and conventional power takes place on

such a massive scale as to produce a massive migration from countryside to city, the basic assumptions underlying the Maoist doctrine of revolutionary war no longer operate." This subtle and ingenious approach is particularly useful in Vietnam where he describes our problem as follows: "With one-half the population still in the countryside, the Viet Cong will remain a powerful force which cannot be dislodged from its constituency so long as the constituency continues to exist." We therefore ensure that this constituency—the rural population—ceases to exist, by direct application of power on a massive scale. And then, after the war, we will "resettle migrants in rural areas" and promote development, as we have done with such notable success in the countries protected from harm by the Monroe Doctrine.

All of this, of course, with the noblest of intentions. As John Adams once said, "Power always thinks it has a great soul and vast views beyond the comprehension of the weak; and that it is doing God's service when it is violating all His laws."

Given the realities of contemporary history, we can believe that we are serving noble ideals only by adopting a view that verges on psychosis. And I believe that we are in the grip of a kind of national psychosis. The man who is now President of the United States warned, in a letter to the *New York Times* four years ago, that ". . . victory for the Viet Cong . . . would mean ultimately the destruction of freedom of speech for all men for all time not only in Asia but in the United States as well"—nothing less. Perhaps a clearer statement of our purposes in Vietnam is given in a State Department pamphlet of 1951, which emphasizes the psychological effect of the fall of Indochina. "It would be taken by many as a sign that the force of communism is irresistible and would lead to an attitude of defeatism. . . . Therefore Communist forces must be decisively conquered down to the last pocket of resistance." Recall the context: we are speaking of the destruction of indigenous Vietnamese forces by French colonialism. Such documents make nonsense of the pretense that we are concerned with freedom for the Vietnamese, as do the facts themselves. This kind of paranoia is illustrated by our present Secretary of Defense, who sees us "locked in a real war, joined in mortal combat on the battlefield, each contender maneuvering for advantage," against an enemy who ap-

pears in many guises: Kremlin bureaucrat, Asian peasant, Latin American student, and, no doubt, urban guerrilla at home. Small wonder, then, that Melvin Laird is on record with the advice that "Step one of a military strategy of initiative should be the credible announcement of our determination to strike first if necessary to protect our vital interests." Compare *New York Times* military expert Hanson Baldwin, who urges that in the post-Vietnam era we be prepared to "escalate technologically rather than with manpower" as we "bolster governments under attack and secure them against creeping Communism." Such escalation, he suggests, might involve the use ". . . of small nuclear devices for *defensive* purposes." (June 9, 1968) Particularly interesting is the concept of "defensive purposes," as we bolster a weak government against creeping Communism. As far as I know, ours is the only country where the Minister of War and the leading military expert of the press have spoken in such terms, as it is the only country guilty of international violence on anything like the scale of Vietnam.

Probably the typical figure of the new society is Robert McNamara, a man who showed how to do with superb efficiency that which should not be done at all. McNamara's views of social organization are most illuminating. "Vital decision-making," he says, "must remain at the top." Ultimate control must be vested in the hands of management, which is, "in the end, the most creative of all the arts—for its medium is human talent itself." This is apparently a divine imperative: "God is clearly democratic. He distributes brain power universally. But He quite justifiably expects us to do something efficient and constructive with that priceless gift. That is what management is all about." No doubt it is the same divine imperative that leads us to construct and manage an integrated world economy, "no idealistic pipe-dream," according to George Ball, "but a hard-headed prediction; it is a role into which we are being pushed by the imperatives of our own technology." The major instrument is the multinational corporation, which Ball describes as "a distinctly American development. Through such corporations [he says] it has become possible for the first time to use the world's resources with maximum efficiency. . . . But there must be greater unification of the world economy to give full play to the benefits of multinational corporations," this distinctly American development. It is not difficult to guess to whom these "benefits" will accrue.

The Cold War has provided the psychological environment and guaranteed the financial resources to enable us to enter into the construction of this integrated world system. On the domestic scene this has meant a tendency toward centralization of control in economic institutions and political life. The government has taken on the task of providing a public subsidy for a significant part of the industrial system, its technologically most advanced segment. It has also become the "employer of last resort" for the nation's engineers, most of whom work in projects funded by the Defense department, NASA, and the AEC. Jerry Wiesner once pointed out that "the armaments industry has provided a sort of automatic stabilizer for the whole economy." I will omit statistical details. One can go on and on to outline what has aptly been called a kind of "socialism" for the rich and powerful and for segments of the technical intelligentsia.

At the same time, the role of Congress, particularly in the area of foreign policy, has diminished virtually to zero. The House Armed Services Committee described the role of Congress as "that of a sometimes querulous but essentially kindly uncle who complains while furiously puffing on his pipe, but who finally, as everyone expects, gives in and hands over the allowance." Senator Vandenberg, twenty years ago, expressed his fear that the Chief Executive would become "the number one war lord of the earth." That has since occurred. The clearest example of all of this was the decision to escalate the Vietnam war in 1965. It now appears that that decision was taken in 1964, perhaps as early as the summer. You recall, of course, the rhetoric of the fall 1964 election campaign. This one incident reveals with perfect clarity the role of the public in decisions about peace and war.

To the system the technical intelligentsia make a very definite contribution, not only by the design of technology and the implementation of policy but also at an ideological level—in protecting policy from criticism by investing it with the aura of science. Weapons cultists bemoan the "flimsy premises involving public world opinion" that stifle innovation. Pacification is "computerized"; its police state measures are described as "experiments with population and resources control methods." *Science* magazine publishes technical studies of defoliation, as in the most recent issue, studies

that are unexceptional except that they overlook the irrelevant fact that there is a civilization of human beings living in those millions of acres of defoliated land, individuals who have not been asked whether they are amused by the experiments that we have undertaken to carry out with their lives. And applied social scientists decry the anti-intellectual attitudes of those who insist on moral considerations or concern for such sentimental matters as our treaty obligations, when any serious scientist understands that only technical pragmatic considerations of cost and utility are relevant to policy formation. Of course, it is only those intellectuals who conform who achieve the exalted status of responsible thinkers. When George Kennan wrote his famous article advocating containment in 1947, he was lauded as a serious and responsible scholar. When, in 1949, he began to express his view that Russia did not intend to attack the West, that we should try to neutralize Germany rather than rearm it as part of NATO, he became an irresponsible mystic. As Dean Acheson put it, "Mr. Kennan has never, in my judgment, grasped the realities of power relationships but takes a rather mystical attitude toward them." Had his "mysticism" been heeded, Central Europe—and the whole world—might have been a safer and more healthy place today.

It is in this context that we must consider such matters as the ABM. To a large extent, the issue has been discussed as a technical one: will it work, etc. Such discussion is perhaps somewhat beside the point for two reasons. First, the ABM may be even more dangerous if it does work than if it does not. Hubert Humphrey recently pointed out that if the ABM "does achieve an effective missile screen it could release policy-makers from the restraints imposed by enemy second-strike capacity"—no small consideration in a country as devoted to international violence as ours. Second, the motivation for the ABM is largely political and economic, not technical at all. Insofar as the ABM program serves as a subsidy to the electronics industry, it makes no great difference whether it will work or not. At the meetings of the American Economic Association last year, Walter Adams observed that the current version of the ABM

> has been estimated to involve 28 private contractors, with plants located in 42 states . . . and 182 Congressional districts. Given the

political reality of such situations and the economic power of the constituencies involved, there is little hope that an interaction of special interest groups will somehow cancel each other out and that there will emerge some compromise which serves the public interest.

And if the ABM is discarded, some equivalent monstrosity will no doubt take its place until some radical change in ordering of national priorities occurs.

It is fashionable to decry such talk as naive and simplistic. It is useful to observe that those who manipulate the process and stand directly to gain from it are much less coy about the matter. Samuel Downer, Vice-President of LTV Aerospace Corporation, explains why "the postwar world must be bolstered with military order."

It's basic. Its selling appeal is defense of the home. This is one of the greatest appeals the politicians have to adjusting the system. If you're President and you need a central factor in the economy, and you have to sell this factor, you can't sell Harlem and Watts, but you can sell self-preservation, and a new environment. We're going to increase defense budgets as long as these Russians are ahead of us. The American people understand this.

I have mentioned a number of tendencies in American society, tendencies that, if extrapolated, lead to a garrison state dominating a world empire. These, however, are tendencies. There is no law of nature that guarantees that they will persist. A good deal depends on our conscious choices. The scientists who are called upon to construct the ABM need not do so; the social scientists who are invited to preside over the management of some helpless society—perhaps our own—can refuse. They can organize and encourage others to join them in this refusal. They can also help to create the mass politics that provides the only real hope for restraining and ultimately dispelling the nightmare that they are now helping to create.

They should not underestimate the difficulty of this course. They will find some allies. Let me read you, for example, a few recent remarks by Senator Mark Hatfield:

The universities, by becoming inferior, contracted members of the defense establishment can only increase their participation as the intellectual advocates and architects of the war machine. It is my contention that efforts to examine the debilitating effects of the defense establishment, not only upon society as a whole, but also upon the university itself, are steps towards the reintroduction of

human ideals into what is now policy formed mainly by economic considerations.

Well-spoken words. But such allies will be few. And it is reasonable to suppose that if there is any measurable success at organizing scientists in opposition to war and waste, there will be strong opposition to this effort. Effective political action that strikes at deeply entrenched interests can be expected to lead to attempts at repression. How serious these will be, how well they can be resisted, this we cannot predict—as we cannot predict the success that might be achieved at organizing popular forces to reintroduce "human ideals into what is now policy formed mainly by economic considerations," in Senator Hatfield's words. There is no point in speculation about such matters. Rather, there is an urgent and desperate necessity for serious commitment and determined action.

W. G. McMillan

The Scientist in Military Affairs

I am not here to help celebrate a research strike. Rather, I volunteered to come in the hope of helping to provide a balanced perspective in your concern with the applications of science and technology in our society.

In order that you can calibrate me, I want to tell you something about my background and experience. I received my doctorate at Columbia University in chemical physics during World War II and was a postwar Guggenheim Fellow at the University of Chicago. From 1944 to 1946, I was a member of the Chemistry Division of the Manhattan Project at Columbia University. Since 1947, I have been a member of the UCLA Chemistry Department where I served six years as Departmental Chairman. Since 1952, I have also been a part-time member of the RAND Physics Department.

Prior to 1966, my involvement in national and military affairs concerned mainly nuclear and strategic matters. In the course of this involvement I served as Chairman of the Defense Atomic Support Agency Scientific Advisory Group on Effects (1961–1966), which provides technical guidance for nuclear weapons effects tests; Chairman of the Multi-Service Vulnerability Committee (1963–1966), which concerns itself with the survivability of our strategic deterrent forces; member of the Air Force Scientific Advisory Board (1960–); the Defense Science Board (1962–1966; 1969–); the Defense Intelligence Agency Scientific Advisory Group (1965–); and most recently, of the Army Science Advisory Panel (1969–). In January I returned from over two years (1966–1968) in Vietnam where I was the first incumbent of the position of Science Adviser to the Commanding General, Military Assistance Command in Vietnam, first to General W. C. Westmoreland and later to General C. W. Abrams.

Thus, while I bear my share of the credit or blame for certain advice to the Department of Defense, MACV, and other government agencies, I am a relatively independent member of the "Establishment." So while you are busy subtracting out my bias, I hope you will remember to add in my exposure and experience.

In these remarks I would like to make clear that I am speaking

only for myself and that I am not representing any organization, within or without the government.

When I first saw in *Science* the notice of this meeting, I was immediately struck by what seemed to me its very one-sided tone. In particular I was led to wonder how this exercise could be very scientific when the conclusions were already stated in advance of the discussion. I would like to comment on several of the points that the MIT faculty group proposed, as reported in *Science* (*163*, 373, 1969).

A. The first of these is: ". . . the present overemphasis on military technology. . . ."

With respect to Vietnam I would ask where is this alleged overemphasis on military technology—particularly within the academic community. During World War II, there was a most productive cooperation between university scientists and the military. Under the National Defense Research Council and the Office of Scientific Research and Development, such great and successful projects were developed as the MIT Radiation Laboratory (Radar); the National Bureau of Standards Fuze Laboratory, now the Harry Diamond Laboratories (VT Fuzes); the Manhattan Project (the nuclear pile, the atom bomb); the Navy's "Tenth Fleet" (operations analysis); the Office of Strategic Services (forerunner of the Central Intelligence Agency); and so on.

Now, contrast that former deep involvement with the contribution of the academic community toward bringing the Vietnam conflict to a rapid and successful conclusion. Just so you know where I stand, I believe that with the exception of a handful of people these contributions have been either nonexistent or actually negative. Nor is this for lack of useful things to be done. While it is nowadays most difficult to find any large piece of technology lying around awaiting development, there are literally hundreds of smaller developments that collectively could contribute enormously to shortening that unhappy conflict and reducing casualties on both sides. Some of these developments are

Mine and Booby Trap Detection and Neutralization. Mines and booby traps account for over thirty percent of allied casualties in Vietnam. Moreover, as you must frequently notice in your newspapers, the indiscriminate mining of the roads in South Vietnam by

the Viet Cong and North Vietnamese is one of the principal sources of civilian casualties. When one has seen the pitiful remains of a bus load of South Vietnamese men, women, and children, after it has hit a road mine, this is a memory not easily erased. It is the ugly face of wanton terrorism.

Location and Preemption of Enemy Rockets and Rocketeers. Defeated in every military engagement and denied access to the major population centers, the Viet Cong nowadays resort to launching indiscriminate rocket and mortar attacks at civilian centers. Technology can contribute to preventing these terroristic attacks.

Intelligence Collection Aids. Whereas in previous wars there has been a definable front line, attacks in Viet Nam may come from any quarter. Moreover, instead of being concerned with the movement of only large military units, now a single mortar squad constitutes a threat to hamlet, village, and outpost. The Intelligence required is thus of a much finer grain than in previous wars and poses new challenges to technology.

Location of Enemy Weapons and Ammunition Caches. Those enemy weapons that are captured clearly cannot exact casualties either on the battlefield or amongst the civilian population. The location and neutralization of enemy caches under the jungle canopy and underground thus has high priority but is a singularly difficult technical problem.

Protection of Lines of Communication. The VC/NVA continually harass the South Vietnamese population by the mining and destruction of roads, bridges, and railroads. There is clearly a great deal that technology could provide to improve the protection of these vital lines of communication.

These are some of the military problems that I would put topmost in urgency and in opportunity for technical contribution. It is noteworthy that all of these problems are essentially defensive in character, involving the protection not just of Allied Forces but also of the civilian population.

In the face of such clear opportunities to turn technology toward constructive applications in the Vietnam conflict, one can only ask, where are the Bushes, the Conants, the Ureys, the Fermis, the Oppenheimers, the DuBridges of this generation? Where today is any organized effort on the part of the academic community to contribute? The answer is, there is no such organization. The university community, and to some extent the whole intellectual community, has been satisfied to sit back, accept the lopsided view of Vietnam presented by the news media, and on that unscientific basis decide

to have nothing to do with Vietnam. This is a tragic development, both for our men in Vietnam and for us in the academic world.
B. A second point from the Science article concerns ". . . participating in the construction of destructive weapons systems. . . ."

Here I would point out that many weapons systems that might be classed as destructive have defense as their primary purpose. For nearly two decades our strategic defense has depended upon a credible retaliatory capability as a deterrent. Is anti-aircraft artillery destructive? Yes, in the sense that it destroys attacking enemy aircraft. But I hope that this conference can acquire a better perspective than that!
C. Still a third point expresses ". . . determined opposition to ill-advised and hazardous projects such as the ABM system. . . ."

The weight of scientific, technical, and military judgment of those who bear the responsibility has been that the United States cannot afford to forego developing the technology of an antiballistic missile system. We must remember that the Department of Defense and, in the last analysis, the military services are charged with the defense of the United States. Until that direction is altered, these men, who have not only the authority but also the heavy responsibility, are going to continue doing what they deem necessary to provide that defense. Moreover, these responsible individuals have the fullest perspective available, including extensive Intelligence estimates, and are thus in the best position to weigh all the evidence and arguments.

How do things look in the Communist camp? The Soviets have an impressive nuclear ICBM force, a growing fleet of Polarislike submarines, a fractional orbital bombardment system (FOBS), large forces prepared for tactical warfare—including BW and CW—and a highly developed space program. The Mainland Chinese have made rapid progress in nuclear weapons, have their own aircraft factories, and supply much of the arms and ammunition used by the Viet Cong. These are clearly capabilities that cannot be ignored. But we must also be concerned with intentions: Can we take any comfort from the ruthless suppression of the Hungarian uprising, the Berlin blockade, the Cuban missile crisis, the Berlin wall, and last fall's display of naked repression in Czechoslovakia?

In Asia we have a latter-day Mein Kampf in the candid statement

by Marshall Lin Piao, Chinese Communist Defense Minister. Following Chairman Mao's thesis that "Political power grows out of the barrel of a gun," Marshall Lin gives a blueprint for "peoples wars" throughout the underdeveloped world, a blueprint that is being closely followed in Vietnam.

Let's not kid ourselves: the sheep of the West and the communist leopard are arraigned on opposite sides of the arena—and the leopard is not about to change his spots.

D. A fourth point concerns opposition to ". . . the development of chemical and biolgoical weapons. . . ."

I should like here to focus on chemical weapons, particularly as they contribute to our nonlethal warfare capability. To most people the word "gas" brings to mind the World War I phosgene, chlorine, mustard, or Lewisite compounds, along with their attendant long-term physiological effects. By contrast, in Vietnam the only chemical agent in use by Allied Forces is the solid lachrymator or "Tear gas" "CS" the same agent used by police throughout the world. This substance produces temporary incapacitation through the stimulation of the mucous membranes and tear ducts. When exposed personnel are removed to uncontaminated air, the effects of the tear gas disappear in ten or fifteen minutes.

It seems to me very desirable to have the ability to incapacitate the enemy for a few minutes, even at the risk of similarly inconveniencing some friendlies, so that they can be sorted out, disarmed, and rendered harmless. This is not to say that exposure to CS is pleasant or fun. But I am reminded of the classic response of Maurice Chevalier when he was asked how it felt to be seventy years old: He replied, "Wonderful, when you consider the alternative."

One of the most difficult aspects of the Vietnam war is that the Viet Cong faithfully follow Mao's injunction to the guerrilla to "swim in the sea of the people." To have a nonlethal means at the disposal of our military forces makes it possible to lessen battle casualties to both sides—but perhaps even more important, also to the civilian population, behind whose skirts the Viet Cong hide. There is great opportunity to develop improved nonlethal chemical agents. It is for these reasons that I find utterly incredible the unqualified opposition to ". . . the development of chemical . . . weapons. . . ." contained in the third statement of the group organizing this meeting.

To promote such a position seems to me to be either terribly misinformed or terribly misleading.

This brings me to the central message of my presentation. I support most strongly the view that intellectuals—particularly university faculties—should be concerned with national issues. But this concern is useful and constructive only if it is well informed. It is altogether too easy and too tempting to believe that the decision makers are stupid. They are not. Whether military or civilian, they are among the most capable, thoughtful, dedicated, and responsible people we have. Moreover, by contrast with most lay intellectuals, they are exceptionally well informed.

I am reminded of a great piece of wisdom captured in one of Walt Kelly's Pogo adventures, which used to grace the periodical shelves of the Harvard Physics Department Library. One of Pogo's colleagues asked another, "What kind of a stupid reason have you got for doing that?" But when the reason was explained to him, he conceded, "Well, what d'ya know! That's a pretty good stupid reason!" And so it is with those responsible for decisions within the government: they have their reasons, and the reasons are usually pretty good.

For the last several years some of us have been concerned with how to get a larger segment of the university scientific and engineering community to become informed and interested in the greater issues of national defense. And we have even done something about it. Specifically, with the support of the Office of the Director of Defense Research and Engineering (ODDR&E) and the Advanced Research Projects Agency (ARPA), there was established at UCLA an annual summer program called the Defense Science Seminar. I would like to quote from the Background and Purpose as described in our 1966 report:

The Defense Science Seminar grew out of a series of conversations with Dr. Harold Brown (then Director of Defense Research & Engineering) during the Fall and Winter of 1963, deploring the seclusion from the affairs of government of one of the nation's greatest resources: the young intellectual leaders of our universities. Although many universities and their faculties were deeply involved in the great military projects of World War II, the application of science to national defense did not long remain a popular academic pursuit. Those university scientists and engineers who did maintain their interest and proficiency in defense problems have

played a vital role, largely in scientific advisory and administrative capacities, in shaping our defenses and—with increasing frequency—in helping to formulate policy in other areas of government. Curiously, despite the recognized need for such advisors, these World War II project alumni have been allowed to become two decades older—and much busier—without the development of any mechanism for training their replacements, much less meeting the increased demands for such talent.

It is the aim of the Defense Science Seminar to help develop a new generation of responsible people, knowledgeable in the scientific-technical problems of defense and government, as a base from which might be drawn new technical committee members, counselors and even occasionally government administrators.

This seminar ran for the month of August during 1964, 1965, and 1966, with an attendance of about 40 in each session.

While in Vietnam I established another program aimed at bridging the gulf between those who know the military problems in the field and the technical people in our laboratories at home who can solve them. With the encouragement of General Westmoreland and General Abrams, and with the support of Dr. John S. Foster, Jr. (DDR&E), and Mr. Leonard Sullivan (ODDR&E-SEAM), I invited selected scientists, engineers, and social scientists—some military officers, but mainly civilians—to join the Office of the Science Advisor in Vietnam as consultants for periods ranging from one month to over one year. These individuals were drawn from government laboratories, nonprofit institutes and—where possible—from the academic community. At its maximum this group numbered about 40, with a total of about 100 during my tenure.

The stimulation of seeing the Vietnam problems at firsthand and of being able to grasp the opportunity provided by technology to help out in a constructive and substantive way gave rise to an almost unparalleled esprit among these consultants. While we were certainly concerned with our weapons systems, we were equally concerned with assisting in developing an indigenous capability on the part of the South Vietnamese to handle their own problems. These activities ranged all the way from studies of health problems in the Mekong Delta to assisting in the establishment of a factory for making boots.

With this background of intimate involvement in Vietnam, I find myself not a little impatient with the attitude of some in the intellec-

tual community back home. I daresay that if the same low standards of expertise, logic, homework, and critical perceptivity adopted by some of our colleagues in their pronouncements on public affairs were carried into their scientific societies, they would be drummed out of the lodge! This poses a question: Why are we so ill informed?

Part of the answer lies in the handling of "news." Again I should like to use Vietnam as an example. You will all remember the Viet Cong TET celebrations of a year ago. When there is fighting in a city, or when there are fires burning, or when a rocket lands in the middle of a populous district, it is always the affected area that is shown on TV, in the wire photos, and described in articles. That is where the news is. However, taken alone such coverage provides a very limited view.

Shortly after TET I received one of the periodic visits by some of my colleagues in the Pentagon. They were naturally curious to see what had happened to Saigon. When we flew them over the city in a helicopter they were utterly amazed to see what a tiny fraction of the city had been affected. Significant damage was limited to a few blocks, principally in the Cholon district. By contrast, the impression from reports back home was that Saigon was in shambles. The action pictures had not shown the 99.44 percent of the city that was untouched; that wasn't newsworthy. The TET damage to Saigon was comparable to that in Watts, both in physical destruction and in number of civilian casualties; yet the news media would have led us to believe this should have been measured in kilowatts!

Not only were the TET accomplishments of the Viet Cong greatly exaggerated but so was the military capability this represented. Recall how few snipers it takes to bring a city like Detroit to a virtual standstill. As we have seen too often, all it takes to terrorize a city is a few dedicated troublemakers, who are indifferent to human life and destruction.

But we can't blame the news media for all our monumental ignorance. The rest of the answer lies in not having done our homework. Not only the technical basis of modern weaponry but also the political, strategic, and tactical aspects are complex and difficult subjects requiring just as much study and preparation for expertise as any academic discipline. While some of the reference material is

necessarily classified, there is a great deal in the open literature that all too few have read. The dilemma of the militant intellectual is that he is unwilling to entrust such major decisions as the ABM question to those having the responsibility and at the same time unwilling to invest the great amount of study required to become reasonably expert himself.

Certainly all thoughtful people share the concern over control of weapons of mass destruction. But it is not a helpful attitude simply to hope these will go away. We must reckon and deal with the grim realities of the situation as it exists today. There is no way of replaying history. Similarly, it is not fruitful—except for the historical lessons we may learn—to debate whether we should or should not be in Vietnam. The fact is that we are in Vietnam and have strong national commitments to the South Vietnamese people which few thoughtful citizens in this country would be willing to abrogate. Two questions that are worth spending our intellectual energies on, however, are these: How can we best become disengaged in Vietnam while still fulfilling our commitments with honor, not abdicating our responsibilities, and without simply giving way to Communist aggression? And how can we prevent other Vietnams?

Communications difficulties exist in at least two other areas that should be of concern to this conference. The first is between us and the North Vietnamese. Here I include not only formal diplomatic exchanges but also such plainer messages as the bombing of the North. A principal obstruction in this communication channel is all the extraneous noise being generated in the United States. Despite the monotonous record of defeats and catastrophic losses the North Vietnamese have suffered, their hopes and resolve are buoyed by our anti-Vietnam demonstrations. The sad part is that these same demonstrations, born partly from frustrations over the protracted character of the war, feed back to reinforce the North Vietnamese hopes—and thus make the war more protracted. Moreover, while these demonstrations do not change the essential direction of our national policies, they have a modulating influence and can render those policies less effective. Compare the straightforward zap of Israel versus Egypt with our self-imposed restraint that tolerates over-the-border sanctuaries, uninhibited shipping to North Vietnam, and a score of other constraints that bind our

hands. The intellectual community bears a share of the responsibility for this confusion.

We should be concerned also about communication between the academic community and the U.S. public. If we pursue our idealism beyond the bounds of common sense we will lose our audience and, with it, the bulk of our inheritance of credibility. Some of the proposals emerging from members of the intellectual community, when followed through to their logical conclusion, are tantamount to renouncing the capability to defend our country and its institutions. I am sometimes led to wonder whether this is the result purely of the superficiality of the proposals or whether in fact there is a deeper conviction that if pressed to the wall we should actually not defend ourselves—the "better-red-than-dead" philosophy. If the latter is the case, we had better get it out on the table and expose it to the hard light of day.

I would like to leave you with this thought: When you become impatient with the gulf between ideals and practical realities, I hope you will temper your impatience with the realization that *things are as they are because it is exceedingly difficult for them to be otherwise.*

V. F. Weisskopf

Intellectuals in Government

The scientific revolution is very different from other revolutions. It is not based on any political ideology. It is the effect of the vast and steadily increasing exploitation of scientific knowledge by technology. Many beneficial results for mankind were achieved by this exploitation, but it brought with it many dangerous and threatening developments. It was Winston Churchill who said, "The stone age may return on the gleaming wings of science, and what might now shower commensurable material blessings upon mankind, may even bring about its total destruction. Beware, I say, time may be short." And it certainly is.

Let us note a few of the beneficial effects of the scientific revolution. In these days of crisis, it is good to be reminded of them. We live a longer and healthier life, the amount of physical pain we have to endure is vastly reduced, we no longer need to exploit our fellow men with forced labor in order to provide the means of survival, housing, transportation, and decent living. Let us not forget that, only a few hundred years ago, sea transportation required the use of galley slaves. With a reasonable amount of organization, we could provide every family on earth with decent conditions of life, if we make sure that the number of births does not exceed the number of deaths.

On the other hand, the same scientific revolution has created enormous harm and, as Churchill says, may destroy humanity as we know it. The destructive effects come from many sources. First of all, the technical advances in the art of killing, the overwhelming destructiveness of modern weapons, has made it possible to annihilate a large fraction of the world population, a privilege previously reserved to epidemics only. One faces the terrible lesson of the past, that every weapon invented was subsequently put to use. But there are other indirect ways in which the scientific revolution has created new dangers. The progress of medical science succeeded in effective death control, but there is yet no effective birth control, and we are threatened by a population explosion, famine, and disorders. The unbridled expansion of industries and power plants, the growth of human habitation, have reached a degree at

which they cause irreversible changes of the surface of the earth and threaten human survival and health.

Here the scientists face a responsibility, since the development of technology was largely based upon their efforts or those of their predecessors. The main responsibility of a scientist was, and is, the development of knowledge within his own science by teaching and research. But in these days, when the detrimental effects accumulate so rapidly, scientists must be concerned about the physical and social effects of their work. It may turn out that it will be too dangerous to create new scientific knowledge. The result of the scientists' concern may be a decision to stop scientific progress.

We do not believe that this should be the conclusion. We scientists are optimists, and we are convinced that the net effect of scientific knowledge is vastly positive, that we can enjoy the fruits of science and at the same time avoid the destructive effects of its application. But this is only possible if we do something about it. Action is necessary, the sooner the better. What kind of action?

We have heard different views tonight about ways and methods to improve the situation and to avoid catastrophe. It will be my point tonight that there should be different views because there are, in fact, many avenues of action open to us, and all of them must be taken. The battle we are in for has a very broad front requiring a large spectrum of different plans, attitudes, characters, and methods. Some of the approaches will appear contradictory, but actually they are complementary.

There are two types of problems: those that require for their solution more application of scientific knowledge to fields where not enough research was done and those that require a slowdown or a halt of certain applications of science because they represent misuses of knowledge and technology. The first types of problems are widespread. They appear wherever it is necessary and possible to improve a bad situation. I mention the problems of smog control and atmospheric pollution, the problem of birth control and increased food production, the problem of traffic control and rational transportation in cities. In most of these cases we face a double edge of problems, some that can be attacked with methods of the physical or life sciences and some that are problems of social sciences. Sometimes the latter ones are harder to solve.

The second types of problems come from the misuse of science and technology, the development of technical gadgets whose net effect on society is negative. Examples are the supersonic transport plane, the overproduction of automobiles with internal combustion energies. We must begin to study not only the technical feasibility of an innovation but also its effect on the physical and social environment. The main and most important case of misuse of science is its use for military purposes. Every invention of a new and more deadly weapon is a step nearer to a final catastrophic mass suicide of mankind. But the problems of ending this madness are by no means simple. Ways and means must be found to curb the armaments race by means of arms control and by a de-escalation of military efforts. This also is a problem that is only partly one of the physical sciences.

We scientists must try to make better use of science and to prevent its misuse. Let me describe two approaches to these aims that are and must be complementary. One is what I call the "inside" approach, the other is the "outside" approach. The first approach consists of collaboration with the government and other offices of the "Establishment." There should be scientists in almost every office of the government, in order to apply scientific methods to important problems, in order to draw attention to neglected facts, in order to prevent abuses of technical information, and last but not least, in order to get public support for scientific research, in particular in neglected sciences. So scientists are needed in the Departments of Interior, of Health, in the National Science Foundation, in the Atomic Energy Commission, and also in the military departments. Particularly, in the war departments scientists are important to draw attention to unpleasant facts and to warn against irrational action. Unfortunately, the political developments in the last years have shown that scientific and rational advice was rarely accepted in the military field. That is no reason, however, not to try it again. The situation would be even worse without any advice.

The outside approach is different. It is the line of independent study and protest, if necessary, against public policies that were found to be wrong and detrimental to the public interest. It often leads to opposition to the powers in office. It may require political action, consisting of organized studies, of information and educa-

tion of the public via assemblies, newspaper articles and literature, and demonstrations of protest. The last years have shown several examples where this method has been effective. Public opinion can be influenced by rational arguments. The development of the public attitude toward arms control, toward the bomb test stop, toward peace in Vietnam, are examples of how steps in the right direction can be induced and supported by this approach.

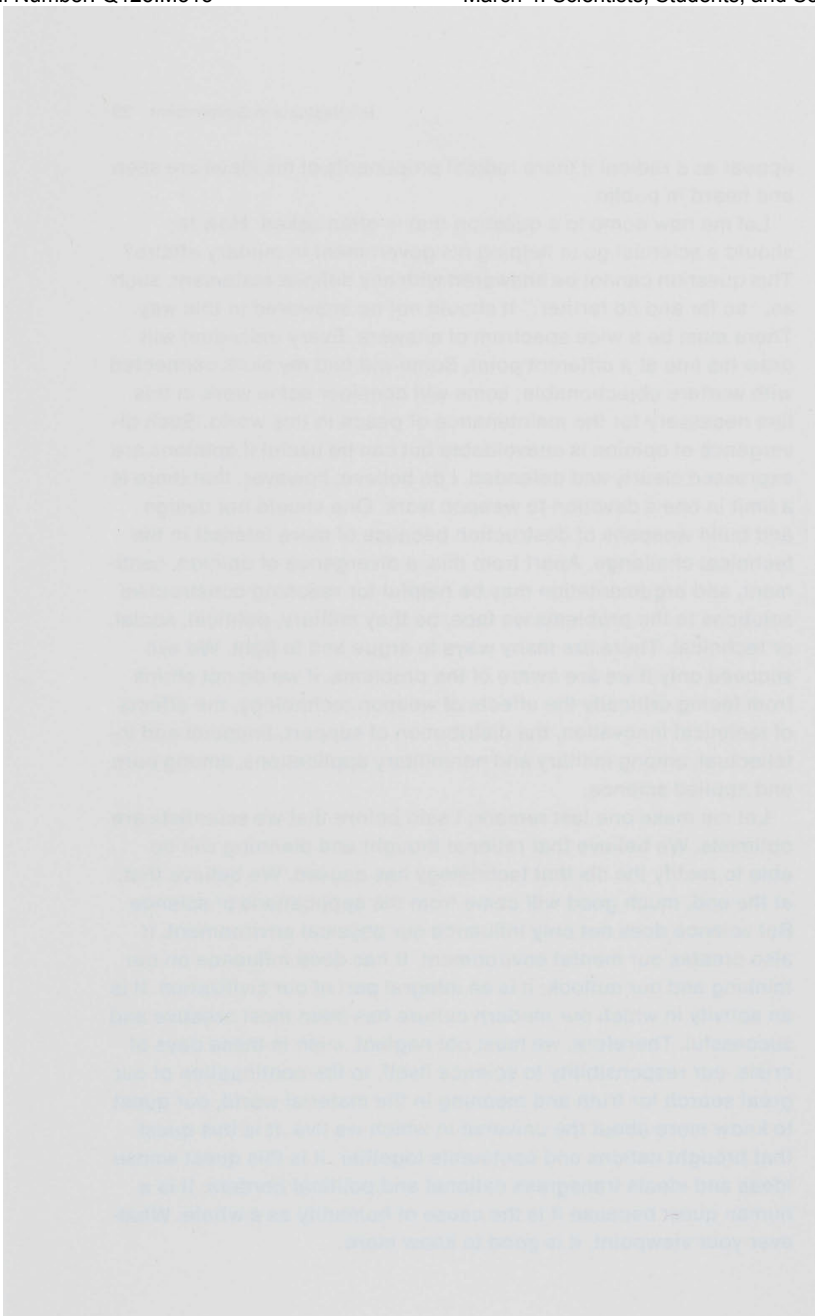
Both approaches, the inside and the outside ones, are necessary. Both have their dangers and pitfalls. The inside worker may easily become too much of an establishment man, he may be attracted by the power and influence he can wield by his position, he may become accustomed to the ways of the military and loose his restraining influence. The outside worker may be infatuated by impressive but contentless slogans, he may rely on popular but false conclusions that can be easily and effectively transmitted to the public. As the inside man may be smitten by the power politics of government circles, so can the outside man be infected by the heady atmosphere of journalism and protest speeches.

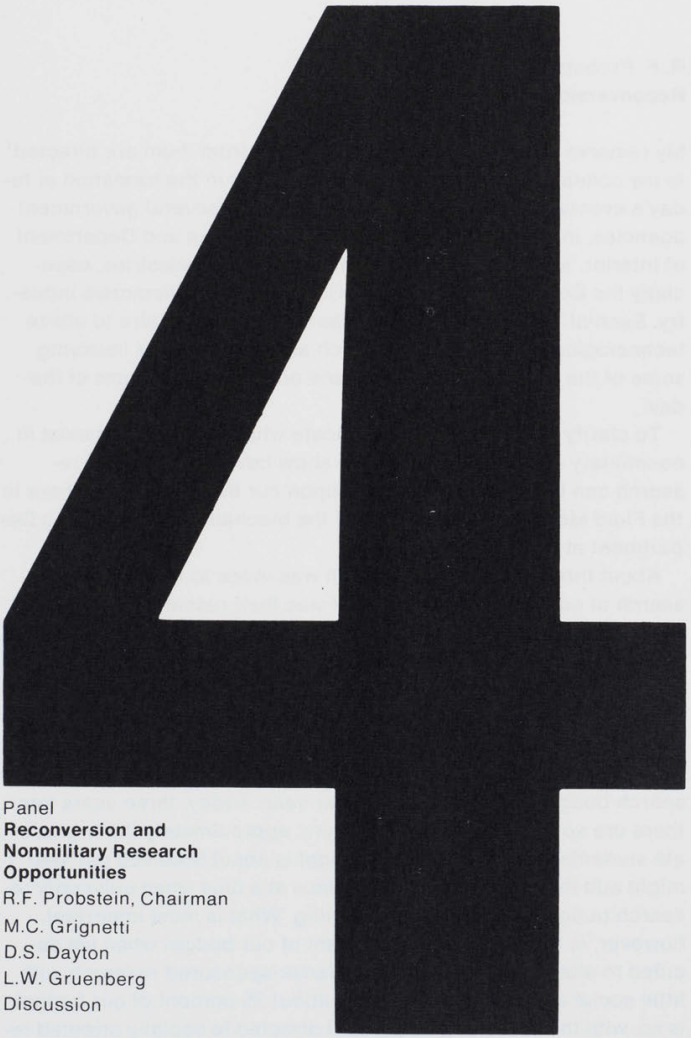
One thing, however, is certain: the two approaches cannot be carried out by the same individual. On the contrary, the representatives of each approach are highly suspicious of each other: the in man fears that the activities of the out man jeopardize his efforts and shed a bad light upon the ideas of which he wants to convince his government. The out man considers the in man in cahoots with reprehensible circles in the government and accuses him of compromising ideals and of trying to defend the indefensible. Let it be said, however, that it takes sometimes even more courage to sit around days on end with generals listening to their arguments and trying to convince them of a point than to go before the public and promote an unpopular idea. Both approaches are necessary and complement each other; one group is helped by the other in spite of differences in outlook. The in man helps the out man because government and Congress are by far more ready to yield to public demands and protests if the ground was prepared before by acquainting members of Congress and government with the arguments of the protesters in a language that they may more readily accept. The out man helps the in man because it is much easier to convince the government and the military of something if public pressure exists in that direction. Within the establishment, the in man will no longer

appear as a radical if more radical proponents of his ideas are seen and heard in public.

Let me now come to a question that is often asked: How far should a scientist go in helping his government in military affairs? This question cannot be answered with any definite statement, such as, "so far and no farther." It should not be answered in this way. There must be a wide spectrum of answers. Every individual will draw his line at a different point. Some will find my work connected with warfare objectionable; some will consider some work in this line necessary for the maintenance of peace in this world. Such divergence of opinion is unavoidable but can be useful if opinions are expressed clearly and defended. I do believe, however, that there is a limit in one's devotion to weapon work. One should not design and build weapons of destruction because of mere interest in the technical challenge. Apart from this, a divergence of opinion, sentiment, and argumentation may be helpful for reaching constructive solutions to the problems we face, be they military, political, social, or technical. There are many ways to argue and to fight. We will succeed only if we are aware of the problems, if we do not shrink from facing critically the effects of weapon technology, the effects of technical innovation, the distribution of support, financial and intellectual, among military and nonmilitary applications, among pure and applied science.

Let me make one last remark: I said before that we scientists are optimists. We believe that rational thought and planning will be able to rectify the ills that technology has caused. We believe that, at the end, much good will come from the applications of science. But science does not only influence our physical environment, it also creates our mental environment. It has deep influence on our thinking and our outlook; it is an integral part of our civilization. It is an activity in which our modern culture has been most creative and successful. Therefore, we must not neglect, even in these days of crisis, our responsibility to science itself, to the continuation of our great search for truth and meaning in the material world, our quest to know more about the universe in which we live. It is this quest that brought nations and continents together, it is this quest whose ideas and ideals transgress national and political borders. It is a human quest because it is the cause of humanity as a whole. Whatever your viewpoint, it is good to know more.





Panel
Reconversion and Nonmilitary Research Opportunities
R.F. Probstein, Chairman
M.C. Grignetti
D.S. Dayton
L.W. Gruenberg
Discussion

R. F. Probstein

Reconversion and Academic Research

My remarks and the challenges that follow from them are directed to my colleagues, many of whom were active in the formation of today's events, to you students present here, to several government agencies, in particular, the Public Health Service and Department of Interior, and finally to the automotive and oil industries, especially the Coordinating Research Council of the automotive industry. Each of the groups I refer to has expressed a desire to utilize technological resources to research adequately areas involving some of the most pressing urban and ecological problems of the day.

To clarify my challenges, to indicate what opportunities exist in nonmilitary research fields, and to show how conversion of research can take place, I will draw upon our own experience here in the Fluid Mechanics Laboratory of the Mechanical Engineering Department at MIT.

About three years ago a decision was made to reorient the research of our laboratory from what was then research primarily in the fields of re-entry physics and high-temperature plasma physics. Although this work was totally unclassified, its main direction was nonetheless toward problems of missile re-entry and space exploration. To give you some idea of the size of the laboratory, at that time there were approximately half a dozen professors and some twenty graduate research students with an annual contract research budget of about $300,000 per year. Today, three years later, there are some nine or ten professors, approximately thirty graduate students, and the research budget is about $600,000 per year. I might add that this increase took place at a time when university research budgets have been contracting. What is most important, however, is that whereas 100 percent of our budget when we decided to alter our direction was defense-sponsored research with little social application, today only about 35 percent of our budget is so, with the remaining 65 percent directed to socially oriented research. I want to emphasize that even of the 65 percent, some part of it is supported by the Office of Naval Research, which I would like to single out for an especially far-seeing approach to problems

of scientific research. However, I wish to point out that they are by no means alone in the Defense Department in their sensitive and intelligent approach to research. Further, I would hasten to add, it was not our intention either three years ago or now to sever relations with defense-supported research. Rather it was an effort to redress an imbalance.

Let me make clear that what I am talking about is reconversion. Thus I, and many of you, are aware that there are now and have been many segments of the MIT community engaged in important and productive socially oriented research; however, much of this research is in the nature of the field. For example, the fact that individuals in food sciences are working on problems to eliminate famine throughout the world, or that some biochemists are working to eliminate a variety of diseases, or that transportation engineers are trying to eliminate the mess in urban transportation, or that chemical engineers are engaged in water processing is to be commended, but the research carried out did not necessarily require reconversion. What I am speaking of is a directed effort to change.

Again, I think this can perhaps be best illustrated by the fact that among the group of professors in our laboratory who decided to make the change I spoke of were Professor James Keck, a nuclear physicist whose research experience was in the development of atomic bombs and ballistic missiles, Professor Ascher Shapiro, who is well known for his work on aircraft jet engines, and Professor James Fay and myself, whose research work has centered primarily on ballistic and antiballistic missile systems. I must say that to take such a group and reconvert them really appeared to be quite a task.

After months of discussion we were able to sort out four fields of social importance in which we thought we could apply both our knowledge of fluid mechanics and chemical kinetics to certain critical and unsolved problems. The fields were air pollution and water pollution, which Professors Fay and Keck undertook to supervise, biomedical fluid mechanics, which Professor Shapiro entered, and desalination, which I began to study. I want very much to emphasize that prior to our decision none of us, along with our many colleagues including Professors Hoult, Sonin, and Jaffrin, and our graduate students, had had any experience whatsoever in these

fields other than perhaps Professor Shapiro's latent desire from childhood to be a doctor. For the moment let me put aside the agonizing efforts that went into deciding what were some of the critical fluid mechanics problems in these fields, to thinking up the possible solutions, to writing the necessary proposals, and then to the peddling of them to anybody who would listen to us. And here I might add that the most reluctant to listen were always the experts. Suffice it to say, we did finally manage to get funds from such places as the National Institute of Health, the Office of Saline Water, the Public Health Service, Edison Electric Institute, and others. As reluctant as the government agencies were to award money, their magnaminity far outweighed that of private industry, which seemed to spend research money on advertising to convince us how they were working to eliminate smog and to clean the oil off the birds.

Rather than to speak in generalities, let me mention some of the specific problems we tackled, as fluid mechanicists, and let me mention some of the results. In air pollution we undertook a study of the flow out of high smoke stacks used to disperse pollutants from power generating plants. We discovered, to our amazement, that although consideration was being given to the building of stacks as high as the Empire State Building, there was no real knowledge of why they were being built the way they were or, indeed, if they would properly disperse the pollutants the way they were supposed to. I think you need only look on any smoggy day at the effluent coming out of the stacks of the neighboring power plants to see what I mean.

Also, in the field of air pollution we undertook to study what trace chemicals remained unburned in an automotive engine, for that's the stuff of which smog is made. In this regard it was of some surprise to us to learn that, although internal combustion engine research had been going on for some fifty years or more, all of it was directed to power and efficiency, which confirms what the Dodge girl has been telling us all along in the TV commercials, but that little, if any, effort had been put into understanding the combustion fluid mechanics that give rise to the hydrocarbons we are forced to breathe.

In the area of water pollution, after Torrey Canyon but before

Santa Barbara, a theory was developed in the laboratory that indicated how oil, once present, would spread on ocean surfaces and how, by means of a fluid mechanical bubble screen, such spreading might be stopped. Unfortunately, we were not able to obtain the funds to carry out the necessary laboratory experiments to test the theory in order to see if such disasters as overtook Santa Barbara could be prevented.

Along the biomedical line we were almost at home in our research, for it was easy to see that the human body is virtually a mass of piping so familiar to mechanical engineers. One of the more interesting research areas in this field that we undertook was to understand why an infection in the bladder could sometimes travel in a direction opposite to the flow down through the ureter and wind up in the kidney with deadly results. Such a phenomenon clearly ran against all intuition; yet on examination we did find out why it occurred. Another interesting project undertaken in this field was a study into how by fluid mechanics means one could assist a weakened heart in its opening and closing processes.

Finally, in the area of desalting of water we set about investigating how to separate ice crystals from salt water. As you may know, if you freeze salt water the crystals of ice that result are salt-free; therefore, if you could separate these crystals from the sea water and then melt them, you would wind up with fresh water.

On looking at the problems we undertook, they would on the surface certainly appear to be vastly different—certainly different from the types of problems encountered in nuclear explosions or missile re-entry. However, the answer is that they are not that different. They all involve fluid mechanical and chemical kinetic concepts, so that the real efforts were in reconverting our own thinking from one area of research to another but not necessarily in starting from scratch. After all, isn't that what we professors have been saying for ever so long? Namely, what we give you is a basic education that you can apply in an infinite number of directions. Yet once we professors get on one track, it is rare that we ourselves are willing to carry out what we teach.

The fact that our laboratory was able to have some success is, I think, more an indication of the real need for research of the type I have spoken about. This is forcefully illustrated by the fact that Pro-

fessor Fay, one of our reconverted MIT missile experts, has within the past week been appointed Commissioner and Chairman of the new Boston Air Pollution Control Commission; Professor Shapiro has initiated a joint medical research program with Boston City Hospital to test out his ideas in actual medical situations; Professor Keck has devised, by means of a relatively simple combustion-chamber redesign, a possible way of eliminating many of the smog-producing components from internal combustion engines; and one of my graduate students and myself are now discussing with one of the largest arms manufacturers in America the production of a plant for water desalination.

What of the students? What do you do after MIT? Where do you go? Again, let me use our laboratory as an example. Prior to our reconversion our best estimate is that approximately 80 percent of our students receiving their master's and doctor's degrees who did not go into university teaching entered defense, and more particularly the missile industries. Despite the fact that our new look in the laboratory has been evident for only a short while, our students are now receiving high-paying offers from industries, who themselves feel they should be in socially oriented work. Indeed, within the last six months I would say that more than half of the graduating students in our laboratory have entered industries either engaged in or entering into socially oriented research. As you can see, it doesn't take long for the word to spread. There are more jobs available in these industries than can be filled. But if the picture is so rosy, what then is the challenge I speak of that you students will have to face? After all, I did say that the research is meaningful and in addition that it is even well paid. Perhaps I can best exemplify the difficulties you will face by pointing out that as late as 1952, after I received my Ph.D., I went to a large rocket engine manufacturer who was finally getting the idea that research was a good thing. They offered me an appropriately high-paying job directing a group in fluid mechanics research, and just to assure me that all was well and that I was really wanted, they told me, "Don't worry, we won't let anybody know you have a Ph.D." That was but a little more than fifteen years ago. Times have certainly changed in the missile industry.

But today you will face similar problems in industries desirous of entering or already in the urban and ecological fields but who are

only now embarking on research. It is clear to me that you will have to forego glamor, although it may not be as bad as an office where everybody wears green eye shades. Despite the fact that you will be able to make a meaningful contribution, I would be pretty certain that many years will have to pass before the real role of research is understood by most of those companies now engaged in urban work—and before the medical profession, for those of you who enter it from the engineering and physical science side, will accept you as an equal when you work on electronic and mechanical plumbing rather than human plumbing.

To my colleagues here at MIT the challenge I speak of is not dissimilar, for they must be prepared to throw over the cushy academic bed in which they are accepted in order to enter seemingly less glamorous fields in which they are unknown to those already there. They even have an extra burden, because unlike the biologist or food technologist they must define the critical problems to which they can make a contribution. After all, it is a long way from quantum statistics to getting the snow off the streets in Cambridge.

So far I have spoken of our successes and what I think we as a community of students and faculty at MIT can do. Let me recount the failures, and here I refer mostly to the support we did not get, where, as you all know, by support I mean money. Some of my colleagues say that when government and industry really decide to put money where their mouth is, then the work will be done. This is an argument I refuse to accept. It is one of following rather than leading, something to which universities are notoriously prone. I claim that at MIT we can lead by first showing at least some results and then by challenging both government and industry to join in supporting the research.

Let me make some challenges and let me be specific. I address myself first to the Department of Interior and the large oil companies. To date both have shown little or no interest in formal proposals presented at length by our laboratory for research to prevent the spread of oil slicks on the ocean. An amount of $150,000 a year for two years was requested. The proposals we have made followed the established and proper routes, and even some unestablished ones. They have been turned down with a remarkable consistency. Perhaps Santa Barbara has changed some minds, though as yet I

am not aware of such a change. The research proposed among other things the study of elementary fluid mechanical devices to stop an oil flow spread once it has started. However, the ideas are at present only paper and pencil ones and, as I mentioned before, experimental research is required. Nevertheless, it does appear that fluid mechanics research in this area could yield remarkable results. To date not one dollar has been forthcoming to support such research despite the many pious pronouncements from Washington and the oil companies of how they are doing all they can. I emphasize again that the standard route of proposals, talks, endless visits have been made, and I now specifically challenge those concerned to show their interest by supporting research that we feel can produce results.

Finally I address myself to the Public Health Service and the auto industry as constituted by Ford, General Motors, and Chrysler. Here, despite all the pronouncements from these sources, I can state that they have been unwilling to consider giving any funds to support a two-year $350,000 research program suggested by the MIT Fluid Mechanics Laboratory to find out why internal combustion engines as now designed emit the pollutants they do. It is, after all, difficult to specify the cure of a disease when you don't know what the ailment is.

The Public Health Service has claimed their funds are limited, and that they must therefore be used sparingly, and that their most efficient use is in the drawing up of regulations governing the amount of pollutants automobiles are permitted to emit into the atmosphere. That does sound fine, but, as far as we can tell, the criteria as to the admissible amount of pollutants seem to come primarily from the automotive industry and are tailored to what they feel they can do. On investigation, it appears that the research arm of the auto industry which defines what can be done, the so-called Coordinating Research Council, receives most of its money from the auto and oil industries with a bit of assistance from the Public Health Service. It was logical therefore, to approach the Coordinating Research Council itself for money to study the problem I spoke of; their response was firmly negative. It seems that the research they support should fit into their ideas of what research they think is needed rather than what a group of MIT professors think might be

important. I would suggest that even Ralph Nader might be shocked at the interlocking nature of how research is sponsored by the automotive industry. The route of the formal proposals has already been made. Therefore in its place I challenge the government and automotive industry to support a very specific program for which there is every reason to believe, though of course no guarantee, that research will produce spectacular gains.

Clearly, from our small efforts in the fluid mechanics laboratory it is obvious that there are reconversion opportunities in all areas of socially important physical science research here at MIT. It's only the challenges I have posed that have to be met.

M. C. Grignetti

Some Proposals to Aid Reconversion

I will be very brief and to the point. I have three proposals to present as working hypotheses for future development. This is not a technical meeting in which some previously developed work is presented. These are just ideas that came up in the course of the few days in which I have been involved in this thing. So it is open to criticism, and it is my understanding that the main purpose of this meeting is to work out, collectively, a viable approach to the solution of these problems.

My first point has to do with the issue that Professor Probstein used to introduce me. The fact is that the work that most of us are doing is being sponsored by the Department of Defense. I'm not talking about strictly military and perhaps a horrible kind of work. I'm talking about strictly nondefense work, which nevertheless has to be justified in terms of a dreamt-up or a remotely possible military application in order to get funded. Often one has to do some incredible stretching of an idea to convince some military agency of a military connection. The problem is, to put it bluntly, that there is no, or very little, opportunity to do nondefense work, which is not supported by the Defense Department. And this, I maintain, need not be so.

My first suggestion, then, addresses itself to this problem. Why wouldn't it be possible for us concerned scientists, as a consequence of acts like this or by launching a campaign, to persuade the members of Congress to prune out those items in the Department of Defense budget that are not defense related? This is my first proposal. Why should anybody who is working in pure math be supported by the Army? Why should anyone who is interested in research on computers, which are used for teaching purposes or for information-retrieval purposes, have to find resources or have to resort to the military in order to find financial support. I don't see any reason for it, and I would like again to propose in the manner that is common among the citizenry in this country, through letter writing to Congressmen and through all similar political action, to have a curtailment of the defense budget that is not directed specifically to military work. To call a spade a spade, the nonmilitary work should

be put into the hands of the corresponding civilian agencies. Since they do not exist (it is not enough to put it in the hands of NSF), let's propose the creation of a new body that will deal with the administration and the granting of funds for applied research in nonmilitary areas.

My second proposal is directed against the disproportion between the means and the needs of the nondefense government agencies—especially when compared with the same ratio of means to needs that are available in the Department of Defense. There is a prime need on the part of these former agencies for more work to be done. In the few cases I am personally aware of, they are desperate to get help from a wide range and a large number of members of the scientific community. I could cite, for example, cases like the agriculture department and the bureaus of chemistry and physics of the Health, Education and Welfare Department who have a crying need for physicists, for example, to study diffusion models in the atmosphere, or for chemists to study photosynthesis problems that are of relevance in pollution studies. They do not even have the manpower to administer the contracts for which they would have meager support. They are not able to come up with a request for proposals in certain things because they simply do not have anyone able to monitor those contracts.

I propose then that in order to help these agencies, we could use our specific differentiation from the rest of the citizenry, namely as the scientific public of this nation, to protest and show our willingness to support them by initiating a flood of unsolicited proposals in all those problem areas that demand a solution—projects that those government agencies will welcome even if they are not now able to support them. I cannot see a better way of carrying our outcry to the lower echelons of the decision-making mechanism of government than to give these men who are actually complaining about our lack of interest in their many interesting scientific problems which we may be able to solve. Now in order to do that, we need as our first step, and this is my third suggestion, to establish a clearinghouse or an information center where we would compile information about who is interested in what and where in the government so that we can all draw from that information in order to make our proposals.

D. S. Dayton

Problems and Possibilities in Reconversion

I want to direct my comments to the scientists and engineers of today, but particularly of tomorrow, because I feel they have a special responsibility to mankind and the universe in which they find themselves, which comes from two special factors of their identity. One is that presumably we as technologists are trained in the pursuit of truth. You know that's a very profound and challenging kind of assignment, and we don't always do it to the best of our ability, and we don't always observe it with the greatest of our loyalty. Second, we have a responsibility of leadership in the commitment of resources in our companies and in our communities because the technologist today is in a unique position; he is able to see into the future much more accurately than in any other discipline. We are a uniquely future-oriented discipline. And so we have these two responsibilities—to pursue truth and to lead in the commitment of resources in a direction that will benefit mankind and leave the universe better off than the way we found it.

We have a couple of vehicles for this concern. One is the application of our special resources—our job if you will—the way we devote ourselves, the way we spend our time, the way we study, the new things we learn. And second is the influencing of the application of other resources. These go hand in hand. I suggest that the scientist or the engineer is overly concerned with the application of his own resources, his capability, his background, his time, and not enough with leadership and influencing the application of other peoples' resources. I think this is a very practical thing, and we are in a very powerful position; perhaps we don't realize how very much power we have in exercising that leadership. One obvious vehicle for this is through our professional societies, which are just beginning to awaken to their responsibilities as societies and their position in the leading of thought and the application of resources in the future.

Now there are several difficulties here that I think we have to face honestly. I can think of three, and maybe you can think of others. The first is that the criteria are very hard to define and to apply. What do we mean by benefiting mankind? What do we mean by

leaving the universe better off than we found it? Our traditional religious values, generally speaking, do not give us sufficient day-to-day guidance in making these decisions. That is the function of the Boston Industrial Mission, which was mentioned. The Mission is attempting to infuse human values into decision-making in industry, particularly the research and development industry. So, number one, the criteria are very hard to define and to apply.

The second difficulty in finding an optimum discharge of our responsibilities is that the challenge of military and other government programs, which we feel do not adequately satisfy these criteria, is very great. The challenge to us as people is very great; it is exciting. The action largely tends to be in the military budget, as Mr. Grignetti says, since not only direct applications to military ends but even the many peripheral projects sponsored by the government contain most of the advanced work today. And this is because nobody else can afford it. If I am a specialist in new coding forms, in information theory, chances are I will wind up being supported in one way or another by the government, because the distance between what I'm doing today and where the application of this will be for social betterment is great. And there are few organizations in society able to afford this gap. So the challenge is great. The excitement tends to be in the military and space kind of work. And the transferability, at least at an equal depth, is very hard. If I've grown up and spent ten or fifteen years as an expert in electronic countermeasures, it is very hard for me to turn around suddenly and begin to work on housing or transportation or pollution control or any of the pressing needs of society. So this is the second difficulty.

The third difficulty of course is money—money and what goes with it, the authority over others—what we lump together as opportunity for the professional development of a career. The tendency is to gravitate toward large organizations where there are opportunities to wind up in a position of supervision over many people and to see the results of our labor in large movements of one kind or another and to earn more money for ourselves, for our families, for what we hope to do. So here are three difficulties, and let me try to answer them, at least in part.

First the criteria. I have only a couple to suggest, and they are very old so this is not unique, but I think they're applicable. The first

is a concern for others. How much of our work is purely devoted to our concern for other people? This is a question which, if asked continually, I think leads to some new directions. Second, as I mentioned in the beginning, is our commitment to truth. How much of our work is really developing new information, new knowledge, new understanding, new insights that are going to be beneficial and have some depth to them? And third is the preservation and improvement of this universe in which we live, to leave it not just as we found it without destroying it, but to improve it and to pass it on to others who follow us. These are three criteria that I think are applicable, and I think, on pondering them in our daily work, we will find that they can guide what we attempt to do.

The second difficulty I mentioned was the great challenge that exists in large systems. The ABM system is popular to talk about today, and the challenges for engineers in the ABM system are tremendous. It's an extremely exciting project. You've got to recognize that. It has an appeal that is completely apart from patriotism, completely apart from money, completely apart from professional development. It's exciting. There are problems there that haven't been solved. I don't think it will work, but in the process of making it not work we learn an awful lot. Now the answer to this comes in two parts. First of all we have to recognize that the man who has spent all of his professional life in one narrow field reaching great depths, doing great new things, publishing and inventing has to retrain himself completely. In very many cases he cannot simply transfer what he's learned over to things that he feels may be more socially useful. He has to change completely. This is not impossible. I'm in the process of doing it, I see many others doing it, and it's very hard to do.

But we are concerned not only with the person who's been in this field for years, we are concerned with the people who are going to be in the technical fields in the future. That is where the great hope is. You see, the students in the great universities, the people who are starting out, have a completely clear slate to start with; they have every opportunity to go in any direction that is meaningful. So when we talk about reconversion, this is a little bit of a myth. What do we have to reconvert? Well, there are some facilities that are very expensive, but you know after the Second World War they put

bulldozers into the Boeing plants and leveled them because it was the cheapest thing to do. And, in any event, our facilities tend to turn over in a very few years in this industry. There are skills to reconvert, but these are largely the skills of experience, of application, and not the skills that come through education. More and more today our scientific educations, of course, are oriented toward basic understanding of physical phenomena, and they're very widely applicable. The reconversion that is a problem for the senior specialist then, is not a problem for the people who are newly entering the field. And it is not in any event a tremendously long-term obstacle to be overcome. In fact, I think we can find greater challenges and harder problems when we are dealing with human equations and problems where the variables are hard to measure. This is really very exciting.

The third obstacle I mentioned was the money and the authority: the opportunity question. Here I think that I would like to emphasize as strongly as I can that I believe that ideas create opportunities and not the reverse. It's easy to hide behind the argument that the money is in something that I don't want to do, and it's impossible to break this cycle. It's not impossible. The ideas for new systems, the ideas for new applications of technology come almost entirely from industry and the universities. Very few, I believe, are originated in the government. And I base this on experience in both the military and the Department of Defense and in the many agencies that I am now working with in the civilian sector. The ideas are coming from us. And if we have the courage to propose them and to follow them through, gradually the money will follow them. The real leaders in our companies are not at the top. If you work with industry over a long period of time, you realize that the opportunities lie with the people who are at the levels where the new ideas are being created. They are not the vice-presidents and the presidents. These people are making decisions among an extremely limited number of alternatives that have been carefully sifted and passed up to them in the organization. Never be awed by a president. The person who awes me is the person with a new idea. And there is unlimited opportunity for this. However, in the long term, and that's not very long—a few years—the real lack is good practical ideas, not money, not organizational problems.

Let me try to give a few examples; it's difficult to speak academically and not leave something that is, if you would, concrete. Basic research is an obvious one. You know we know nothing, we know nothing. This is the age of ego. We think we know a great deal about the universe in which we live, but anyone who examines himself honestly knows that we know extremely little. So the field of basic research is an obvious application that will absorb many people. Second, perhaps the largest and most popular field is the field of system design. We've developed tremendous facilities in the field of systems design, by which I mean the disciplines of operations research and the application of all fields of technology in what is a synergistic focus on a problem. Synergistic is an old theological term, coming through the medical profession to us, which means, in short, the whole is greater than the sum of the parts. But systems design is a great opportunity because it is interdisciplinary. And there are many, many opportunities; let me list just a few. The problem of food distribution—it is ridiculous for us to be throwing garbage away at a tremendous rate while people are starving elsewhere. This is a system problem—it can be solved. Waste management, crime prevention and control, transportation, the postal service, information transfer in government and industry, water resources, pollution control, city planning, the list goes on and on. I have a bibliography that I can recommend to people who are interested. And these are solvable problems. A system is something with an input and an output and some sort of a definable transfer function; you know that. And we can apply this kind of system design to all of the problems. And it's been done; it's been done successfully, and there are good examples of it, which is the most encouraging thing. RAND, I just found out last night, has a paper-work-reduction contract on Wall Street now. You know, they've been closing down the exchange on Wednesdays. They recognize that a system design and a system analysis organization is a good one to solve this kind of problem.

OK, other examples: there is a War Control Planners' organization—perhaps you've heard of it—in New York, which is devoted to the changing of our emphasis from self-defense to a worldwide protective system; such things as ensuring border integrity between countries and developing pacifying agents and worldwide sur-

veillance systems and all of the things that are now part of our defense technology but can be applied using what they call safe initiatives to peace control. I have a friend, a thermodynamics engineer, who changed the direction of part of his company from military applications of heat transfer, which are obvious, and space applications to things like thermal-pollution research and control. They are under contract, being funded, and being funded well. The money is there once the ideas are demonstrated.

Let me say something about my nascent companies. There are two: one is nonprofit and one is a profit-making corporation. The idea is for the profit-making corporation to feed money to the nonprofit. A nonprofit corporation can take the time to investigate new opportunities and experiment with new ideas in the social problems. The profit-making company develops products. Let me tell you about a couple of them. One that I think is very exciting is home access to time-shared computers. You know the capabilities of time-shared computers. Professor Fano is on a panel later today, I think, to talk about the MAC system at MIT, and there are many others in the country where people can share a central computer, which has tremendous power. We can have access to these computers from the home. There's no technological block to this—the communication capability is there, the programming capability is there. What we need to develop is a very simple input device, and we can use television as the output device. It's easy to wire wideband cables to homes. And the capabilities of such a system are enormous, especially in the underprivileged sectors of society, because it gives them an ability, an access to educational opportunities, organization capabilities, and communications that normally are enjoyed only by the upper echelons of society. So the profit-making corporation, by developing products, feeds the nonprofit, and you know you can work the process the other way around. The nonprofit corporation receives grants from foundations, private sources, and government to investigate new ideas, which the profit-making company can't afford to do. After the ideas have developed, then the product-making company can take over. So this is an example of what I think can be a powerful approach.

There are many examples like this, which I don't have time to go into. Let me recommend a couple of documents. There is one

called "Defense Systems Resources in the Civil Sector, an Evolving Approach to an Uncertain Market," which was prepared for the Arms Control and Disarmament Agency. It's available from the superintendent of documents and has a very extensive bibliography. It's done by Denver Research Institute. There's a book called *Transferability of Research and Development Skills in the Aerospace Industry* by Black and Foreman, in Falls Church, Va., Analytic Services Incorporated, as far back as 1965. You may be familiar with the Arthur D. Little efforts in city planning. There are reports on this. There is a document called the "Systems Approach in the City" by a man named Kibbee. He's from Systems Development Corporation, which has also pioneered in the application of time-shared computers. Well, the list goes on and on.

Let me end with kind of a plea. First of all, don't sink into the system. Don't sink in. But don't drop out either. The opportunities and the needs are there in a unique way, and I think we've reached a point in our society where the timing is just right. I think the challenges are obvious to everyone, and the possibilities for getting support for useful research are here more than they have ever been in the past. If you can't join a big company, form one. It's very easy to form corporations—you can do it for seventy-five dollars in Massachusetts. All it needs is some ideas. That's the basic ingredient that is missing. There's capital, there's contract money, there are people who will listen, there are workers, there are specialists who will work for you. There is everything you will need except the good, basic practical ideas of something that has just the right time to be put into practice today, and just the right degree of practicality yet innovation. It can be done.

The skeptics think of reconversion as a sort of massive movement from defense-oriented problems over to nondefense problems. But these skills and resources are changing over every few years. This is creation, not reconversion. The creative process is here, in universities like this. It's in your hands.

L. W. Gruenberg

Reconversion Within Government Laboratories

The reconversion I want to talk about is a kind of internal conversion that is taking place, at least to a small extent, within the military or defense-oriented research itself. Let me give a very specific example: the work being done at a government laboratory at Los Alamos on nuclear safeguards. Let us suppose that the nuclear nonproliferation treaty is ratified and some form of disarmament or arms limitation is agreed upon by the big powers. There still are, however, serious problems that can lead to dangerous instabilities in the world. Some of these problems are the following: (1) a small country, having a nuclear reactor being used for nonmilitary purposes, manages to collect and hide sufficient quantities of plutonium to enable them to construct an atomic bomb, which they do in a clandestine manner; (2) foreign agents from some small trouble-making country smuggling in a nuclear device by air into our country; (3) a black market in fissionable materials is formed, which enables some countries to obtain illegally quantities of plutonium.

In order to prevent these things from happening, it is necessary to develop methods for detecting and quantitatively analyzing fissionable materials. This must be done in a nondestructive manner; that is, we can't destroy, or even open for that matter, innocent peoples' luggage which is carried on airplanes. Detection of this kind is necessary in order to have a tight accountability of fissionable materials, and this is a very necessary thing if the nonproliferation treaty, for example, is to mean anything. This work is now going on. It's only a couple of years old at Los Alamos, and I'd like to suggest that this understanding represents a reconversion from military to nonmilitary research that is right within the Defense Department effort and that these efforts are worthy of consideration for idealistic young scientists who want to do some good in the world, who are looking for something relevant and socially responsible to do.

Let me spend the last couple of minutes to tie this in with something that doesn't really belong here, just to make a connection. And that is the subject Professor Weisskopf discussed at some length yesterday. I think that we need people to work at places like Los Alamos on things like this, and perhaps even on other things,

not only because this is important work that has to be done but for political reasons. I feel that it is necessary to have good people working within the system who are sensitive to social issues in order to counteract other work that's going on by people who are not aware of these issues. I feel very strongly that the military-industrial complex is not as monolithic as it may seem at first sight. A man who works in a weapons lab is very concerned about the fact that if the particular airplane that he's working on is going to be discontinued, he's going to lose his job. If he can be educated, and if the administrators can be educated, into recognizing that by reorientation of their research they'll be in a less vulnerable position, I think that it's possible, as in this case of nuclear safeguards, that very great changes can be made within Defense-Department-supported research itself.

In conclusion let me quote William Buckley's column in last week's *Globe*, a short quote:

> The question of whether to have an ABM system or more public housing or less taxation is answered by a value judgment. It is derived from a consideration of pooled scientific knowledge, strategic calculations, diplomatic guess-work, etc. . . . For the professors to act like Aristophanes' women, threatening to deny their services unless they have their own way, is a form of public blackmail which is anti-democratic in character and seditious in its implications.

Let me suggest to you that we take a lesson from Mr. Buckley's remarks and turn them back the other way. I'm not suggesting that we should or are capable of such a strike as he suggests. However, what I would like to suggest is that one way to carry out some of Professor Chomsky's ideas of exerting influence by refusing to work on certain things, one way to be effective in this manner is from within the system, because then the government has something at stake in keeping you there. It's much harder for an outsider to protest and say he's not going to work on dirty things anymore, when he's been protesting all his life and not really working on them to start with. Let me end now with that remark.

Discussion

Rossi:
[Bruno Rossi is Professor of Physics at MIT.] I have been extremely interested in many of the ideas that have come out, for example, the idea of Dr. Grignetti about the establishment of information centers. I wonder if he would expand on this idea. How do you consider such ideas could be set up? Who should take the initiative for setting them up? How will they work?
Grignetti:
The question concerns the first proposal that I made in my short speech on the establishment of an information center or a clearinghouse that will essentially supply for general use information concerning who is interested in what and where in the nondefense government agencies. I'm sorry I cannot be any more specific. I have no definite blueprint plan for the establishment of such a center. It is, however, not a major enterprise, I would suggest, judging from the basis of a few visits to Washington that a few colleagues of mine at my place of work have made. As for the type of interesting work that may be available in places such as, of all places, the forest service of the Department of Agriculture, let me just point out some of the highlights: for example, soil structure and soil-plant-water-nutrient system analysis; conservation and efficient use of water for agriculture; technology of watershed conservation and management; weather-effect probabilities on agricultural decision-making (here is something that should be very appealing for those of us who are in the applied mathematics or the computer field); appraisal of forest and range resources by remote sensing. What I'm trying to say is that the compilation of such data does not appear to be a very difficult task. Such data is available. And at least in the few government agencies I know of, they are more than willing to provide it.
Question:
Professor Gruenberg, you've been working within the system for the past thirty years. [Professor Gruenberg is in his thirties.] *You* built the atomic bomb, the H-bomb, the missile systems, and so on. How do you expect that, if you stay in a system, you're going to be able to do any different in the future than what they tell you?

Gruenberg:
I can't say that I have a very simple answer to that, but let me say that to stand on the outside and act morally superior and moralistic is also not of use. We need to have some kind of concrete constructive political method of accomplishing something. And just standing on the corner and rabble-rousing is just as useless as going ahead and working on missiles.
Question:
Yes, but the missile is a very tangible thing, and it already exists. I'm not moralistic. I'm scared.
Question:
I'd like to make a comment or perhaps ask a question. My comment is, first of all, that what appears to be socially useful in one era is socially useless and destructive in another era. There are many people here who contributed to the Manhattan project, to the Radiation Laboratory, who were doing something at the time that was socially constructive from the point of view of those times. And of course times change and something else is required. So I reject the thesis that the people who rallied to the defense of the country when we were standing against Hitler were necessarily from the beginning socially destructive. It is true that things get out of hand after a while, and everybody has to change their thinking, and particularly older people with gray hair like myself get into a rut and we have to be shaken out of it after a while. My other point is a question really that I direct to anybody who can answer this, if he has the answer. That is, you've talked about how to reorient applied research. But what about basic research? It's perfectly clear what to do if you're a fluid mechanist. You find another problem to which you can apply fluid mechanics, and you get to work on it, and you get somebody to put up the money for it. These may be hard things, but it's very clear what you do. But I think basic research now finds itself in a rather different position. For the last 25 years it has been the child of the Defense Department, which has supported it on a very elaborate scale, although in recent years that's been tapering off. It now looks as if there is going to be a change. I think on the one hand DOD is becoming disenchanted with basic research, and on the other hand scientists feel themselves captives of a machine and feel very uncomfortable about this and would like to shake it

off, if they can. But of course they don't want to cut off the limb on which they are sitting right now. So what's the practical answer to this? Where is it possible to visualize civilian support for basic research in the future on anywhere near the scale it's been supported by DOD and related agencies for the last 25 years?

Probstein:

Since you refer to fluid mechanics, may I take the option of replying. It seems to me that what is defined as basic research and what is defined as not basic happens to be a function of where you are at the moment. When as a professor I go outside into industry, as you well know, one is often looked upon as a longhair living in another era—sometimes past, sometimes future. When I go over to some of my colleagues in the physics department, one is often looked upon as a plumber. Now I suspect the truth probably falls somewhere in between. What I would point out, however, is that the people whom I mentioned in my talk, prior to our "reconversion" were doing what I think even you might consider fundamental research. Some of the areas my colleagues were working on, for example, were the determination of reaction rates from a quantum-mechanical point of view, general statistical-mechanical and kinetic theory studies. On the most fundamental level I might cite investigations being carried out on the nature and meaning of the Boltzmann equation. I would say that such studies can be classed as pretty fundamental work. The trick was to try and see where such work could be fitted in to socially useful research. Now I would like to give you an example of it. I can honestly say that it turned out that there was a direct analogy between a fundamental kinetic model for a high-temperature gas flow and the means of separating ice from water. I could give similar analogies in several areas of work we undertook. The trick then is that we should be able from our knowledge to specify what our own particular sort of basic understanding can let us do. I think that's the job. What is your field? Where do you think it can be applied? Or is the argument such that we will simply continue doing the same thing that we've been doing, but let's just get the money from clean hands? I don't think in that case it would be much of a change.

Question:

I tend to agree with what you've said, but I don't think you've really

faulted my point. I think that people who have been in—I don't like to use the word—pure science have worked on problems that cannot reasonably be associated with direct practical objectives except in the most remote way. Now it's been possible to sell their research to the Department of Defense over the past years on a basis that is rather complex, simply because the elder statesmen involved were people who were fantastically successful in applying technology to solving the military problems that confronted us during the Second World War. The military establishment or the government establishment has been sold on basic research to a large extent on the basis of personal faith in the people and their abilities. What I'm saying now is that I think some of that belief may be fading out and we may be coming to a time where a more hard-headed approach will take place which may involve a shrinking in support for many things that have been supported. I think on a long-term basis this would not be good for the country, either the civilian or the military part of it.

Question:

I'm rather impressed with the elitism, the arrogance, the presence of intellectual detachment that my colleagues, perhaps myself, sometimes pretend to. And I think there's a lot here that is of concern in that respect. For example—and I will address myself to comments of various panel members —one of you refers to working from within the system, with the inference that one can subscribe to the system and do his job well enough to maintain it and yet not be influenced by the system that surrounds him every day. Another view speaks of the students coming into industry as blank slates, assuming that they can go to a university with (for the most part) defense-oriented contracts, that they can live in a society which is speaking of war all the time and still be free of these influences. You mention the problem of converting your laboratory, Dr. Probstein, into non-DOD things, and yet you say you have 35 percent defense-oriented work. How many Vietnamese children have died because of that 35 percent? I don't think that we are referring here enough to the immediacy of the problems that brought us together today. There's a sort of leisureliness and inference that we as some select group can deal with some select people in the government and solve this problem. None of us here, none of those on the panel

have spoken of the necessity of educating the public so that they will be more responsive to programs that are socially oriented rather than programs that are war-oriented or, as the word is sometimes used, defense-oriented.

Probstein:

Thank you for your speech; that sort of complements the panel now.

Question:

I'd like to support the preceding two speakers, and let me begin by reminding you of something that happened about a year ago. An internationally celebrated mathematician from Berkeley went to Moscow and made some derogatory remarks about this country's presence in Vietnam. He returned to find out that the National Science Foundation was holding up his grant application. That became a national event, and I don't remember exactly what the outcome was, but as all professional physicists know, their life's work is in fact threatened by the fact that much of their support, in many cases all of their support, comes from the Department of Defense, and their work may have nothing whatsoever to do with defense work. That is to say, we all feel intimidated by the fact that our money is coming from the Department of Defense, and I think it is going to be difficult to get out from under its power. And as others have implied, it's extremely important, it's nontrivial, that our support come from institutions that are not attached to Defense Department institutions.

Probstein:

Thank you very much, and now we'll take the right microphone.

Question:

I'm not sure to whom I should direct this question, and perhaps it's a rhetorical question at that. But some of the figures stated, and I'm sorry but I don't know your names, but the gentleman with the glasses nearer the middle [Professor Probstein] said that requests have been made to solve problems like those generated by the internal combustion engine. I believe the numbers were something like $400,000 for a two-year project, or something of this nature. And then the gentleman on your left [Professor Gruenberg] was talking about changing over from military to civilian things with projects such as stopping the insidious agents of small countries who

want to smuggle small bombs into airports. I assume that this problem is of a similar scope in cost. Now the last estimate that I heard on the war in Vietnam was that it cost 77 million dollars a day. So after we readjust our military direction and reorient it to civilian needs and clear up these problems of smuggling bombs and other like things, what is the Defense Department going to do with this money? More directly, my question is, how do you take a bloated, overgrown part of our economy and of our government and cut it back down to the size that it ought to be? I don't think that it's merely a matter of redirecting the Defense Department into civilian things, but rather chopping it back down to normal size, if you can talk about a normal size.

Probstein:

Again, thank you; since you've given both the question and the answer, we won't have to supply our answer here from the panel.

4

Panel
The Academic Community and Government
S.E. Luria, Chairman
H. Zinn
E. Rabinowitch
E. Mann
F. Schurmann
T.C. Schelling
Discussion

H. Zinn

The Academic Community and Governmental Power

I think that in the past the academic community and the American government have enjoyed quite friendly relations. I don't mean in the immediate past, I mean in the historic past. And I think this was mainly because we knew our place. It wasn't only in Germany that whole classes marched straight from the classroom to the trenches, as Erich Remarque described in *All Quiet on the Western Front*. In the United States our leading intellectuals rushed to embrace World War I, the war that Robert Sherwood later called "Idiot's Delight." It tells us something about the relationship between intellectuality and idiocy that both Woodrow Wilson, our first Ph. D. president, and the halfwit Czar Nicolas joined in this venture.

Randolph Bourne in an essay he wrote around that time, "The Twilight of Idols," noted very sadly that John Dewey had supported the war, and he talked about the general enthusiasm of the intellectuals for it. And this is what he said. (Incidentally, he did this in an essay called "The Seven Arts," which the editor Van Wyck Brooks later disbanded in the interests of saving paper for the war.) He said,

The war has revealed a younger intelligencia immensely ready for the executive ordering of events. There seems to have been a peculiar congeniality between the war and these men. It is as if the war and they had been waiting for each other. They are making themselves efficient instruments of the war technique, accepting with little question the ends as announced from above. They have, in short, no clear philosophy of life except that of an intelligent service, the admirable adaptation of means to ends. They are vague as to what kind of society they want and what kind of society America needs, but they are equipped with all the administrative attitudes and talent necessary to sustain it.

In the Widener Library there's a mural some of you may know very well. It shows a young Harvard soldier making the ultimate sacrifice for God and Country with the inscription, "Happy is he who in one embrace clasps death and victory." In the mural, of course, war is a beautiful woman, and I recall Giraudoux's *Tiger at the Gates*, in which it was said that war has two faces: one, that of Helen of Troy, and the other, the backside of a baboon. Well, three

wars later it's different. The young Harvard men and the MIT men and the BU men are no longer happy at the thought of death even with victory. They are even suspicious at the word "victory." Maybe we've had too many. In fact, these young men have become obstreperous, angry, and all of us, of course, annoyed at campus disorder, wonder why these young people are so angry, so unreasonable. It's only their lives the government is after. And so the formerly good-humored members of the academic community, students and faculty, are now criticizing the government, exposing it, resisting it, impugning its chastity, challenging its legitimacy. Knowledge has gotten out of hand.

Now why should this worry the government—the most powerful government in history? Because knowledge, it seems to me, is a form of power, and it's true, as Max Weber told us some time ago, that the government has a monopoly of force, which is the most direct form of power. But force is no longer sufficient, because now we have societies that are based, as we like to put it, on the consent of the governed—we call them democratic societies. And so with such societies, force is not enough. Deception must accompany it. When government has learned this, we say political modernization has taken place.

Now knowledge really can't compete with force, but it can counteract the deception that makes the government's force legitimate. And when a whole people get the notion that the government is illegitimate, even force cannot maintain its rule. In a society that is held together by falsehood, knowledge is an especially important form of power. Now when the government sees independent sources of power develop, it can no more tolerate this than John D. Rockefeller can tolerate the existence of an independent oil refinery.

Historically, the longevity of governments has depended on their ability to deal with developing rival forms of power. And so it has invited them in as allies, or absorbed them, or crushed them. The United States, much as we would like to believe its essential goodness, has been particularly adept at all three techniques. Right from the beginning of the republic, in the space of about three years, it cemented its ties with the rich, as Alexander Hamilton suggested, by adopting his financial program. It pleased the liberals

with the Bill of Rights and crushed the Whiskey rebels in Pennsylvania with cavalry and muskets. The pattern has continued down to the present. The government is tied to the rich through such a complexity of devices as to make Hamilton's program seem unimaginative. It pleases liberals with the floods of legislation and rhetoric; it crushes social rebels with police and national guardsmen.

So why shouldn't the same devices be used to maintain the goodwill or the neutrality or the obedience of the academic community? And so the government offers friendship and a billion a year—that's roughly the annual average the universities get from the government in research. Friendship and a billion dollars is an unbeatable combination. Also jobs. If we're physicists, we can build an H-bomb. If we're biologists, we can work on something we might call, for want of a better name, the area of communicable disease. If we are chemists, we can work on that nerve gas that killed six thousand sheep out in Utah. Now it's true human beings weren't killed. But what if we all turn out to be sheep? If we're political scientists, we can study counterinsurgency warfare. MIT is very good at that. If we're agronomists, we can study how to destroy rice crops. If we're historians, we can sit in a room at the White House waiting for a phone call to let us know when history is being made so we can record it. And sometimes our field doesn't even matter. War is interdisciplinary.

But most of us refuse to be bought for the war machine. If we take the Department of Defense money, it will be to work on pure research. But, better still, we won't take money from the Department of Defense; we'll only take it from the Office of Education; or, better still, not from the government at all but only from the Ford Foundation. Well, it's true that if you go to the Ford Foundation, the head there is a man who yesterday worked for the government. You try to forget that. So you leave the Ford Foundation, and you come to the university. You come to the university, and you discover that the first person you run into has just come there from the government. I just read this morning in the newspaper something about that. But it's better to deal, I suppose, with an ex-government man than with a government man.

And so, we can always do our own research, which means we'll produce knowledge: for doctoral dissertations, and postdoctoral

dissertations, and post-postdoctoral dissertations, for the scholarly journals, the obscure monographs, the papers to be read at scholarly meetings to deaf audiences. And what kind of things will we write? Well, I quote from an article in a leading scholarly journal that raises two important questions: (1) "Whether a stone inscription discovered by Professor M. H. Jameson will require revising the history of the Persian wars, especially the campaign of 480"; (2) "What did Marvell think of Cromwell when he wrote the Horatian Odes?" Or perhaps we'll write an article like the one that appeared in the leading journal of political science not long ago, which dealt with the effects of Hurricane Betsy on the mayoralty election in New Orleans. Or we might disdain questions like that for burning relevant ones and move right into the ghetto with questionnaires and $100,000 for expenses and discover out of all these questionings two very important facts: that black people in the ghetto are poor and that they have family difficulties.

So, rejecting the call of the Defense Department, maybe even signing petitions against the war, we will take that power which is knowledge and use it in the way it is traditionally used in the academic community—to produce pretentious exercises in trivia for which academia offers the traditional awards; promotions, prestige, personal gain, professional acclaim. Our knowledge in this way won't be purchased, just deflected.

Now what if we refuse either to sell our knowledge or to waste it? What if we insist on using it to pick apart the structure of falsehood that sustains the bombings in Vietnam and the police in the ghettos and the power of the oil companies to pollute our beaches? Then we might be indicted, or, just as good, threatened with indictment, for conspiracy—not all of us, just a few of us—as examples to the rest. And then there's always the House investigating committee, whatever its name is at the moment. And if we go further and march and demonstrate, there are billy clubs, mace, and broken heads to punish us for being unscholarly.

These are the three fundamental tools of all governments dealing with opposition, dealing with rival sources of power: to buy them off, to deflect them, to crush them. It's hard for us to recognize that the Air Force, the Office of Education, and the House Committee on Un-American Activities represent a division of labor in one organ-

ism, a government dedicated to its own power at the expense of whoever stands in the way; and that the difference between a so-called totalitarian and a democratic government is a difference in the proportion of these three techniques and not in their common result.

Now am I exaggerating the nature of government? I think it is more likely that I am understating the case. Academics tend to do that because the harshness of the world outside is somehow softened as it descends through the atmosphere of the academy. But I think that one of the great deceptions (that is, we in the academy are deceived, and then we go ahead and pass the deception on to our students), I think one of the great deceptions that sustains the power of government in our country as well as in other places—but in our country especially—is the myth that our government is somehow unique in the world, the chosen one, born free, as de Toqueville said, after what probably was an immaculate conception. This must be a very powerful myth if it's able to overcome the record of the enslavement of millions of blacks, the slaughter of Indians, the violent march across the continent, the exploitation of immigrant labor, the pandering of corporate wealth, the wars of conquest in the Caribbean and the Pacific.

Is Vietnam the aberration of an otherwise humane government or is it the logical culmination of a history of conquest usually better masked than the brutality in Vietnam? I suspect that many of us were so intoxicated by the generosity of the New Deal and so caught up in what seems the obvious noble crusade of the Second World War that we overlooked the record. We just forgot. Alfred North Whitehead once said, "Knowledge does not keep any better than fish." It must be constantly used, kept alive.

And maybe we, as historians, should remind the nation, so concerned with Communism (just as an example), that in 1927 Calvin Coolidge sent the Marines into Nicaragua—remember, he was the do-nothing president—because Secretary of State Frank Kellogg saw a Communist threat in the rebellion there. The rebellion was crushed, and the Marines supervised an honest-to-goodness American election. Democracy was saved, and four years later Nicaragua is a place where half the children under five die and a military dictatorship rules. A State Department publication of 1920 says, "In

entering into the transaction''—notice that the gift of vocabulary has not diminished over the years—''in entering into the transaction, the United States government followed a customary policy of lending encouragement and moral support to constitutional governments beset by revolutionary movements intended to overthrow the established order.''

Well, I think we in the academic community, as much as we have squandered our power in the past, can't afford to do it any more, despite the call on all sides for disinterested scholarship. In just the space of a few hours, I ran across three different references to disinterested scholarship: one was in a speech by Walter Lippmann, which was reprinted in the *New Republic*, another was in an article that Daniel Bell wrote, and another was in a commencement address of Richard Hofstader at Columbia University. On all sides, the call to disinterested scholarship is one of the great deceptions of our time, because scholarship may be disinterested, but no one else around us is disinterested. And when you have a disinterested academy operating in a very interested world, you have disaster.

Well, our country may be in the midst of something in the proportions of the American Revolution or the Civil War, maybe a crisis even greater than either of those. I recall that C. P. Snow in his novel *The New Man* had one of his characters say after he heard of the dropping of the bomb on Hiroshima, ''The party is over for Western man.''

We're all in danger—people all over the world—from our respective governments. And I think we must find sources of power to save ourselves and our neighbors. Now in the academic community knowledge is one of these sources, knowledge used not in the Aristotelian sense of contemplation but in the Baconian sense of transformation. We ought to use this power of knowledge to reveal to our students, to the nation, and I guess to ourselves, the history and the nature of government, to show its lawlessness behind its slogans of law and order, its violence behind its pretensions of keeping the peace, and its support of privilege behind its pretense of neutrality. We need to keep alive the great visions that the poets and philosophers of the past have given us about what life can be like. And we should also say, I think, exactly who we are: disinterested academics, second; human beings, interested human beings, first.

Our power lies in our ability to tell the truth. In this crisis of our age, in the face of enormous evil, we in the academic community are called upon to choose. We can sell our knowledge to the highest bidder, we can waste it, or we can use it on behalf of those values we suspect the government does not share—at the risk of being crushed but with the hope of transforming both government and society so that someday we can bring children into the world in good conscience.

E. Rabinowitch

A Historical Perspective

I have a certain hesitancy. It turns out that, apart from our chairman who has wisely said that he is not going to participate in the discussion, I am the only scientist on this panel. And in the second place, my distinction from my colleagues on this panel is, I suppose, age, and that I went through the Communist revolution in Russia. I have lived under Communism, I have lived under Nazism, I have lived under the English government in England for five years, and I have lived under the American government. I also lived through the development and the first use of the atom bomb. And to me, the whole situation of mankind, not just of this nation, is so critical that discussions which would pin the fault on this or that government, or this or that individual, are much too lighthearted to deal with the kind of crisis into which all mankind has stumbled by the logics of historical and social evolution.

It is easy nowadays to get applause, to get laughter, because of all the horrid and ugly things that now abound in the policy of this country—no less than in other countries. For example, I have seen the Communist regime come to power under the slogan of complete internationalism, of abandonment of national interest, and I saw it develop into one of the most self-centered, egotistic, nation-centered regimes in the world.

I have seen, not so closely, of course, the same happening with the Chinese Communist regime. I have seen America, which was for a long time remote from colonialism (despite all the ugly things done in Guatamala and other Latin American countries, still, on the worldwide scale more remote because of its very origin than the other big European countries), the same America, getting by historical development into the position of the greatest power in the world and becoming a power like the other powers have been, in the same way that the Soviet Union has become a world power. And the great crisis, the great tragedy in which I see mankind now, is that this traditional situation is not good enough for mankind to survive in, for mankind to progress toward a better future, toward greater justice and happiness. The social inheritance of mankind, not that transmitted through the genes but that going through the

so-called inheritance of the second kind, through tradition, through the spoken and the written word, has brought mankind into sovereign states which, even though some of them like the Soviet Union may begin with belief in their worldwide mission, invariably end up playing the game of power politics. This is the kind of world in which we live now, despite the fact that the scientific and technological revolution of our time has made this kind of life not viable any more.

The great revolutionary task mankind faces right now is not to overthrow this or that government, this or that economic system. It's not to fight for such beautiful aims as individual freedom, or political freedom, for which so much has been sacrificed in the past and to which the aspirations of many of us and particularly of our younger people are still geared. The great establishment now standing in the way of the future is the world establishment of self-centered national states. This system has been more or less satisfactory for human development in the past. It has made mankind the dominant animal species on earth. It has produced a sequence of communities, certain states, to which great wealth, great health, and great power was given in the world. But it is this establishment that now threatens the survival of mankind as a whole. And this is not a polemical exaggeration; it's a matter of dead seriousness. We are now in a position such that if we are going to continue past history—fighting our enemies, assisting our allies, in general, behaving as big powers have always behaved in the past—we are going to destroy mankind; our children, our children's children are going to have no future on this planet. And this is where the real problem lies. It's not just that something is particularly bad in this community. Having lived in many other communities, under many other governments, I personally would still choose this one as the best. But even the best is not good enough for our future.

What can we as academics and as scientists do in this situation? The sad but inevitable thing is that we have to operate on two levels; one is the level on which we can operate together with all the constructive, with the advanced, with the progressive elements in the political structure as it exists now. For example, as long as our country is involved in the arms race, we have to see to it that our own government—and as far as we can help it, other governments,

too—maintain a restraint, a moderation, an openmindedness in the deadly course of armaments. One example of this situation is the ABM controversy. The academic community, and scientists in particular, can do much to stop this new round of the arms race. This problem arises not only because of the evil influence of a vicious atomic-industrial arms establishment in America. The technological arms race is a bastard child of the scientific revolution. Not only in capitalist America but also in the Soviet Union and in China, there is no such establishment; yet they merrily go along with the arms race, and not only with the arms race between Communism and the United States. No—the Chinese and the Russians are fighting each other at this moment, along the boundary at the Ussusi River, and their arms development is aimed as much at their communist as at their capitalist adversaries. It's not imperialism or capitalism, it's the whole history of mankind as sovereign, self-centered nations that has led to this situation. And to the extent to which we have to operate within this situation, we should not see our administration, or our Congress, as an inimical, dirty, coercive organization. We have to try to influence them toward more rationality, toward more restraint, toward avoiding the worst possible excesses of the arms race. But this will remain inevitably rear-guard fighting, and the positions we may defend successfully today will be overrun, in the same way as this has happened in other stages in the arms race, when it seemed for a moment to be stabilized.

We are not going to stop for long, short of the ABM race, let's say, or short of a race in poison and bacteriological weapons, unless we devote ourselves to the really serious, crucial revolutionary task of our time. And this is to end the division of mankind into self-centered units, for which the *summum bonum*, the ultimate good, consists in what is good for the national interest. Not because there was something inherently wrong with this. This revolutionary behavior evolved in all nations, and it has done well by them in the past. But we now know, and the scientists know better than anybody, that what has been tolerable or even good in the past, has become obsolete and deadly dangerous now. Scientists all over the world feel this in their bones; they feel that misuse of science for the arms race is inherently evil and wrong. This use is not inherent in the nature of science, as many people and, in particular, many

young people now think. It is an artificial growth, a bastard growth, a cancerous outgrowth of the scientific and technological revolution, which cannot be stopped until mankind goes through a cortical transitional period and ends its separation into self-centered groups.

I think there's another group in this nation, and other nations, that feels it. This is the young people. Many people wonder why it is that in our prosperous society, in this century when even military service is not such a dangerous thing as it used to be in the First and the Second World Wars, why it is that the young generation in America (and also in Germany, in Italy, in France, in Japan, and probably behind the scenes, as we have seen in Yugoslavia, in the Soviet Union, and in other Communist countries) is so opposed to military service and so unreconciled to the reality of our present-day existence, although this reality gives them at least a chance for a prosperous and useful life. The reason is, I think, that the young generation sees the nonsensical structure of the world bequested to it by past generations. It was not nonsensical in the past; but it has become nonsensical in the age of the scientific and technological revolution. And I think there are assets that these two groups, the scientists and the young people, have and could use to try to change this situation.

Science is a common enterprise of mankind in contrast to religion, to political art, to social reform. It is the first common enterprise of mankind. Scientists have a true international community of interests, something that has been claimed for international labor by Marx and Engels, but which collapsed before the reality of the First World War. Scientists know that a new beginning in the world of international relations is needed. Scientists know, and youth feels, that there is nothing inevitable, nothing god-given in the state of affairs in which billions and billions of dollars have to be spent by every nation in the arms race on arms that nobody ever wants to use. It goes on not because there is a military-industrial establishment that profits from it. These profits are but an additional factor in the situation in this country. But the main factor is the whole structure of international society that has become obsolete in our time. As scientists are an international force by virtue of science being an international effort, so is the youth by virtue of its alienation from

this international system. This is shown by simultaneous occurrence of youth disorders, youth riots, by the worldwide spread of youth's discontent in many nations that are not participating in any war now, countries where they don't have to go to fight in Vietnam. I think that the younger generation justly feels that this is not a sound, a promising, a healthy world for them to enter.

So, I think, here is the really great common task for both scientists and youth. They must fight for moderation of their own national policies, but beyond this, they must strive to create all over the world, a new international attitude, which then could be followed by a new international organization. You cannot establish a new international system until there is a new attitude. It is this new attitude, I believe, for which the youth all over the world is groping.

E. Mann

Academic Freedom and the Military

I had originally planned to talk on some myths about the military on campus. However, I think that although it will in some ways disorganize my speech a little, I'd like to add another myth, which is one of the central functions in Professor Rabinowitch's presentation. You see, by arguing that the central conflict is only between nation states, then essentially what happens is that we are led to a theory of history that makes us unable to respond to most of the aspirations of most of the people of the world right now. If, in fact, the only conflict is that if we find the society in which it is (1) a nation, and (2) a state, and that is the central conflict, then how do we judge? How do we understand, for instance, the Cubans who still have a nation, still have a state, but many of whom still thought it was worth fighting the Batista regime? How do we explain the fact that life in India and life in China are not at all the same, although they both are nations, and they both are states. How do we explain the fact that of course youth are fighting all over the world and rebelling? But can't we go beyond the very superficial description to say that young people are upset with the fact that young people in Vietnam are fighting for a cause they believe in and a cause that's just, and that American youth are fighting both on the campuses against that, and those who are drafted are fighting for an unjust cause, and many of the American youth who were drafted are organizing inside the Army against being sent to Vietnam and against having to do that work. Therefore an attempt to level all categories to say the problem is nation, the problem is youth, and not try to discuss interests that some nations have in others, and by placing the central emphasis on conflict rather than justice is a very compelling argument for the status quo. For people like ourselves, who feel perhaps that the fear of nuclear war is more important to us than the justice of the Third World, it's an argument that in some ways can appeal to us. But let me make it clear that the people in the Third World are not that worried about a nuclear war, primarily because they live in a nuclear war every day.

Now the second thing I'd like to talk about is academic freedom. Academic freedom can only really exist in a society in which the in-

terests of that society are not fundamentally at odds. For me to work for the government in a just society would lead to an argument which would say that a faculty person should have the right to do research. Essentially some people would argue that the research should be perhaps more oriented toward transportation, and other people would say that instead of doing research on cancer, tuberculosis has a higher priority. In that kind of a decision, when there's a fundamental similarity of interests and the disagreements are one of priorities, then academic freedom is a valid concept. When in fact some members of the faculty are serving a system that's committed to the exploitation of human beings, and other people—students and faculty—are committed to destroying that system, committed to liberating other human beings, unfortunately there can't be a simple question of academic freedom. That is, when people argue that some of us work for RESIST, others of us work for the government—after all, isn't that just a simple difference of opinion? Well, you see, the problem is that maybe one of the issues that has to be weighed is not your freedom to do your thing versus their freedom to do their thing but rather the ethical consequences of what doing one's thing means. The freedom to kill the Vietnamese has to be weighed against my freedom to act politically against that. The freedom to take a course in industrial management in cost-control accounting to figure out how we can get human beings to work at the most efficient ratios, essentially to integrate labor in the productive process as if it were a machine—the individual has the freedom, the academic freedom, to do that. But I should have the academic freedom, and workers from Boston should have the academic freedom, to come into that classroom and say, "I want to tell you what you're training those people for." I read an old paper I did at Cornell before there were people who interfered with academic freedom. I read about an industrial management course that I took, and I wrote down things like, "The factory I visited was run according to the principles of scientific management. The wages are $1.60 which is pretty good for the area," etc., etc. Now one of the reasons that I wrote that was precisely because the professor had the academic freedom not to be challenged by the workers in that factory nor by students in that university who put forth a very clear ethical position. And one of the things I'd like to point out is

that ethical position has to be backed up by action—that's another myth about the university. Why don't you put it in a term paper? Why don't you make a speech? Why don't you send a letter to the editor? But action, that's against the whole basis of the university.

The second assumption that I'd like to challenge is the whole idea that we should keep militarism on the campus so that the liberal university is able to temper the more extreme tendencies among the military through our sensitivity to human value. You see, in fact, that's one of the most seductive arguments, and yet one of the most obscene. Essentially it's an appeal to the ego rather than to the conscience. What it says is, "Look Professor so-and-so, why don't you take General Westmoreland into your seminar on international affairs? With your great insight he might end up being a guerrilla revolutionary at the end." Now perhaps, in fact, the military would never come to the university and say, "We would like to come and indoctrinate you." Because of course the ego of the faculty would be so upset that they would say, "Oh no, it's interference with the university." They're much more clever. What they say is, "Would you please indoctrinate us? Would you please let us come on your campus so that we can have the benefit of your wisdom, of your insight." You see, that assumes that there's a split between the military and the civilian elite in America. That assumes that the Pentagon is the enemy. That forgets the fact that William Bundy, McGeorge Bundy, John F. Kennedy, Robert Kennedy, Adlai Stevenson, Hubert Humphrey are the architects of cold-war foreign policy. The military has only come to an increasing amount of power inside the society because the basic concepts of that policy have made military intervention necessary. It's precisely the reason imperialism has existed for a long time. That's not what's new in our lives. What's new in our lives is that the subjects of imperialism are fighting back and winning. What's unique about the war in Vietnam as opposed to the Dominican Republic is that there was a National Liberation Front in Vietnam that has made us care about the war by fighting for their own freedom. The ethical question in the Dominican Republic was just the same. But the question of efficacy, the fact that it was crushed so quickly, meant that, frankly, for most of us, we didn't seem to care. So one of the dilemmas we are now running is that the attempt to isolate the military misses the point. The

military is only coming to a greater amount of power now because the liberal policy is failing, because, in fact, the Third World is fighting back militarily. We would much prefer a Moussideg coup by the CIA; we would much prefer getting rid of Arbenz. Maybe many of you never heard of those people; there wasn't an effective revolutionary movement, precisely because it was over very quickly. The ethical question is the same. And that ethical question was not determined by the military. It was determined by the priorities of corporations and by the priorities of the government.

And so what I'm trying to argue is that for those of us on the campus, we don't claim that kicking the military off the campus is purifying the university. We don't claim even that by kicking the military off the campus we're going to prevent it from functioning. We argue just the opposite, which is that because of the interrelation of forces inside the society, one cannot kick capitalism across the street. One cannot kick the military downtown. Their coercive capacities are the same. The reason why the scientists of 1950 did not come out against the A-bomb was precisely because (1) they knew that they could be replaced by other scientists, and (2) because they didn't want to. In fact, the ethical question was just not as compelling as the question of job security. It seems to me that the dilemma goes like this. Why are we kicking the military from the campus if in fact we understand its coercive force is the same? Precisely because by kicking an institution off the campus (if we're successful enough), although we don't hamper its capacity to function, we do hamper its capacity to coerce without people knowing that they're being coerced. You see, up until recently people were recruited to capitalism, but who ever knew it was capitalism? People like me who used the word capitalism were immediately branded as radicals. People didn't say, "I'm going into capitalism." They said, "I'm going into the service, I'm going into business, I'm going into (and there were names) General Motors, Ford, Chrysler, IBM, CIA, AFL, CIO"—tremendous similarities. In fact the problem built up, so that now Dow Chemical is having some problems. It's having problems not because we kicked it off the campus—they still exist, they still have the same job openings—but now Dow Chemical is seen as a political force in the society that's partisan. It's not just doing its thing.

The military has to be seen as a partisan force. It's not a public service. It represents an interest in the society that many of us do not have in common with it. And many of us for the first time are being recruited into those institutions and for the first time understand that ROTC is not a joke (it's the primary source of junior officers for Vietnam), that war research is not something that everyone has to do. It's something that one has to do only under this present system. And you see what's beginning to happen is that the left is strong enough so that we can offer people security from the military, security from the recruitment of capitalism. The difference is that up until two years ago, people went into the draft, went into business, voluntarily, read *Careers Today*. *Careers Today* is a new magazine dedicated to psychedelic capitalism.

What it's about is saying to you, "Look, you know what those SDS people say—well, they got some good points, except that what they don't seem to understand is that they want to get rid of capitalism. We want to accept all their criticisms within the system. Now, we can't give you a meaningful job. We can't give you a job that doesn't exploit other individuals. What we can give you though is a good magazine. We can give you more coffee breaks. We can give you the right to wear long hair so that when you go into the corporation you can say, you see, capitalism isn't as stuffy as I used to think it was. We can give you all the superficial prerequisites of the system without changing anything." I don't think it's going to work. I think today's panel is opening a Pandora's box that some people here are going to want to close because they're going to go back on March 5th; some other people won't want to. Some people are going to say, "Well, it was a very interesting day. I'm really glad we reexamined these questions. Now back to work." And other people are going to say, "I'm sorry. You see once you open up the discussion, we don't want to close it."

Now the third assumption that I'd like to challenge is the idea of the scientists as the agent of social change. Again, very flattering—an attempt to reconcile questions of personal commitment with job security. It's a reconciliation that obviously everyone would like. I don't think the reconciliation is possible under the present system. People who are organizing at Lincoln Labs for today told me that. We went around and said to people, "Look, look who's

coming; even the RAND Corporation has been invited. You see it's not a radical thing. You don't have to worry." This is how they tried to argue. And the reaction of people in Lincoln Labs wasn't on a political basis; they didn't argue that they didn't care because they disagreed with March 4th or they disagreed with the speakers. What they said was, very frankly, "We're scared." What they said was, "We're not sure if we want to attend this. We're not sure we want even to circulate a leaflet inside Lincoln Labs."

Now for those of you who talked about civil liberties, just a parenthetical remark—civil liberties in America exist precisely outside of the economic arena. Civil liberties do not exist inside the job market, and that's the dilemma that many of us implicitly understand; that is, that of course it's much more flattering and much more unthreatening to say I've invested four, five, eight years at MIT. I would like to go to Dow Chemical now, go to the Pentagon, work from within, catch the ear of a sensitive antimilitarist, write up that proposal for breaking down the defense establishment, write that tremendous work in the *Bulletin of Atomic Scientists* that explains the futility of nuclear war, the futility of counterinsurgency. In fact, the primary argument against that is not anything that I can say. It is (1) the previous history of scientists as agents of social change, and (2) your own personal experiences when you get there. You see, in fact, all I'm asking you to do is not to believe me but to believe yourselves. If we agree on what has to be done, the argument is not stay out of the science establishment, stay out of the universities, because as Dr. Zinn said, the interrelationship means that there's no place to go. You see, there's no place to drop out into. If I believed that the Pentagon was a bad place, I'd say go teach in the public schools. Except I've been fired from the public schools for doing the same thing that you're going to get fired for when you go into the science establishment, whether it's for private industry or for the government.

What I'm trying to argue is that dropping out does not mean physically dropping out, because there's no place to drop out to. It means dropping out mentally; it means seeing yourself not as a scientist but as a radical scientist and a radical organizer. It means that your commitment is first to other people; your commitment is first to certain interests in the society and against other interests in

the society; that you're willing to work inside particular companies as long as you're able to, but you're willing to accept one fundamental assumption—that you're not going to last, that, you see, the tension is the following: Capitalism is based on an investment principle. You've all invested at least four years—that's a weight around your neck. As you invest more and more time, as you invest more and more money, your capacity to challenge the system becomes more and more reduced. In fact you understand that being kicked out of one laboratory, one corporation, does not mean that you can just transfer to another. It may mean that you'll end up having to do a completely different job, that your scientific career may be over at twenty-six, twenty-eight, thirty and that all that "good education" will have gone to naught. I don't like those choices, but let's make it clear that it's not SDS who is setting those choices. It's just SDS who is pointing them out, that one of the reasons why people resent us, I think, isn't because we produce violence. It's because we produce the situations in which violence is perpetrated against us. People don't resent us for getting you fired; they resent us for telling the truth, which is that they will be.

The last thing I'm trying to say is that it's not such a terrible thing. You see I'm assuming that we're all going to die anyway; it all sort of levels out at the end, you see. Now we've all met the person who whispers to us, "Next month, I'm going to make my move. I know it looks like I'm selling out. But just wait, I'm getting myself in a position so that someday when I expose this whole thing—Bam! You see I'm not just going to be a nobody; I'm going to be a somebody who exposed it." In practice very few of those somebodies ever get around to exposing it. In practice most of those people end up being broken individuals and end up more than being just personally broken individuals serving the system that breaks other individuals. What I'm saying is, "Let's be honest." When we really look at the options that are open to us, violence is not really the question in the next five or ten years. The real question is job security for most of us. And what I'm saying is that I'd like to offer you the prospect of a massive movement of scientists in the next five years who will protect each other. In fact, that won't happen. Let me posit an alternate model. A group of people, some of whom are teachers, some of whom are scientists, some of whom are lab technicians, some of

whom are social workers, all go into those jobs understanding that every single institution that they're going into hurts other people. They work together by helping each other financially. They work together by being part of a political movement in a city. They do the best they can. They speak openly and honestly to as many fellow employees as they can, and they take the consequences. That seems to me a political model that threatens the government. The idea of working from within is precisely the argument that they hope you'll accept.

F. Schurmann

Scholarship in the Academic Community

After a few initial remarks I want to address myself more narrowly to the problem of the relationship of universities and government and the question of scholarship. The introductory remarks I'd like to make have a sense of urgency. If you study the political process of the U.S. government, you really realize that the spring months are months of decisions (particularly when new administrations come in), partly because all decisions involve the budgetary process—it's what Professor Huntington calls the interrelationship of strategy and structure. Obviously, whatever decisions you make you have to back up with resources. Now, I suggest, major fights and conflicts are going on in Washington over matters that are going to affect all of us. One of them that has already been touched upon is the question of the arms race. There is a lot of evidence that the country must devote between 10 and 12 percent of its gross national product to defense spending. Whether this need be so, economically, I don't know, but I have a suspicion that either putting it all in space or putting it all in cities would not be feasible unless there were some major structural rearrangements. I've also been told by a number of people that the cost of many kinds of weapons seems to go down each year. If you've got to spend between 10 and 12 percent of the gross national product on weapons, we're going to reach a trillion. Yet if certain weapons, like MIRV, for example, don't cost as much, relatively speaking, you've got to think of new types of junk to manufacture. I suggest that this present ABM Sentinal System, which is an absurdity, is going to be typical—is perhaps typical already—of all kinds of weaponry junk that has been and will be designed to keep defense spending high. There are a lot of jokes about F-111—its wings falling off. There is a study now making the rounds in Washington about the declining effectiveness of weapons systems. Now big decisions are being made on new weapons.

Another point is the question of the cities. Two of the great blemishes of capitalism are war and the decay of cities. To me racism means decay of the cities. I'll put it in graphic terms. I have a black friend who is an anthropologist and who's been working in Oakland

for a long time. He came over the other day and said that Oakland is a dying city. I said, "In what sense is it a dying city?" "In a very simple way; businesses are moving out; stores are moving out." If you go through ghettos—I don't know what Roxbury is like in this area, but I know what Oakland and Hunters Point in San Francisco are like—those areas are literally dying. That's what racism is. It's not just refusing to sit next to somebody of a different race. That's not the core of the thing. The core is that people who live in these cities no longer have a store in which they can buy; if they buy in a store the prices are exaggerated. The Fillmore district in San Francisco looks like occupied territory.

There is real urgency here. There also is urgency to take and give knowledge. First of all, knowledge that's to be withdrawn from the government, knowledge that it needs in order to design these absurd weapons systems, and second, knowledge that the cities need in order to save them. People have only begun to think about these things. The technology of architecture ended way back around 1910. These are some general points I wanted to make, and let me get on to the more specific questions.

I came across a statement in a book by the physicist Max Born, which I'd like to read. He said,

In 1921 I believed and I shared this belief with most of my contemporary physicists that science produced an objective knowledge of the world which is governed by deterministic laws. The scientific method seemed to me superior to other more subjective ways of forming a picture of the world, philosophy, poetry and religion. And I even thought the unambiguous language of science would be a step towards a better understanding between human beings. In 1951 I believed in none of these things. The border between object and subject had been blurred. Deterministic laws had been replaced by statistical ones and though the physicists understood one another well enough across all national frontiers, they had contributed nothing towards a better understanding of nations, but had helped in inventing the most horrible weapons of destruction.

I'd like to make a general comment on why people go into the professions to become intellectuals, and I use the word intellectuals to mean anyone with a higher education, the way it's normally used in many parts of the world. We're all intellectuals in this room or in the process of becoming ones. I think one of the reasons,

aside from personal advancement, people become intellectuals comes from wanting to discover the logic of the world; you know, as children look out at the cosmos and want to understand. I remember this very well from my teens, this great feeling that somehow the world makes sense—if you could only discover what its laws are. I'm not a natural scientist, I'm a social scientist, but I suspect that it's true of the social sciences, natural sciences, everywhere. It's a kind of a hubris of knowledge. It's a great and wonderful feeling, an expansive feeling. I've found that when you talk to ghetto kids, they have an enormous hunger for education. People want to learn math and languages and a variety of other things. It's false to assume that people don't want to learn. One characteristic of the Third World is a hunger for education. The ghetto and the Third World could be great consumers of education. This joy at trying to discover the logic of things, I think, is a reason why a lot of people in their teens go into scholarship. It's also true that people involved in a field have the need for shop talk—talk with professional friends, talk about the problems that you're interested in. We are, after all, human beings, and one of the manifestations of humanism is being in a group. We want to be with people with whom we can discuss our ideas.

Even though there is the fascination with trying to discover the logic of things, after a while this gets boring. People become interested in problem-solving. Problem-solving is an impetus that keeps you going. When things get too abstract, too remote from the world, you lose interest. Problem-solving then becomes important. I had a friend in the RAND Corporation whom I asked why he worked for the RAND Corporation. He said he loved problem-solving. He didn't want to go into the university because he liked the challenge of problems—you know the kinds of problems that Rand gives. I might add that RAND, having started with nuclear warfare and then moving to counterinsurgency problems, is now devoting its considerable resources to trying to solve the problems of the cities. This is the thing he found exciting. This is the kind of intellectual process that many of us go through. We have a commitment to logic. There is a logic of sociology, though it may be a poor logic, and there's a logic in the natural sciences, and there's a logic in art, too. It's a

sense of colors and shapes. But for all, problem-solving is important.

Who suggests the problems—this is the critical thing. It is common knowledge by now that there is a powerful financial connection between the federal government and the universities. For those of you who are interested, a pamphlet was put out in 1966 by the Stanford Research Institute, available if you write away for it, called "The Universities and the Government." It has more facts than the radicals have been able to compile on the subject of the relationship between the universities and government. Over half of the research and development in the United States is supported by federal funds, and about half of that is concerned with the war effort. It is not sufficient grounds to say that because the Air Force gives money to a project, or the Pentagon gives money to a project, that in itself is a source of evil. I personally am against money from the military, yet I have a radical friend who said he'd take money from anybody. If the Air Force gave it to him, he'd take it and spend it in his own way.

It is not just whether you get money from the Ford Foundation or from the Pentagon, the question relates to problem-solving. Who poses the problems in that particular field? My own field has been for a long time the study of Communist China. Reflecting back, I know a lot of problems of leadership, of party struggles I worked on that were suggested at conferences I went to with my fellow professionals, or from talking with people at RAND. I dealt with problems that had been suggested to me by others. Few people really think of new problems. Mostly the problems come from somewhere else. In my own field an extraordinary number of problems come from the government and are related to cold war concerns. This is true of Stanford Research Institute and RAND, true of many universities; it's very true of the way the Ford Foundation has channeled its grants. Ford Foundation has channeled its grants to a considerable extent toward the problems that have interested the government. Interest in Communist China began in the mid-1950s. Big projects were funded and financed as the issue of Chinese expansion became more acute.

We need the logics of our disciplines. We need the logic of sci-

ence and art. That's knowledge the Third World wants, too. No one wants to destroy that; if we do, then we are back in barbarism. I think the farther you go down the socioeconomic ladder, the more people want the wealth of that knowledge. That is one of the great wealths the world has to give to people.

We do not need many of the problems our professions have given us to solve. While continuing to cultivate the logics of our disciplines, we must radically alter the problems we undertake to solve. That is not easily done. It requires new thinking. It requires organization. It requires effort. We can begin by speaking a new language, by ceasing to use cold war terms. Out of this new language will come new problems. In my field I used to use the word "regime" to refer to the government of China. Without reflecting on it, I found myself using the word regime. It was not just a word but a vehicle for carrying into my mind a whole set of cold war attitudes and problems.

In the universities we are probably stuck with federal monies. If these monies ended, so would the universities. There are no alternative sources. In any case, as Mr. Mann says, it is part of the whole system anyway. Though I am personally against taking government money, perhaps we should take it but give them nothing in return; do not solve their problems for them unless we see them as of help to man. We must not speak in the language of the government. We should force them to pay us to solve problems that we consider important. Those are the problems that have been raised by all the speakers here: war, cities, the Third World, the humanization of our lives. That we can do, not in spite of knowledge and technology but with them.

T. C. Schelling

The Future of the Academic Community

When i was invited to join this panel, I was sent, by my good friend Bernard Feld, a copy of the statement of the Concerned Scientists. It says that there's a small group of scientists that helps to conceive these policies and a handful of eminent scientists who have tried but largely failed to stem the tide, etc. I was wondering which group I belonged to, until Professor Rabinowich reminded us that I don't belong to a scientific community—I'm a economist.

But as Mr. Mann spoke, I realized also that there's not an academic community anymore. At least, he thinks there's not, and I'm afraid there may not be. It may heal and come back. But when the interests of the people who usually have been counted as members of the academic community are so violently different that academic freedom has become meaningless, then clearly we're not a community, and I quite accept his analysis here. And particularly when the personal respect is gone that used to be accorded by one faculty member to another, and by students and faculty to each other, it becomes even harder to be a community.

I was struck with Mr. Mann's desire, if he doesn't like what I'm teaching, to walk into my class and tell the students what's the matter with what I'm teaching and why I'm teaching it. What he did not make clear was whether he was going to walk politely into my class, wait for his chance to speak, ask whether I would listen to him, perhaps privately first before he wastes my students' time, giving me a chance to decide whether he gets to speak or somebody else gets to speak. I'm not really against this point of view, I'm just remarking, we aren't an academic community if he won't do it politely and if I won't politely give him his chance to speak.

So I'll just make a few remarks about what may for a while yet continue to be the "faculty community." I had ulcers twenty-five years ago and became alert to the many occupations in which people have stomach trouble, and I became aware of a large number of occupations that thought stomach pains their own peculiar ailment and often had a pet name like "surreal stomach" or "bridge-deck stomach" or something of the sort. Detectives, school teachers, union organizers, naval officers, and about 985 other occupations

all think that they have stomach trouble and that it comes not entirely from cigarettes, coffee, and irregular meals, but because they worry, and they worry because they alone in the world have the ultimate moral responsibility. Nobody else's thumb is in the dike. Children are ruined either before kindergarten or in graduate school, I'm not sure which, but whichever place you teach them, you have the last chance to save them. (And now the way to save them is to stop teaching them, I guess.) What characterizes the attitudes of the moral crusaders—the way Mr. Zinn described the U.S. government, the way Mr. Mann made his call to arms—is first, that it is a moral crusade. Second, the enemy is the most beautiful tight-knit, devilishly clever conspiracy that's ever been put together. And third, total victory, victory without compromise, is the only way to deal with the enemy.

Now I've been through enough of the same years you've been through, preoccupied by Vietnam, to believe that early commitment to total victory, early commitment to the nonnegotiability of what you're fighting about, can be disastrous—can be disastrous on both sides—and is particularly disastrous when the nonnegotiability is based on the moral worth rather than the practical value of what your objective is or what you're fighting about.

Unless you want to join the rebellion, my first piece of advice would be, don't make everything a moral issue, don't make everything a moral crusade—whether it's draft deferment for students or recognition of Communist China, or whatever it may be—don't make everything a test of a man's moral worth. For one thing you both become unable to compromise. Moral crusades tend to be uncompromisable. That's usually what we mean by moral; and words like "appeasement," which once were used to describe astute diplomacy, have become anathema to the military and to the SDS. Another difficulty with making everything a moral issue is that your adversary can't admit you're right without admitting his own lack of moral worth. He has to admit complete wrongness of a deeply personal, highly shameful kind. A third difficulty is that if all things become moral issues, it's hard to choose among them in terms of priorities. And, finally, moral issues, as we have seen in Vietnam and various places in this country, have a tendency to escalate, and we don't yet understand how to control escalation inside the coun-

try any better than we know how to control it outside the country. This makes personal honor and moral crusading dangerous, likely to escalate, and likely to bring about what was tersely described by Mr. Zinn as the path from intellectuality to idiocy.

What I conclude is that you have a choice. It's a hard choice. Mr. Mann has made his, I've made mine. I can't be as sure that I'm right as he is sure that he's right. One choice is rebellion, a declaration of war against, or a boycott of, or a withdrawal from, "the system," whether the system is merely the LBJ administration or the broader system. If that is your choice, Mr. Mann is quite right: make everything a moral crusade; don't compromise, learn to escalate; don't try to make incremental improvements in American policy; change the system first.

But if you don't plan to rebel, I'm afraid a lot of the fun is gone. You have to be selective. You have to try to be effective. You have to try to pick the issues that are worth working on, the money that is worth taking, the channels of communication with the government that are worth exploiting, the people who merely want to use you. You have to decide for yourself whether in the end you humanize military officers or militarize the campus by what you do with ROTC. You have to decide whether, if you really consider ballistic missile defenses idiocy, resigning from the government and declaring it an absurdity and staying in that posture for the next fifteen years is the most effective way, or if instead you should work on subjects that will bring you in touch with the technology and the arguments used within the government, so that you can be more effective in the typically academic way, which is to provide what you think is the truth. The truth can then be used in a self-serving way by whatever agencies' momentary interests happen to coincide with your view of the truth. It's a competitive procedure that doesn't always work badly.

And if you do elect to have some kind of contact with the government, I think you'll discover that the United States government differs from others not only because it's as good as Mr. Rabinowitch says or as bad as Mr. Mann says, but because it's probably the most porous government that has ever existed, in the sense of secrets leaking out and people moving back and forth. Any of you with persistence and a little politeness can get the ear of almost anybody you want, whether he's in the executive branch or the legislature. The

feedback of communication and knowledge by people who move out of government or into government or into quasi-governmental agencies, who talk a lot, write a lot, and meet a lot, provides us with a government in which the citizenry is much better able to know what is going on and better able to influence the prejudices of those who work inside and to affect what is going on, than in any other government.

Even the military services subject the people to the views of people like you and me. And while Mr. Mann thinks this is a clever device to appeal to our egos, I don't think they're that clever. I really don't. Nor are they tightly organized. Just to give you two examples, I think the reason why civil defense didn't go in this country was because the military services were not interested, no matter what. And, lacking the support of the military services, the great civil defense campaign of 1961–1962 failed. And nobody is less interested in chemical and biological weapons than the military. They are much more willing to be blown up than to be suffocated. Whenever they wade ashore, be it North Vietnam or wherever else, they don't want to wear rubber suits.

I've been saying a lot of negative things. Let me tell you what I was hoping to talk about, because it's a real problem. A fundamental problem in the relation of the academic community to government, right now, is this: our government is old-fashioned. Not in a capitalistic, militaristic sense, but simply in terms of its formal structure: federal, state, city, and so forth. The federal government has the money and is also engaged in activities that generally attract intelligent, high-priced people, people who read, talk, think, appreciate research, and so forth. State and local governments don't have the money and don't have the kind of people who generally can use the results of academic research.

Within a decade, the money problem may be solved. Things like the Heller plan may begin to channel money into cities, states, or even metropolitan districts and other units of government that may be the appropriate units for dealing with the academic community. But it's going to be much harder to get the cities to know how to use the results of academic research and consultation, to communicate with people like you and me. Many cities have universities close by, but for a variety of reasons the people engaged in state and local

government are less appreciative of scholarship and scholars, less experienced in how research gets produced and how it can be used.

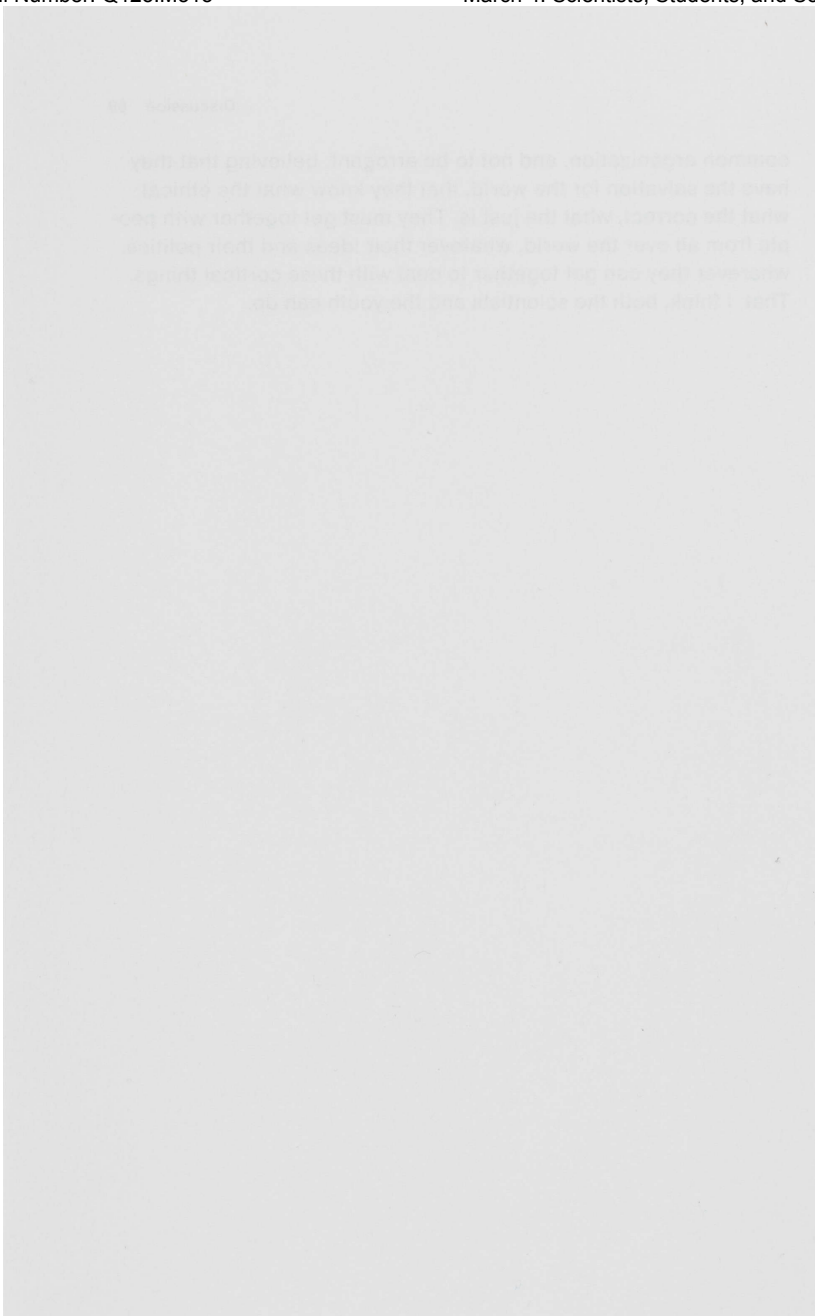
When the federal government studies a city transportation problem, it can spread the cost of the study over all the cities that want the information; but any one city, to finance the study for itself, would have to justify the whole project in terms of its own need for the work. Therefore, there needs to be some way for cities collectively, through the federal government or not, to finance the kind of research that will help the cities with their problems. And there is a slower process by which the cities, or the people who comprise city governments, learn to associate with and to communicate with and to appreciate people like us. We in turn have to learn to associate with and communicate with and to appreciate people like them.

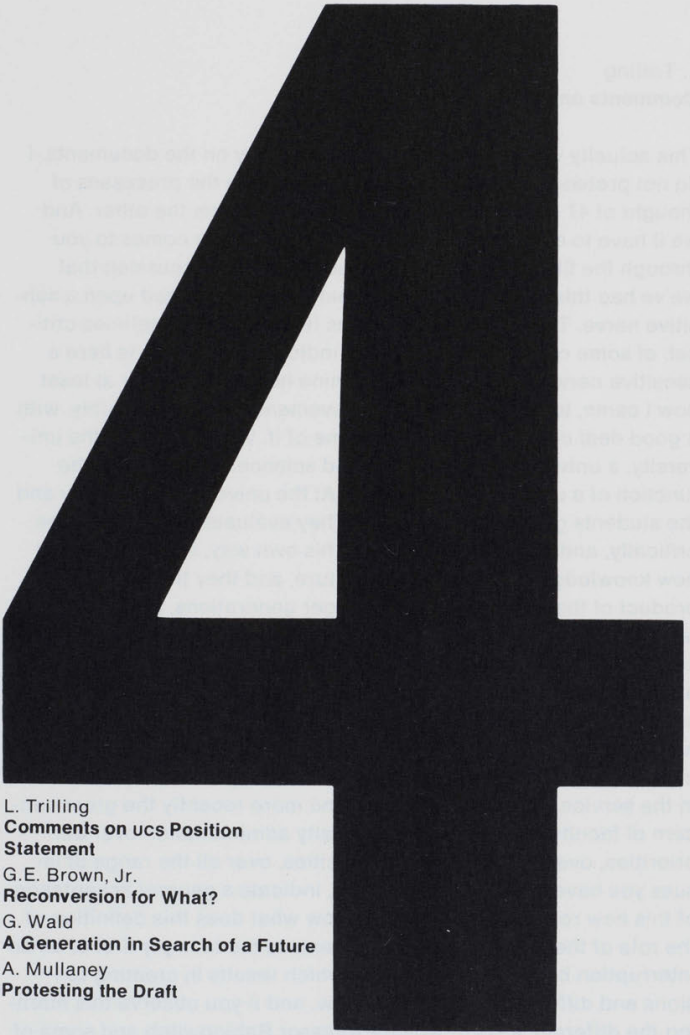
Discussion

Question:
Is there anything that we can try to create now as a continuation of March 4 and a continuation of the mood of 1968? If so, fine; if not, this whole conference is dead-ended. I'd like a comment from the four people who conceive of themselves as part of the movement.
Rabinowitch:
Well, I mentioned that for a while before the First World War there were some groups who believed that the interests of the working man, in contrast to those of the capitalists, are international ("the proletarian has no fatherland") and that therefore international labor would provide the answer for the future. Well it turned out, in 1914, that that was simply not so; that the actual interests of the proletarians in all the warring countries were associated more closely with national interests than with those of the international labor class. And so I can say we had one example of internationalism, and it failed; and I'm not at all optimistic that a second one, or a third one, will not fail. But I only know that mankind is not going to be rescued from its present crisis unless new efforts to create an international interest become successful. And I do worry whether youth organizations have sufficient feeling of international solidarity to be able to unite and work together, even in crucial moments of international conflict. I do hope, again with little hope, but still with one of my few hopes, that scientists will come together for the cause of peace. In the past, scientists have become quickly attached to their national causes. Every nation thinks that her cause is right, and scientists, being needed for national victory, associate with their governments in the pursuit of national causes. Still there are now more objective chances, more objective reasons, why an international movement of scientists could be more successful than before—above all because the objective situation in the world, created by science and technology, has reduced *ad absurdum* the ancient type of international relation, involving continual conflicts and war. Continuing this tradition has become nonsensical and dangerous to all.

This is why I think that the next thing to do for groups like this one, for all students' groups, is to seek international ties, to seek

common organization, and not to be arrogant, believing that they have the salvation for the world, that they know what the ethical, what the correct, what the just is. They must get together with people from all over the world, whatever their ideas and their politics, wherever they can get together to deal with these cortical things. That, I think, both the scientists and the youth can do.





L. Trilling
Comments on UCS Position Statement
G.E. Brown, Jr.
Reconversion for What?
G. Wald
A Generation in Search of a Future
A. Mullaney
Protesting the Draft

L. Trilling

Comments on UCS Position Statement

This actually will be one signer's commentary on the documents. I do not pretend to express the view or describe the processes of thought of 47 colleagues, each very different from the other. And we'll have to excuse the fact that the commentary comes to you through the filter of one particular science. The discussion that we've had this morning indicates that we have touched upon a sensitive nerve. The interest, sometimes friendly and sometimes critical, of some of our colleagues also indicates that there is here a sensitive nerve. I would like to examine how we came, or at least how I came, to participate in this movement and what possibly, with a good deal of hard work, might come of it. We are here at the university, a university polarized around science. Traditionally the function of a university is threefold. At the university the faculty and the students generate knowledge. They evaluate their knowledge critically, and they attempt, each in his own way, to integrate that new knowledge into the general culture, and they transmit the product of their thought to the younger generations, both the hard facts and the values and recommendations that flow therefrom. Recently a new function has increasingly been accepted as appropriate for a university, and that is to perform a range of services for the society within which the university operates. Traditionally the whole concept of the land grant college implied this, but, more dramatically, during the Second World War the mobilization of science in the service of national defense, and more recently the great concern of faculty, students, and university administration over our priorities, over the problems of the cities, over all the range of issues you have heard of this morning, indicate a general acceptance of this new role for the university. Now what does this definition of the role of the university imply. It seems to me to imply first of all an interruption between generations, which results in creating tensions and differences in point of view, and if you observe this morning the different ways in which Professor Rabinowitch and some of the younger members (the SDS member of the panel in particular) addressed themselves to comparable problems, you will see what I mean. The role of a university also involves a commitment to schol-

arship and with a certain degree of impartiality, a certain amount of social, cultural, and political criticism. This, in turn, involves a certain amount of detachment and at the same time a certain amount of commitment to action—detachment because we must think issues critically through; commitment to action because, as Professor Zinn said, we are not only scholars but human beings. The thin line between detachment and commitment to action is sometimes difficult to follow, sometimes even difficult to see. As long as we argue about issues in principle among ourselves, we can maintain cohesion within the university. Commitment to action involves choice of one alternative rather than another, selection of one priority ahead of another, and strains, perhaps in a creative way, the fabric of the university.

At MIT, some special problems arise. First, of course, in order to address ourselves to some of the scientific problems that are interesting to us, we need equipment that becomes increasingly expensive. Partly for reasons of convenience and expediency, as we know, these funds have been channeled through the Department of Defense in some measure. And this is true not only in the United States but all over the world. Second, and more important, the direct application of the information, of the new ideas, of the new facts that are brought to light has immense potential consequences for mankind. They increase the reach of power of those groups or individuals who are able to control the new technique. This includes the development of weapons you have heard earlier. It includes a much tighter control, a much better ability to handle, possibly at the cost of some distortion, vast bodies of information, and therefore a small number of people are able to make decisions more easily, decisions that affect larger numbers of people than in the past. There is also the matter that the new technical means at our disposal cause us to interfere, sometimes with insufficient awareness, with our natural ecological and biological processes which take place on the earth. And finally the introduction of new technical means profoundly affects the lives, the style of living of all of us, as the automobile did a generation and a half ago, as electronic media are doing now. So that the point here seems to be that we are bringing into existence means that affect people more rapidly, more drastically, than before, and the ability of the social fab-

ric of the communities to respond, to adjust, is less easy than before because the time available is smaller, because the rate of change, the degree of change, the nature of the change is greater than at previous times in history. Then the language that the scientists use in describing their findings, and even more importantly, the language that the scientists and the engineers use in describing the reasoning process that allowed them to reach their findings, is difficult for the public at large to grasp. And therefore, many of the fine points, many of the cautionary words, many of the restrictions and so forth, may be lost.

Also, very often the public is forced to accept the statement of the scientific community—or the not-always-concording statements of the scientific community—somewhat on faith. And this is a dangerous state of affairs. It puts us in some respects in the position of the medicine man who has the magic words that need to be pronounced to make it rain in a time of drought, and no one except the medicine man knows how to pronounce the magic words. It is at times an uncomfortable position to be in. It puts the scientist and the engineer in a somewhat ambiguous position with respect to those who wield social and political power. And while all of us may not feel quite as strongly as some of the speakers of the preceding panel, we are all very deeply concerned over this. We are concerned over it because there seems to be an asymmetry between our relationships with those in authority and with the public in general. This asymmetry is reflected all the time in our political debates, where the executive branch of the government, for example, has better access to scientific information and more time to absorb it than the Congress. And the Congress often feels, I judge from reading the newspapers, in the position of being faced with an accomplished fact.

Similarly, in one of my other lives, I served on a school board in this area, and the administration comes to us with proposals and makes some of us feel that we do not have all the facts and all the information to make decisions, and some of us feel worse about this than others. In this particular case I do not feel badly about it. But the asymmetry I spoke of is a serious matter. The greater leverage that we have on human lives, and the difficulty that we have in communicating with the body politic at large, puts us in a position

where the sort of thing Professor Rabinowitch was so eloquently speaking of is of extreme danger. This was also described recently in *Science* magazine in a social paradox, where each entity, whether it be a nation, a social group, a corporation, or what have you, makes decisions that are considered the best in the context of the sphere of authority of interests and the jurisdiction for that particular entity, but that are not necessarily the best for the community at large. The group among all the competing groups that exercises self-restraint is automatically penalized unless there exists an overall body of control. We very badly need a mechanism for such a body of control.

Scientists and engineers, of course, have for a long time been concerned over these matters. The Union of Atomic Scientists was one of the first to take these concerns into the public arena. Political leaders such as Churchill and Eisenhower expressed concern over these issues fifteen or twenty years ago. As a result, for one thing the channeling of research and educational support through the military establishment has begun to decrease. There have been an increasing number of channels for funds; there has been first the creation of the National Science Foundation and the Atomic Energy Commission. There has been the establishment of the Office of the President's Science Adviser and his staff; there has been the transfer of funding to Health, Education and Welfare, in particular, to the National Institutes of Health and National Institutes of Mental Health, the transfer of some funding to the National Aeronautics and Space Administration, and the increasing role of HEW and NSF in funding graduate and undergraduate education. Also it must be stated, as some of the speakers stated earlier, that the military establishment itself has been using great vigilance, particularly the Office of Naval Research and the Office of Scientific Research of the Air Force, in not interfering with the judgment of the scientists who are making proposals and in judging proposals within their budget. Therefore I concur with Professor Rabinowitch's statement that this is not really such a bad system, but it needs to be a great deal better before we can be satisfied with it. And it is because we have these concerns that we felt the need—it was because time was running short—to dramatize our concern, our concern over how decisions are made in the society, how priorities are decided,

concerns over the risk that there is now independence of the educational process, the balance between student participation (education on the one hand and research on the other hand), concerns over the continuation of certain legends or myths if you will—such as, that the federal government buys results of research rather than that the federal government supports education—and the danger of these myths to our educational system, which is excellent in its technical and formal aspects but possibly should leave more room for inquiry about the use made of the findings that are obtained.

It is all these concerns and our sense of urgency about them that brought this day about. This day began through the initiative of a number of graduate students from the Physics Department, who were joined also by students in biology, who then approached some of us and prepared a document which at first was rather immediate and focused on the problems of our foreign policy, particularly Vietnam. As members of the faculty were drawn into this, by the initiative of the students originally, the scope of the inquiry and of the concern broadened, the range lengthened, and the present pattern evolved. I suppose that a crucial feature of the day was our commitment to abstain from doing research for one day in order to examine these issues. This was not conceived as a confrontation with anyone. This was conceived as a response to our own inner motivating forces, our consciences if you will. We are aware that many individuals within the administration of MIT, many individuals in the government and in other agencies that support research, share our concerns, and we are not confronting them.

I hope it is clear from all that has been said that the task of doing anything about the concerns that we raise is a difficult one. It is not to be done by a romantic rebellion. I personally would align myself more with the approach proposed by Professor Schelling, and it is a matter of rather hard work. The examination, the bringing into life, of the issues that we are carrying out today is merely the first step in what is a long and difficult process. And let me say that dispassionate examination of the seat of power, the interests involved, so that one can deal with them in an effective way, is part of that problem. March 4th then is just a first step. There will be further steps at MIT and I'm sure elsewhere. The exact shape that these other steps will take is not yet entirely clear, and in fact it is one of

the objectives of our discussion later today to solicit everyone's best thought and advice on how students, faculty, administration, the entire MIT community can put their best minds to work, both those who contributed to forming and organizing this day as well as those who have reservations about the way it was done. All of us ought to work together to continue to examine these issues and get specific concrete proposals for continued work within MIT and outside MIT. Those were at least my own concerns in being involved in this. I think to a fairly large extent they were a common denominator of the concerns of all the people who signed our document.

G. E. Brown, Jr.

Reconversion for What?

I am personally very interested in the problems that confront the scientists, students of science, and their search for a more significant involvement in the problems of our society. I think that the students who initiated the March 4th event, which has spread so widely, are to be complimented. You have started an activity of great value. I hope that this is only the beginning of a much more active dialogue in which the scientists will continue to be heard. "If men are to be precluded from offering their sentiment on a matter, the freedom of speech may be taken away and dumb and silent we may be led like sheep to the slaughter," so said George Washington in 1783. And I think we are in a fine conservative tradition offering our sentiments here today.

I am speaking on the topic of "Reconversion for What?" Basically, I am going to speak on the "for what" more than I am on the reconversion, but I will have a few things to say about reconversion.

It is appropriate to point out that Senator George McGovern and a large number of cosponsors have introduced a major reconversion bill in the Senate. A corresponding bill has been introduced in the House of Representatives. The important aspect of the bill is to provide a framework for thinking about what shall be done with our economy when we can begin to lower the costs of our resources that are going for military use. The bill seeks to encourage this kind of thinking and provides certain incentives to defense contractors for thinking in these terms.

It is important and necessary that thought be given to the problem of reconversion, and it would be important even if the Vietnam War were not being fought. One reason is that, today, the Defense Department is operating on about 80 billion dollars a year, and it will probably continue to operate at about that level even after the Vietnam War is ended if action is not taken. We are talking about expenditures of nearly 10 percent of our gross national product. The 10 percent, of course, interacts with other segments of the economy and has become a very powerful influence in the structure of our economy and in the political power structure of this country as well. It has a profound effect upon individual Congressmen and whether they are elected and reelected.

If we can ever hope to scale down the arms race, it must be done in such a way as to ease the worries of those men (estimated at one in ten of the civilian population) and communities all over the United States whose livelihood depends upon military expenditures. That includes the voices of most of our largest labor unions. Many people do not think beyond the next paycheck and are deeply concerned with any reduction in military expenditures that would force them to lose jobs; it would clearly have an adverse economic impact upon them. These factors need to be given careful consideration, and some sort of a structural scheme must be developed to ease the problems.

Well, I'm not going to dwell upon what can be done insofar as reconversion is concerned. You have heard, or will hear, about many of the things that can be done about reallocation of our resources, the unmet needs of this country, the possibilities of diverting people who are engaged in building missiles or in making ammunition into other kinds of activities. These subjects have been explored by many learned men during the past several years.

Instead, I want to talk to you about the fundamental nature of the fight with the military in regard to the basic direction of our society. An excellent study was recently made by the Brookings Institute and presented to the Nixon administration. The title is *Agenda for the Nation*. The chapter that impressed me most is called "Budget Alternatives after Vietnam," written by Charles Schultz, a former Director of the Bureau of the Budget. This essay points out that we have a budget which has been forced into balance between the domestic and the military demands upon it; that with the tapering off of the Vietnam War, and the natural growth of our economy, we can expect what Schultz calls a "fiscal dividend," which will amount to about eight billion dollars in the fiscal year 1971. By 1974, there will be a thirty-eight-billion-dollar fiscal dividend. This means that decisions will have to be made as to how this money will be spent. The military has a stockpile of programs almost beyond the scope of the imagination, which would use the fiscal dividend and even more.

Foremost among these is the antiballistic missile system, one of the biggest technological boondoggles for consuming resources that has ever been conceived. It can be initiated with the claim of a modest deployment, which will only cost six, or eight, or ten, or fif-

teen billion dollars. It is infinitely expandable; it will always need to be refurbished as technology improves, and when we find that the old system won't work anyway, we will have to upgrade it, just as we are upgrading our Minute Man missiles and our Poseidon missiles, etc. The ABM has all the characteristics of a prolonged WPA, and it could operate at the level of at least five to ten billion dollars a year for the next generation. This is, of course, a tremendous boon to the military and to technologically based industry that would supply the military with the materials. This is only one of dozens of items that the military has in mind currently and that they are prepared to back up with all the resources of the Defense Department in terms of their vital importance to the security of this nation.

On the other hand, competing for this presumed fiscal dividend are demands that stem from the needs of elementary, secondary, and higher education, the need to eliminate or lessen poverty, and to devote a portion of our resources to helping other parts of the world, and so on. These needs have tremendous scope; I will give you some minor indications of what they would be. For example, in the field of higher education, there is absolutely no doubt that within the next five years there will be the need for at least ten billion dollars per year more than we now spend, if we are to avoid a fiscal crisis in education. There is the need for half this amount for elementary and secondary education. There is the need for a minimum of five billion dollars per year in addition if we are to accomplish what we said we were going to accomplish with the model cities program. The program of foreign aid, which has been cut to the lowest level in twenty years, should be increased by at least five billion dollars per year.

I could go on itemizing these needs at great length. They add up to totals that run to at least fifty billion dollars more that are needed. And yet each of them is merely a fragment. None has a constituency engaged in lobbying for it. Each is isolated in terms of presenting its vital importance to the Congress. The domestic programs suffer a severe handicap when it comes to competing with an integrated, well-thought-out, well-documented plan for utilizing the resources as presented by the Department of Defense, and backed up with talk about the security of our way of life, our role in the world, and all of the nebulous phrases used by military person-

nel. The military continually upgrades its demands by references to the Cold War and to the arms race. Just before appropriations time in Congress, the military is able to find out that the other side has deployed some sophisticated new weapons, that Moscow is ahead with missile defenses, that there is a new and unexpected threat from Red China, etc. These findings are perfectly timed to have a telling effect upon the Appropriations Committee.

There have been several studies of the mechanisms of the Cold War and the strategic arms race, but one of the best ones was produced recently by Professor Rathjens, in which he describes the mechanisms of these action-reaction sequences that propel the arms race. He points out that, until we are able to control this sequence, we have no chance to win the fight for a more reasonable allocation of resources. He also discusses the importance of engaging in a program of mutual arms reduction with the Russians and other powers. It is the only way we are going to avoid continued pressure from the military for a larger proportion of the resources that our country can reasonably provide. I am convinced that we have within our culture the basic causes of competition regarding arms, etc., with the other powers of the world, and until we can analyze this culture, examine its deficiencies, and examine what generates these pressures, we're not going to be able to stop the arms race or to enter into serious negotiations.

I am delighted to find that a group such as this, a group one might call the "scientific elite," has chosen to ask some searching questions with regard to the nature of our culture and the kind of changes that should be made. I read an article in the *Bulletin of Atomic Scientists* by Donald Price of the John Fitzgerald Kennedy School of Government. He says that within the last decade a new relationship has emerged. Science and scientists are vital to political power and societal goals. Science can no longer stand apart from the flux of political controversy as an objective source of truth, because when research must be supported by government grants, science itself becomes a part of the political system.

However, it is far too simple to imagine that organizations of scientists are going to be able to reach a complete unanimity on the organization of the "good society," and that the power structure in Washington is going to say, "My God, you are right! We're going to

turn right around and start doing what you recommend." This will never happen. The political power structure in Washington is not responsive to sweet reason, or even to unsweet reason. It is responsive to only one thing in general—to power. If you wish to have an impact on the political power structure, you are going to have to learn how to exercise power in the political sense. This is not as difficult as it might appear at first. Any experienced politician will tell you that as few as one percent of active people within any jurisdiction can change the course of that constituency. I have never, within my own Congressional district, had more than one percent of the electorate who actively supported me, who were willing to get out and work in a campaign, to contribute money, or to do any of the other things that are necessary. So if scientists are going to have an impact on the power structure, they are going to have to mobilize that one percent.

I am very deeply concerned about what you are going to use your power for. You can develop it, but it is vastly important to know what you are seeking to accomplish, what kind of new structure, what kind of new culture, what kind of new organization of power, and what kind of new communities you want to develop.

I saw an excellent review of a recent book in *Newsweek*. The book is *The American: A Conflict of Creed and Reality*, written by a South African, Ronald Segal. He has studied the problems of our country, and the reviewer writes that this book may be the most penetrating analysis by a foreigner of the American character since Alexis de Toqueville. Segal says that America was once the embodiment of liberation for the future and has now become, for much of mankind, the symbol of captivity and the past. Segal's purpose in writing this book, according to the reviewer, is to present a diagnosis of a fragmented society, dominated by a consumer culture. The author finds that violence has increased because the consumer culture manipulates society and provides few intrinsic satisfactions for its members. He contends that, despite guarantees of individual freedom, the United States is not the open society that it pretends to be. Instead it is dominated by a totalitarianism of money that limits the exercise of freedom. Without drastic change, he laments, America must sooner or later suffer a nervous breakdown.

One of the few studies that purports to be scientific in nature,

with regard to some of the possible developments of the society of the future, was done by the General Electric Company. The title is *Our Future Business Environment*. The study reports that there are eight major trends emerging in this country that will develop during the next fifteen years. First, the trend toward affluence; disposable real income will increase by about 50 percent.

There will be an increase in education. Better educated persons will have more self-respect and will want to be treated as individuals. They will be less tolerant of authoritarianism and organizational restraints and will have higher expectations of what they wish to put into their jobs and what they want to get out of them.

The report says further that job fragmentation may continue to be necessary in work assignments for unskilled workers, but that job enlargement may well be necessary for holding the interest and motivating the performance of tomorrow's college students. The notion that hard or unpleasant work must be tolerated because it is unavoidable is expected to enjoy less currency.

There will be a growing interdependence of institutions. It will be increasingly hazardous for the United States, or any nation, to assume that a narrow definition of "what is best for our country" necessarily represents the best policy decisions.

Large industry will undergo a relative decline as a prime motivating force, and, like agriculture, it will decline as a determiner of our values and way of life. Insofar as a dominant institution will arise in a postindustrial society, it is more likely to be an educational institution, particularly a university. Primary importance will be attached to innovation and new theoretical knowledge, neither of which the government will be equipped to supply. The university, on the other hand, is by nature designed to produce and mobilize innovative knowledge, just as the industrial firm is geared to mobilize resources for mass production. It is because of the dominant importance of education in the future society that an alternative title, the *learning society*, derives.

There will be an emphasis on pluralism and individualism. There will be a reversal of the past thirty years' trend toward centralization and a strengthening of the individual's importance in the social structure. And finally the public will expect more from the quality of life within business organizations as well as the quality of business

contributions in the practical (not philanthropic) sense to society.

There are other less popular types of analyses of what the future will hold. I have one here; it is a review of a book written by Daniel Cohn-Bendit and his brother. The review of the book was written by Carl Hess, a former assistant to Senator Barry Goldwater, and I am going to quote a few lines. "The Cohn-Bendits write that communists and Trotskyites, Maoists, etc. no less than the capitalists, look upon the proletariat as a mass which must be directed from above. As a result of this attitude, democracy degenerates into a kind of ratification of decisions only." Hess says there should be nothing in that statement to shock adherents of Jeffersonian democracy or individualistic republicanism. Actually the kind of philosophical concept that the Cohn-Bendits have presented in this book as a model for the future has, as does the General Electric study, several aspects of truth in it. Where they differ, and I think this is the fundamental difference, is in defining the structure of power in society. The fact is that there is no effective participation by large numbers of people in our society in determining their destinies—effective access to power, in other words. The masses of the people are presented with decisions that are made at the highest level, and they are expected to ratify them or to tolerate them. It is a government by consent, not by participation. It leads to the kind of thing that we have in the case of the Vietnam War, as close to being a one-man war, at least an executive office war, as we can imagine.

If we are going to achieve a new set of values, if we are going to have a different allocation of resources, if we are going to reconvert a society that is basically militaristic, we are going to have to hit directly at the problem of how to change the distribution of power. The goals of reconversion are to search for the process of winning the fight for power in this country.

We must educate people to choose long-range perspectives, to think in terms of the variables that are related to each other as probabilities, rather than as certainties, related to both cause and effect on each other. We must educate for learning the logical skills, to recognize and work through the ethically and morally difficult and tortuous dilemmas implied in the choosing of social priorities and in the risks involved in seeking to attain them. This logical skill must be complemented by deep familiarity with the history of

ideas and comparative ethics, since the recognition and resolution of ethical issues is as much a matter of extrarational factors, historical accident, and traditional values as of purely rational assessment. The teacher will have to *be* in the world in order to teach about it. A neutral teacher can only miseducate the students about the world of turmoil, conflict, and confusion. To be citizen or leader will require commitment and the will and courage to trust, to experiment, and to live with crises of conscience.

To have these characteristics, a child needs to be taught them. Neither exhortation nor audiovisual exposure can accomplish this. Only one human being relating these traits to another human being can cultivate them. Teachers must discard the role of the passive, neutral person who separates teaching from other roles of the citizen and private person.

If a teacher is involved in unionizing activities, or protesting about Vietnam, or scuba diving, or practicing Yoga, or is fascinated by LSD, or the new theology, these interests should be evident to his students. I think this kind of person is more and more needed in all of our institutions.

It is the lack of such teachers and probably the lack of such people in administrative roles that is at the root of many of the difficulties on many campuses in the United States today. I think it is proper to say here that MIT is to be complimented that the initiative taken to organize this program clearly shows that you have students, teachers, and administrators who are committed to this kind of involvement in the problem-solving processes of today's world.

G. Wald

A Generation in Search of a Future

All of you know that in the last couple of years there has been student unrest breaking at times into violence in many parts of the world: in England, Germany, Italy, Spain, Mexico, and needless to say, in many parts of this country. There has been a great deal of discussion as to what it all means. Perfectly clearly it means something different in Mexico from what it does in France, and something different in France from what it does in Tokyo, and something different in Tokyo from what it does in this country. Yet unless we are to assume that students have gone crazy all over the world, or that they have just decided that it's the thing to do, there must be some common meaning.

I don't need to go so far afield to look for that meaning. I am a teacher, and at Harvard I have a class of about 350 students—men and women—most of them freshmen and sophomores. Over these past few years I have felt increasingly that something is terribly wrong—and this year ever so much more than last. Something has gone sour, in teaching and in learning. It's almost as though there were a widespread feeling that education has become irrelevant.

A lecture is much more of a dialogue than many of you probably appreciate. As you lecture, you keep watching the faces; and information keeps coming back to you all the time. I began to feel, particularly this year, that I was missing much of what was coming back. I tried asking the students, but they didn't or couldn't help me very much.

But I think I know what's the matter, even a little better than they do. I think that this whole generation of students is beset with a profound uneasiness. I don't think that they have yet quite defined its source. I think I understand the reasons for their uneasiness even better than they do. What is more, I share their uneasiness.

What's bothering those students? Some of them tell you it's the Vietnam War. I think the Vietnam War is the most shameful episode in the whole of American history. The concept of War Crimes is an American invention. We've committed many War Crimes in Vietnam; but I'll tell you something interesting about that. We were committing War Crimes in World War II, even before the Nurem-

burg trials were held and the principle of war crimes stated. The saturation bombing of German cities was a War Crime. Dropping atom bombs on Hiroshima and Nagasaki was a War Crime. If we had lost the war, some of our leaders might have had to answer for those actions.

I've gone through all of that history lately, and I find that there's a gimmick in it. It isn't written out, but I think we established it by precedent. That gimmick is that if one can allege that one is repelling or retaliating for an *aggression*—after that everything goes. And you see we are living in a world in which all wars are wars of defense. All War Departments are now Defense Departments. This is all part of the double talk of our time. The aggressor is always on the other side. And I suppose this is why our ex-Secretary of State, Dean Rusk—a man in whom repetition takes the place of reason, and stubbornness takes the place of character—went to such pains to insist, as he still insists, that in Vietnam we are repelling an aggression. And if that's what we are doing—so runs the doctrine—anything goes. If the concept of war crimes is ever to mean anything, they will have to be defined as categories of acts, regardless of alleged provocation. But that isn't so now.

I think we've lost that war, as a lot of other people think, too. The Vietnamese have a secret weapon. It's their willingness to die, beyond our willingness to kill. In effect they've been saying, you can kill us, but you'll have to kill a lot of us, you may have to kill all of us. And thank heavens, we are not yet ready to do that.

Yet we have come a long way—far enough to sicken many Americans, far enough even to sicken our fighting men. Far enough so that our national symbols have gone sour. How many of you can sing about "the rockets' red glare, bombs bursting in air" without thinking, those are *our* bombs and *our* rockets bursting over South Vietnamese villages? When those words were written, we were a people struggling for freedom against oppression. Now we are supporting real or thinly disguised military dictatorships all over the world, helping them to control and repress peoples struggling for their freedom.

But that Vietnam War, shameful and terrible as it is, seems to me only an immediate incident in a much larger and more stubborn situation.

Part of my trouble with students is that almost all the students I teach were born since World War II. Just after World War II, a series of new and abnormal procedures came into American life. We regarded them at the time as temporary aberrations. We thought we would get back to normal American life some day. But those procedures have stayed with us now for more than 20 years, and those students of mine have never known anything else. They think those things are normal. Students think we've always had a Pentagon, that we have always had a big army, and that we always had a draft. But those are all new things in American life; and I think that they are incompatible with what America meant before.

How many of you realize that just before World War II the entire American army, including the Air Force, numbered 139,000 men? Then World War II started, but we weren't yet in it; and seeing that there was great trouble in the world, we doubled this army to 268,000 men. Then in World War II, it got to be 8 million. And then World War II came to an end, and we prepared to go back to a peacetime army somewhat as the American army had always been before. And indeed in 1950—you think about 1950, our international commitments, the Cold War, the Truman Doctrine, and all the rest of it—in 1950 we got down to 600,000 men.

Now we have 3.5 million men under arms: about 600,000 in Vietnam, about 300,000 more in "support areas" elsewhere in the Pacific, about 250,000 in Germany. And there are a lot at home. Some months ago we were told that 300,000 National Guardsmen and 200,000 reservists—so half a million men—had been specially trained for riot duty in the cities.

I say the Vietnam War is just an immediate incident, because so long as we keep that big an army, it will always find things to do. If the Vietnam War stopped tomorrow, with that big a military establishment, the chances are that we would be in another such adventure abroad or at home before we knew it.

As for the draft: Don't reform the draft—get rid of it.

A peacetime draft is the most un-American thing I know. All the time I was growing up I was told about oppressive Central European countries and Russia, where young men were forced into the army; and I was told what they did about it. They chopped off a finger, or shot off a couple of toes; or better still, if they could man-

age it, they came to this country. And we understood that, and sympathized, and were glad to welcome them.

Now by present estimates four to six thousand Americans of draft age have left this country for Canada, another two or three thousand have gone to Europe, and it looks as though many more are preparing to emigrate.

A few months ago I received a letter from the Harvard Alumni Bulletin posing a series of questions that students might ask a professor involving what to do about the draft. I was asked to write what I would tell those students. All I had to say to those students was this: If any of them had decided to evade the draft and asked my help, I would help him in any way I could. I would feel as I suppose members of the underground railway felt in pre-Civil War days, helping runaway slaves to get to Canada. It wasn't altogether a popular position then; but what do you think of it now?

A bill to stop the draft was recently introduced in the Senate (S. 503), sponsored by a group of senators that ran the gamut from McGovern and Hatfield to Barry Goldwater. I hope it goes through; but any time I find that Barry Goldwater and I are in agreement, that makes me take another look.

And indeed there are choices in getting rid of the draft. I think that when we get rid of the draft, we must also cut back the size of the armed forces. It seems to me that in peacetime a total of one million men is surely enough. If there is an argument for American military forces of more than one million men in peacetime, I should like to hear that argument debated.

There is another thing being said closely connected with this: that to keep an adequate volunteer army, one would have to raise the pay considerably. That's said so positively and often that people believe it. I don't think it is true.

The great bulk of our present armed forces are genuine volunteers. Among first-term enlistments, 49 percent are true volunteers. Another 30 percent are so-called "reluctant volunteers," persons who volunteer under pressure of the draft. Only 21 percent are draftees. All re-enlistments of course are true volunteers.

So the great majority of our present armed forces are true volunteers. Whole services are composed entirely of volunteers: the Air Force for example, the Navy, almost all the Marines. That seems

like proof to me that present pay rates are adequate. One must add that an Act of Congress in 1967 raised the base pay throughout the services in three installments, the third installment still to come, on April 1, 1969. So it is hard to understand why we are being told that to maintain adequate armed services on a volunteer basis will require large increases in pay; that they will cost an extra $17 billion per year. It seems plain to me that we can get all the armed forces we need as volunteers, and at present rates of pay.

But there is something ever so much bigger and more important than the draft. That bigger thing, of course, is the militarization of our country. Ex-President Eisenhower warned us of what he called the military-industrial complex. I am sad to say that we must begin to think of it now as the military-industrial-labor union complex. What happened under the plea of the Cold War was not alone that we built up the first big peacetime army in our history, but we institutionalized it. We built, I suppose, the biggest government building in our history to run it, and we institutionalized it.

There's another feature of this that disturbs me very much. In recent years, in our innocence, almost every scientific society in the country was sold the idea of establishing a Washington office. We were going to have lobbies like everybody else. So now we've got ourselves a secretariat in Washington attached to practically all of the major scientific societies. Those secretariats are full of bureaucrats just like all the other Washington bureaus. They look for things to do, for more influence, for more money, and there's that Department of Defense with money to burn.

So, one has some very peculiar manifestations. I'm a biologist. The AIBS, the American Institute for Biological Sciences, about a year ago, in a nauseating display of hypocrisy, announced that they were staging two scientific meetings under the sponsorship of Fort Detrick. The first of those meetings—a symposium—wasn't called "Defoliation." No, it was called "Leaf Abscission." The second of those meetings had nothing to do with biological warfare and virus infection—Oh, no—it was called "The Introduction of Foreign DNA."

I was called by a man in Washington some months ago who told me to my enormous surprise that he was the Director of Biological Research for, of all things, the Federated American Societies for

Experimental Biology. I didn't know they had a Director of Biological Research, and I haven't the least idea what such a person might conceivably do. But what he was on the phone for was to tell me that the Department of Defense had asked him to organize a new committee to go into visual problems connected with the use of some new weaponry.

I'm sorry to say that the worst offender in this regard has been the National Academy of Sciences. The outgoing President of the National Academy of Sciences,—and I, for one, as a member, find this a shocking thing—has been simultaneously the chairman of the Scientific Advisory Board of the Department of Defense.

I don't think we can live with the present military establishment and its $80 billion a year budget and keep America anything like we have known it in the past. It is corrupting the life of the whole country. It is buying up everything in sight: industries, banks, investors, universities; and lately it seems also to have bought up the labor unions.

The Defense Department is always broke; but some of the things they do with that $80 billion a year would make Buck Rogers envious. For example: the Rocky Mountain Arsenal on the outskirts of Denver was manufacturing a deadly nerve poison on such a scale that there was a problem of waste disposal. Nothing daunted, they dug a tunnel two miles deep under Denver, into which they have injected so much poisoned water that beginning a couple of years ago Denver began to experience a series of earth tremors of increasing severity. Now there is a grave fear of a major earthquake. An interesting debate is in progress as to whether Denver will be safer if that lake of poisoned water is removed or left in place. (N.Y. Times, July 4, 1968; Science, Sept. 27, 1968)

Perhaps you have read also of those 6,000 sheep that suddenly died in Skull Valley, Utah, killed by another nerve poison—a strange and, I believe, still unexplained accident, since the nearest testing seems to have been 30 miles away.

As for Vietnam, the expenditure of fire power has been frightening. Some of you may still remember Khe Sanh, a hamlet just south of the Demilitarized Zone, where a force of U.S. Marines was beleaguered for a time. During that period we dropped on the perimeter of Khe Sanh more explosives than fell on Japan throughout World

War II, and more than fell on the whole of Europe during the years 1942 and 1943.

One of the officers there was quoted as having said afterward, "It looks like the world caught smallpox and died." (N.Y. Times, Mar. 28, 1968)

The only point of government is to safeguard and foster life. Our government has become preoccupied with death, with the business of killing and being killed. So-called Defense now absorbs 60 percent of the national budget and about 12 percent of the Gross National Product.

A lively debate is beginning again on whether or not we should deploy antiballistic missiles, the ABM. I don't have to talk about them, everyone else here is doing that. But I should like to mention a curious circumstance. In September 1967, or about 1½ years ago, we had a meeting of MIT and Harvard people, including experts on these matters, to talk about whether anything could be done to block the Sentinel system, the deployment of ABMs. Everyone present thought them undesirable; but a few of the most knowledgeable persons took what seemed to be the practical view, "Why fight about a dead issue? It has been decided, the funds have been appropriated. Let's go on from there."

Well, fortunately, it's not a dead issue.

An ABM is a nuclear weapon. It takes a nuclear weapon to stop a nuclear weapon. And our concern must be with the whole issue of nuclear weapons.

There is an entire semantics ready to deal with the sort of thing I am about to say. It involves such phrases as "those are the facts of life." No—they are the facts of death. I don't accept them, and I advise you not to accept them. We are under repeated pressure to accept things that are presented to us as settled—decisions that have been made. Always there is the thought: let's go on from there! But this time we don't see how to go on. We will have to stick with those issues.

We are told that the United States and Russia between them have by now stockpiled in nuclear weapons approximately the explosive power of 15 tons of TNT for every man, woman, and child on earth. And now it is suggested that we must make more. All very regrettable, of course; but those are "the facts of life." We really would like

to disarm; but our new Secretary of Defense has made the ingenious proposal that now is the time to increase greatly our nuclear armaments so that we can disarm from a position of strength.

I think all of you know there is no adequate defense against massive nuclear attack. It is both easier and cheaper to circumvent any known nuclear defense system than to provide it. It's all pretty crazy. At the very moment we talk of deploying ABMs, we are also building the MIRV, the weapon to circumvent ABMs.

So far as I know, the most conservative estimates of Americans killed in a major nuclear attack, with everything working as well as can be hoped and all foreseeable precautions taken, run to about 50 millions. We have become callous to gruesome statistics, and this seems at first to be only another gruesome statistic. You think, Bang!—and next morning, if you're still there, you read in the newspapers that 50 million people were killed.

But that isn't the way it happens. When we killed close to 200,000 people with those first little, old-fashioned uranium bombs that we dropped on Hiroshima and Nagasaki, about the same number of persons was maimed, blinded, burned, poisoned, and otherwise doomed. A lot of them took a long time to die.

That's the way it would be. Not a bang, and a certain number of corpses to bury; but a nation filled with millions of helpless, maimed, tortured and doomed persons, and the survivors of a nuclear holocaust will be huddled with their families in shelters, with guns ready to fight off their neighbors, trying to get some uncontaminated food and water.

A few months ago Sen. Richard Russell of Georgia ended a speech in the Senate with the words: "If we have to start over again with another Adam and Eve, I want them to be Americans; and I want them on this continent and not in Europe." That was a United States senator holding a patriotic speech. Well, here is a Nobel Laureate who thinks that those words are criminally insane.

How real is the threat of full-scale nuclear war? I have my own very inexpert idea, but realizing how little I know and fearful that I may be a little paranoid on this subject, I take every opportunity to ask reputed experts. I asked that question of a very distinguished professor of government at Harvard about a month ago. I asked him what sort of odds he would lay on the possibility of full-scale nu-

clear war within the foreseeable future. "Oh," he said comfortably, "I think I can give you a pretty good answer to that question. I estimate the probability of full-scale nuclear war, provided that the situation remains about as it is now, at 2 percent per year." Anybody can do the simple calculation that shows that 2 percent per year means that the chance of having that full-scale nuclear war by 1990 is about one in three, and by 2000 it is about 50-50.

I think I know what is bothering the students. I think that what we are up against is a generation that is by no means sure that it has a future.

I am growing old, and my future so to speak is already behind me. But there are those students of mine who are in my mind always; and there are my children, two of them now 7 and 9, whose future is infinitely more precious to me than my own. So it isn't just their generation; it's mine too. We're all in it together.

Are we to have a chance to live? We don't ask for prosperity, or security; only for a reasonable chance to live, to work out our destiny in peace and decency. Not to go down in history as the apocalyptic generation.

And it isn't only nuclear war. Another overwhelming threat is the population explosion. That has not yet even begun to come under control. There is every indication that the world population will double before the year 2000; and there is a widespread expectation of famine on an unprecedented scale in many parts of the world. The experts tend to differ only in the estimates of when those famines will begin. Some think by 1980, others think they can be staved off until 1990, very few expect that they will not occur by the year 2000.

That is the problem. Unless we can be surer than we now are that this generation has a future, nothing else matters. It's not good enough to give it tender loving care, to supply it with breakfast foods, to buy it expensive educations. Those things don't mean anything unless this generation has a future. And we're not sure that it does.

I don't think that there are problems of youth, or student problems. All the real problems I know are grown-up problems.

Perhaps you will think me altogether absurd, or "academic," or hopelessly innocent—that is, until you think of the alternatives—if I say as I do to you now: we have to get rid of those nuclear weapons.

There is nothing worth having that can be obtained by nuclear war: nothing material or ideological, no tradition that it can defend. It is utterly self-defeating. Those atom bombs represent an unusable weapon. The only use for an atom bomb is to keep somebody else from using one. It can give us no protection, but only the doubtful satisfaction of retaliation. Nuclear weapons offer us nothing but a balance of terror; and a balance of terror is still terror.

We have to get rid of those atomic weapons, here and everywhere. We cannot live with them.

I think we've reached a point of great decision, not just for our nation, not only for all humanity, but for life upon the earth. I tell my students, with a feeling of pride that I hope they will share, that the carbon, nitrogen, and oxygen that make up 99 percent of our living substance, were cooked in the deep interiors of earlier generations of dying stars. Gathered up from the ends of the universe, over billions of years, eventually they came to form in part the substance of our sun, its planets, and ourselves. Three billion years ago life arose upon the earth. It seems to be the only life in the solar system. Many a star has since been born and died.

About two million years ago, man appeared. He has become the dominant species on the earth. All other living things, animal and plant, live by his sufferance. He is the custodian of life on earth. It's a big responsibility.

The thought that we're in competition with Russians or with Chinese is all a mistake, and trivial. Only mutual destruction lies that way. We are one species, with a world to win. There's life all over this universe, but in all the universe we are the only men.

Our business is with life, not death. Our challenge is to give what account we can of what becomes of life in the solar system, this corner of the universe that is our home and, most of all, what becomes of men—all men of all nations, colors, and creeds. It has become one world, a world for all men. It is only such a world that now can offer us life and the chance to go on.

A. Mullaney
Protesting the Draft

I'm very grateful for this opportunity for many reasons, but one reason is the hope that I have, that this is the beginning—not simply a one-shot affair—of the liberation of our universities so that they can become free and independent institutions in American society. And to be honest, and I really mean this, I'm not sure really how appropriate it is that we hold such discussions in a university setting. There is so much to be overcome. You know, we support a South Vietnamese government that arrests those charged with "disturbing the minds of the populations." I'm not sure just how many universities could be so charged. But perhaps today is a beginning, and that I think is cause for hope.

The Milwaukee incident, the destruction of somewhere between 10,000 and 15,000 1A files, grew out of at least four years of attempting to say something about the war and national priorities, and the one way perhaps that we could sum up the various reasons that went into the Milwaukee incident is the growing fact of polarization in American life. This polarization shows up in a number of ways, but one way is the growing ineffectiveness of speech! Man, the speaker, is no longer effective in American society. This I believe to be a very real cause of polarization. There is also the growing gap between the powerful and the powerless. This, too, causes a great deal of polarization. There are many ways again that this could be demonstrated, but let's pass over that for the time being. And finally a third cause of polarization is the priority of things over people that has become part and parcel of the American style—the emphasis given to transportation over housing and so forth. And look at the laws governing transfer of property as compared to the laws that are in reference to the draft itself; for example, when the state attempts to take property, all kinds of laws and rites of restraint and public hearings and so forth are available to citizens who feel they are being mistreated regarding their possessions, their property. But the draft board is not required by law to allow a young person to bring witnesses or an attorney to hearings where matters of life and death to persons are being discussed. And this is only one sign of this priority of things over people. In the Milwaukee inci-

dent we saw another example of it when we were sent a bill for $83.80 for burnt grass where the files that had been destroyed by napalm in War Memorial Park had destroyed some of the grass—this of course without having been convicted of anything. Well, we'll pay for that when the United States government fully indemnifies the country of Vietnam for all the burnt grass over there.

There are a lot of incidents connected with the destruction of those files that again highlight the priority of things over people. For example, we were isolated from all the other prisoners in the jail where we were staying in our attempt to raise bail. And allegedly the reason was because, as one of the guards put it, "At least you can say this about prisoners, they are patriotic." And yet when we walked into the main room where the prisoners had been lined up against both sides of the wall, a large number of these prisoners showed us the V sign. They knew what was going on. It's also interesting, too, that during our stay one prisoner decided to turn state's evidence, and when he did, of course, the word spread throughout the jail very rapidly, and the probability of his getting out of the jail in one piece decreased with each succeeding day, so the jail officials had to come to a conclusion. Where can we put him where he will be the safest? And of course, they decided that they could put him with the Milwaukee 14, because whereas certain pieces of property might not be safe, human beings had no need to worry. So that again we see this idea of things over people so many times operating, and this I think is the background (I'm going over it very rapidly) that would have to be understood to explain why a Milwaukee incident occurred and why 14 believed that it had to occur.

Our belief is this: given the present crisis in American life, our action does not constitute a threat to American society; on the contrary, it contains a distinct social value. It is for the benefit of the populace, for our act confirms the priority of human life, of people over things, of life over property. And it is an unfortunately appropriate critique of the present overconcern for things, especially insofar as this is epitomized in the Selective Service System. And if this be true, then we would hope that our peers, especially those on a jury, would serve to relate the laws we broke to the issues of justice that we think we have raised. We ask, in other words, that the severity of the grievance highlighted by this priority of things over

people in American society, the magnitude of the injustices connoted by this priority, be weighed against the degree of disruption caused in Milwaukee. We ask, in other words, that the separate incidents, or the charges that have been leveled against us by both the state and federal governments be seen in their totality, the total context, the context of an inhuman priority of values in American life, of the suffering of the Vietnamese, of the lack of response on the part of government to the wishes of the people. Yes, dissent is more disruptive today, but who has raised the cost of dissent—an intransigent government.

And so we are asking really of the courts, we are asking of the U.S. attorneys, we are asking of the juries that they not treat this as business as usual. We are asking the court, in other words, to do what the executive and legislative branches of our government have not done. We are asking the court to do about the questions of war and poverty and racism again that which the executive and legislative have not done, for whatever the reasons. We are especially asking the jury as our peers to judge under the right of jury nullification whether we are indeed a threat to society; to base their decision solely on the material aspects of the Milwaukee incident is to remove the human element from the decision making. And if our action constitutes a danger, not to perform the action constitutes a greater danger. And if our action constitutes a threat to order, not to engage in such activities, constitutes a graver threat.

During the Cattonsville Trial in Baltimore a few months ago, Judge Russell Thompson told the jury, "In the eyes of history they may be right." But then he went on to instruct the jury to pay attention only to the concrete facts surrounding the case, namely, did they or did they not enter the building; did they or did they not seize the files, and so forth. And yet he could say that in the eyes of history they may be right. We are saying that history is now, because suffering time is now, and if there are any doubts concerning the role of the judiciary now, they favor the oppressed and the suffering, the poor here and around the world—the poor who are kept poor by national policies. They favor the oppressed and not the slow plodding of an insensitive leadership. This same judge, after discussing the real issues of that trial with the defendants, said to them, "You are asking me to be a great man." He was right. But he

lost his chance. He had the opportunity to take cues from the U.S. attorney who said, "Process is more important than even the end results," or from Phil Berrigan who said, "These are not times for building justice. These are times for confronting injustice." But he lost his chance. Now certainly this is asking a great deal of our courts at the present moment of history, for they, too, are part of the amalgamation of formerly separate identities now so characteristic of our society.

Ours, as I'm sure we are all well aware, is a time when a number of independent forces in American society are rapidly diminishing. We have new combines now—business, government, military, university, and ecclesiastical. And each segment reinforces the other in such a way that the identity of each becomes ever more difficult to discern. And thus the making of national policy is devoid of much of the free and independent criticism essential in a viable democracy. But this separation of these forces is not going to be an easy task. The process has gone on for too long, and the interdependence and the interconnectedness have become too complicated. This is why President Nixon's view of himself as a reconciling force in American life is so tragic. For no one can be a source of reconciliation today unless he first takes sides and chooses to align himself with the truly forgotten people, the poor and the Black, and the Indian, and the Spanish speaking, and all the millions of human beings abroad whose lives are directly affected by our national policies and priorities. To refuse the role of protagonist is to side inevitably with the oppressor. And Mr. Nixon unfortunately gives evidence of doing just this. Tax incentives as a method for financing, pulling back on new housing construction, raising of interest rates on federally guaranteed mortgages, unemployment as a means for curbing inflation, by-passing the mayors of our larger cities in favor of block grants to the states, and a law enforcement policy such that the *Wall Street Journal* can announce that the chief beneficiaries of government spending on law enforcement will be companies that provide equipment useful in riot control. This is not to reconcile. This is to side with existing sources of power.

So each of us then, I think, has to ask himself really, what is the source of cues he is going to accept as describing the signs of the times. We heard so many different sets of statistics today, and we'll

hear more as the day and the evening go on. But it is important really that we go beyond the statistics, that we really ask ourselves where are the cues whence we will develop our style of response. I think the most appropriate source of cues are the cries of the oppressed, and if these be the source of our cues, then I think we will begin to take that kind of action that is proportionate to the very serious situation in which we find ourselves today. But it does have to be a response, I think, at a very deep level. Each of us has to ask himself, "What will I do about this in terms of my life style?" We can't be like the two faculty members at the other university who about four weeks ago were present at an illustrated lecture on Latin American poverty, and the slides made it very, very clear the type of violence that was being done to human lives. But on the way out, one of the faculty members said to the other, "He was good, but not as good as the fellow last week on China." We are beyond the point where anything less can be proportionate to the magnitude of the situation at hand. We must face up to some bitter facts of national life—such as our ability to gloss over and institutionalize tragedy and violence, such as our blindness in realizing that poverty is built into the American system, and that the poor here and abroad will always be poor until our national priorities and values change. The Milwaukee 14 incident invites the court to participate in this change, to be the separate power that it is supposed to be.

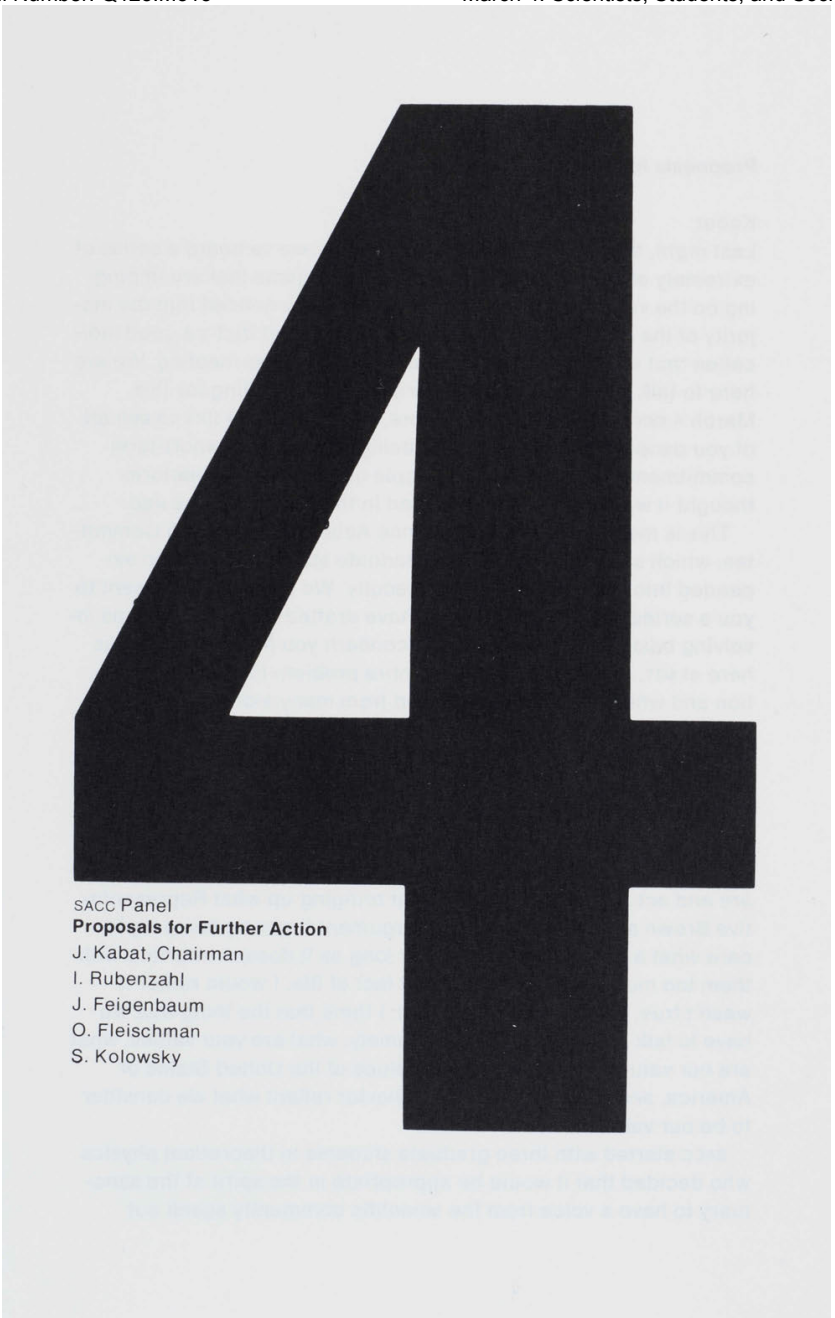
I hope that today's research stoppage is one sign that the universities are receiving a similar invitation. I think this meeting is only one thing that highlights why the student is so important in American society. It is no accident, for example, that the work stoppage today is the result of student initiative. Students are important because the ideas of what ought to be are more valuable to society now than ideas of what can be. Our society badly needs individuals who are willing to risk the implications of a life style that really believes in the power of the future over the present, a life style that believes it is dangerous to defer to the future that which man is capable of doing now. Our times call for behavior modeled after Ghandi's hungry man, who begins to eat right away rather than to accept the tastes and manners of the well-fed. The student as an agent of change is well recognized in at least some circles, and David Deitch pointed out in yesterday's *Globe* the attempt of the

OECD, Nato's economic wing, to warn the university to institutionalize and co-opt the student protest before the university itself becomes irrelevant as far as deserving present institutions and priorities are concerned. The student has to be aware of that. I think then that the student is the best hope that our universities will resist this pressure to be used. The student is the best hope that our universities regain their independence, for universities too have to be liberated, and we invite them to join the resistance, to begin to say "no," and today is a good beginning for this.

One final point, in lowering our bail, the judge wanted to know if we would keep the peace. That's to ask the wrong question. The question is, will you make peace. In other words, this is to opt in favor of change. Those who demand order at any price are the ones who keep the peace. They are the ones enamored of things as they are; keep the peace, keep injustice, keep bad housing, keep sending bodies to the generals, keep things just as they are. Jesus said "Blessed are the peace makers"—not the peace keepers. And speaking of the Cattonsville and Baltimore defendants, U.S. Attorney Steven Sacks referred to them as arrogant men. Why? Because they were pursuing change at a rate faster than Mr. Sack's beloved institutions would permit. Theirs is not the type of arrogance I fear. I believe rather there is an arrogance of institutions in American life, an arrogance such that pace and direction of change are demanded of a citzenry at the price of being called disloyal or anarchist or worse. It is arrogance that places things as they are above human values, and it demands acquiescence now; otherwise indictment. This is indeed arrogance. And it manifests itself in that statement of that same Steven Sacks I mentioned before who said that due process is even more important than the answer you get. Steven Sacks admitted that he would not have served as prosecutor in the "legal" cases involving the identification of Jews in Hitler Germany. This same Mr. Sacks today places institution time before suffering time. So I think that what we're saying today is that the universities are going to become part of this resistance, part of those who don't fear the arrogance of people such as Dan Berrigan and all of those who have been indicted for refusal to report for induction, not their arrogance, but the arrogance of institutions.

If the universities will do this, if they will become part of this

movement to say "no" to the types of priorities that make us the most feared nation in the world, on this earth; if they will say "no" to those priorities that make the elders of our communities fear for their young—think of the implications of that—a society in which the young are feared. If the universities will join this movement and learn to say "no," then perhaps we can reverse the process that Dr. Wald spoke about earlier.



Proposals for Further Action

Kabat:
Last night, this morning, and this afternoon, we've heard a series of extremely eloquent talks on a number of subjects that are impinging on the very fiber of our lives. You may have noticed that the majority of the press and the cameras have left, and that's a good indication that we've arrived at the business end of the meeting. We are here to talk about what we have tried to do, in calling for this March 4 ceremony, and furthermore, what we would like to see all of you people out there join us in doing. This is not a short-term commitment, which I think the people up here on this platform thought it was when we got involved in this, three months ago.

This is the SACC panel, the Science Action Coordinating Committee, which started as a group of graduate students, and then expanded into undergraduates and faculty. We are here to present to you a series of proposals that we have drafted for discussion, as involving basic issues that we think concern you here at MIT and us here at MIT, in the context of the entire problem that faces the nation and which has been addressed from many sides this morning and this afternoon.

We envision this as being a working meeting where there is equal participation from the floor. We don't want to do all the talking. We welcome your ideas. These proposals are in preliminary form, and we haven't talked too much about implementation. We expect, of course, that the administration will understand how reasonable we are and act accordingly. I think that bringing up what Representative Brown said, the one-percent argument that very few people care what a small minority does as long as it doesn't interfere with them too much, is a very important fact of life. I would rather it wasn't true, but as long as it is true, I think that the thing that we have to talk about first is values; namely, what are your values, what are our values, and what are the values of the United States of America, and does our national behavior reflect what we consider to be our values.

SACC started with three graduate students in theoretical physics who decided that it would be appropriate in the spirit of the sanctuary to have a voice from the scientific community speak out

against the things that we've all considered to be aberrations and abominations for a long time. This is something unique in the United States. I think in the past scientists, especially eminent scientists, have taken it upon themselves to seek ears in the corridors of power, to explain how their constituency felt about things, what the expertise was on certain issues, and I think that may have proved successful in the past. But I don't think that it's been successful enough, and something else is called for. We hit on the idea of a work stoppage. It's a symbolic act, but it does try to involve people in making a decision. People didn't have to come here. It was advertised as a work stoppage, namely an act whereby you withhold something for a day because something else is more important. But it's not just a day. As soon as you get involved in these issues, you realize that. People stand up on the podium and talk about moral outrage. But those are just words. Existentialism is just a word; commitment is just a word. And what I've come to talk to you about is you, because you're MIT. You people are MIT. If all of the people left those buildings, the buildings would have very little character. In a larger sense, you are the country. That's what we've been told for a long time by the government. But if we're the country, then we really have to examine our values because it seems to me that it's not people who run the country. It's interests, and it's the interests of the people who have the power. And what they do is use rhetoric to make you think that your values and your interests are being served. And it's just a question of how deeply you analyze that situation before you come to the realization that you're getting screwed.

Now I feel that we're getting screwed. I feel that we're all threatened by thermonuclear war, but what about the people in Roxbury. I don't think they worry about thermonuclear war. I don't think the people in Harlem worry about thermonuclear war. There are much more pressing matters. They are already occupied. They're closer to Vietnam than the people in this room think for the most part. So all I'm calling on you people to do is remember that tomorrow is not the end of what started here. I think that in the past three months we've been involved full time in working on the organization of this thing and dealing with the issues and have given up our thesis work to do this. We've come to a lot of realizations, and we're no longer

the same people that we were before. And I must admit that I think it's true that many of the faculty members that we have been dealing with for the past three months, and who have stopped their research and many other activities that they used to indulge in for the past three months, have also changed. Their lives are no longer the same. This is a basic realization that must come if we are to affirm some sort of purpose and get down to work. Because just talking about these issues today is going to make very little difference. It's eleven months to the day that we were on this platform talking about Martin Luther King, and everybody said, "What a terrible thing. Martin Luther King has been shot, and all our institutions in the country are racist." And how MIT was being bilked by unions that didn't allow blacks to participate. Well perhaps some good has come from that, but I think that it's time that we decide that our lives are not going to be of very much worth unless we consider the questions that we may go through life not facing, being blind, being unconscious, being asleep. So now I'm making this plea because we have used the vehicle of these proposals, in however preliminary a form, to continue the March 4th movement, and to continue it at MIT, which we all know plays an important role in the establishment—the way it is—in the military part of the establishment.

There's been a lot of misunderstanding, and we have been accused by a lot of people of not appreciating how much good goes on at MIT. We appreciate how much good goes on at MIT, but it's not enough. A lot of speakers have said that it's not enough. And it's not enough that there's a lot of good in this country. We want more. And I think that you people want more. And if you do, you're going to have to heed Representative Brown and become that one percent and talk to your friends and get involved to the point where your life changes. I'm not sure of what all the consequences of that are. So I would like to present Ira Rubenzahl, who will in turn present the proposals of SACC to MIT. And then we will open the floor to discussion of these proposals, other related issues, and the kind of things that we would like to deal with in the future here at MIT and in the country. I'd like to add one more thing, and that's that we initially started out organizing within MIT, and practically in spite of ourselves—there was very little effort—the thing became a national movement. We've been in touch with people all over the country

who feel very much the way we do that there is something about this time, that the time is right for action, that people who have previously not been involved should get involved, and that if they don't, I just don't know what to say. The world may go on, but then again it may not. We get a lot of our ideas from this little kid (Danny the Dog) sitting right up here. We talk to the kids. They'll tell you what's happening. And if you're a parent you better listen, because otherwise it doesn't mean very much.

Rubenzahl:

The proposals are on the yellow sheet, the free yellow sheet; you can read them. I want to make just a few general remarks about them first. You may not agree with the specific detail of the proposals. We can work that out because they're not in final form. Let me make a few general remarks. What these proposals say basically is "No!" to war research at MIT. I think they're all in that spirit. They're in the spirit of resistance. I think that's what's necessary. I think we feel that it's possible to turn MIT away from supporting a certain political body, namely the Department of Defense. We feel at least that there should be a chance for that decision to be made in public. I want to point out that we're trying to have an open dialogue about this.

Let me go through the proposals quickly. Proposal 1 deals with the cooperative program, specifically courses 6A and 16B. These are programs in which students at MIT spend part of their time and receive credit for work in industrial laboratories, some of which do classified research. Some of these students work on this classified research and receive credit for it. What we're asking for is that such programs be discontinued, specifically, not all programs, not programs with the Massachusetts General Hospital in which they work on medical problems, but programs where classified military research is done. Point 2 is that the following academic policy, which apparently is not a policy at MIT, be adopted: no credit be given for any classified theses, no credit given for classified research, no classified or otherwise restricted course to be given at MIT. Point 3 is that a board be established specifically to help MIT students, faculty, and staff to find employment in nonmilitary areas. Point 4, that ROTC be abolished at MIT. I know that this is perhaps an issue that has been taken up at a lot of campuses already. We felt that it

would have been a sin to leave it out. We can talk about it later. Point 5, that all war-related research at MIT be phased out. Let me make it clear that we are not asking MIT to get rid of Lincoln Labs or the Instrumentation Labs. What we are asking for is that MIT take responsibility for the kind of research that goes on there. I know there is some good research there. But there's a lot of war-related research too. What we're asking is for MIT to say to the government, "We will run Lincoln Labs for you. But we'll only run it on projects that we approve of, namely projects that do not involve classified research." Point 6, I think, is here to make clear that we are not against scientific research. What we're asking for in Point 6 is a proposal to the federal government, which can be echoed by all the SACC chapters around the country, that the Defense Department get out of the business of funding research that it has no business funding, namely basic research. I think it's one of the indications of what's wrong with the scientific community.

I'd like to turn the discussion over to the floor. We have a panel of people who've been involved in these activities. They have studied these proposals and have some information about MIT.

Comment from the Floor:

I have a couple of things I want to say before taking up the specific proposals. In line with the talks that we've heard today, I think that there are some other issues besides these MIT-oriented proposals that should come up. In particular, I was thinking of speeches by Professor Rabinowitch and Representative Brown as two jumping-off points. First, Professor Rabinowitch has pointed out internationalization. I think it is a fact of life that we will not be able to sell the gravity of how close we are to apocalyptic situations unless we can get this movement internationalized. As my first proposal, I would suggest that we contact reputable scientists all over the world and not just in the free world—this includes Eastern Europe, Mainland China, and the Soviet Union, and I recognize that there are scientists in these countries who will have to have considerably more guts than it takes for me to get up here now—but we should contact these professors with a view toward forming another day of protest along the lines of March 4 but on an international level, with discussions related to the militarism of the world and indeed the suicide the world is moving toward. If we can start something like

this working throughout the world, then we might be able to convince our own violent society to put aside some of its weapons. This is a very long-range idea, but I think it's important to try. This movement must be international if we're going to get it across to the public.

The second point I want to make has to do with Representative Brown's very cogent suggestions, and that is we've got to get political influence in this country. People aren't moved by riots; we are moved, but not enough is done by that. What we want to do is get into political circles, and there are several ways of doing this. One is widespread publicity and getting into the electoral process. For instance, we should get referenda on the ballots at the next election or resolve that the U.S. government should not fund or encourage in any form chemical and biological warfare. And with widespread publicity about what the dangers of this are, it's just possible that we might be able to get the public to go against that. We might be able to get a referendum that the U.S. should ratify the Geneva anti-CBW accord, which I understand we are not a party to. These are very specific things we can put on the ballot as referenda. We can publicize, and by publicize I mean that we should take the initiative to get articles and pamphlets published. I would recommend that the text of Professor Wald's speech be made into a pamphlet and given widespread distribution. We should support candidates that we want and get involved with all the other time-consuming and current methods of American political change.

I think that you should define war-related research more specifically than you have. I want to know what you mean by war-related research. You know that the fact that it's classified does not necessarily tell you anything.

Rubenzahl:

Let's talk about war research. We discussed this and decided that anything that was classified was considered war research. If it doesn't have to be classified, unclassify it. War research is any classified research that goes on at MIT.

Comment from the floor:

I think the proposals are basically good, and I think what's going to be important is the way we work for them and campaign for them. I've been a little disturbed by two concepts that keep coming up again and again, namely that we say we're fighting against militari-

zation and will do so by resistance. It's not the militarization per se that I'm against. It's what the militarization is being used for. For example, I want ROTC off campus at MIT because I don't approve of what it's being used for. If I were in South Vietnam and running a university, I would want the equivalent of ROTC on campus because I approve of what the NLF is doing and I want to help them. I want ROTC off campus here because I think most of the things the U.S. Army does are bad, around the world and also in this country. I think this is what you have to fight against, not the fact that "gee, there is an ROTC," because ROTC doesn't exist aside from the policies that it carries out. So I think the enemy—some people say it's jargon—is imperialism, and we should see attacking ROTC and attacking all this defense research not as attacking the military but as attacking the policies for which that military is being used.

The second topic that keeps coming up again and again is resistance. We attack the system by not participating, by dropping out, and by turning in draft cards. I don't think that this is the answer. If a single person resists, or even if a few organized people resist, other people can take their place. The way to build an effective movement against the policies you oppose is to organize. And you don't organize people to drop out; you organize them to fight against the policies they oppose. I'd like to see these demands implemented, but with the perspective of fighting the politics of the present government and of organizing something that will be effective and will win, and not something that will just purify people's consciences.

Kabat:

Let me make a comment. The demands, although they are on that yellow sheet of paper, don't stand by themselves. There is a set of documentation of those demands, and it will be further augmented. I couldn't agree with you more, that there are political reasons for making these demands. They're not being made in a vacuum, and they are being used as tactics to try to change things. The last thing I would want anybody to think is that SACC is trying to drop out and resist in that way. Our thought from the beginning has been to try to organize scientists, and to organize young scientists, and to organize students to try in whatever way they feel possible to work against the trend that they oppose. Staying at MIT means changing

MIT. And if you change MIT, you're going to change the nation. That's why these proposals are directed at MIT. We can certainly make more proposals about internationalism and about the state of the nations and how it should be changed. But I think that our primary concern must be where we are and the function that we serve.
Comment from the floor:
The human race at this present time is heading toward destruction; there isn't any question of that. And at the head of this movement toward destruction are the capitalists and the politicans and the army, the police, etc., and of course now the scientists. What has to be realized, basically, is that scientists now stand in a position almost equivalent to the armed forces because if the government is going to decide right and wrong, we are going to do it, we are going to carry our imperialism into Russia, right through China, through South America, and the next ten years suggest that this will be the policy. We are the continuation of capitalists and politicians cooperating together in an attempt to exploit the rest of the world. If that's going to happen, then scientists are going to be faced with a moral responsibility. They are going to have one basic choice. "Am I going to destroy the human race or am I not. Am I going to end thousands of years of human evolution, millions of years of natural evolution? Am I going to destroy it all or not?" And it basically comes down to that question. And if you say "no," then it's not a question of a few reforms, it's not a question of just saying that we oppose this aspect and that aspect and this aspect. You've got to say "no" to capitalism. You've got to say "no" to a system that is based on the profit motive and reduces humanity to nothing. You've got to say, "No, we want capitalism to come to an end." We want a system based upon cooperation and sharing, because you can't extricate the scientific community from the capitalist system because everything else remains in it. You can't say, "We want capitalism, but we don't want to exploit people, and we don't want to cooperate in exploiting people," because if you want capitalism you're going to have to cooperate in exploiting people throughout the world. So it's that simple. You've got to say "yes" or "no" to capitalism between now and the year 2000. If it's not in the next ten years, you'll have to make your mind up in the next thirty years or so. And the scientists are going to face this moral responsibility of deciding whether

they are going to be used as tools in a plan to destroy the human race, because that is what it amounts to. We can't do any more. We're up against the wall, we're falling down, we're sinking, capitalism is sinking, capitalism is being destroyed, we might as well destroy the human race in the process. Capitalism is going to come to an end anyhow. It can't possibly go on. It's just a question whether capitalism takes the human race with it, and that will depend upon the scientific community as much as anybody, in fact, probably entirely on them eventually. The armed forces and police will have some role, and everybody will have some role, but the scientific community has that extra role. So that's the important thing. And it's got to be no or yes. I hope it's going to be yes.

Comment from the floor:

I think the last few speakers have in one way or another expressed some of the frustration that a lot of us may have felt with today's and yesterday evening's proceedings. There is this split among people who are trying to create a progressive science and a progressive scientific community. There are those who think that we can go on in the old way of trying essentially to speak truth to power, get the right ear, tell them how it is, and they'll do something about it, that there aren't any opposing interests who have an interest in the irrational and inhumane use of science. The other view, which has also been presented, is that there are interests and that we're going to have to organize, we're going to have to organize with other people, and that in fact we're going to have to use power against power, people-power against power to change things. And I think that in a way the question of the end of an academic community, the end of a rational dialogue, is not due to those who want change, but due to the fact that there are forces that have just resisted change, and resisted change while the inhuman results of technology, not only the danger of nuclear war but the destruction of life in the cities and in the country, are proceeding apace.

This second point is that many people would say that these proposals violate academic freedom. This is a funny call to be hearing from certain people because some of those people who are calling for academic freedom were some of the greatest loyalty oath pursuers and witch-hunters in the anticommunist campaigns in the 50s. But today they are all interested in academic freedom, the aca-

demic freedom to find out how to kill, how to destroy, how to contain ghettos, how to preserve the status quo. I don't think that's an issue of academic freedom. That's an issue of whether the status quo should be defended or whether you should attack the people who defend it. And when Mr. Schelling says that rational dialogue ended between faculty and students, and he hopes it continues with the faculty, he's saying that he hopes that people will allow the status quo to go on. I think again these proposals are not in that vein, that we now recognize that we have to make certain judgments and choices and that the day has gotten pretty late. As Johnnie says, eleven months ago, Martin Luther King was shot, and we had a big assembly, and we talked about the role MIT could play in any racism in this country and in this community, and yet I understand today that MIT along with Harvard are the two chief forces opposing the community peoples' proposals for the community college for Boston. If somebody satisfactorily completes a two-year program at the community college where Harvard and MIT and other schools are supposed to be setting up programs, the community people would like them to be guaranteed admission to the school that organized their field. MIT and Harvard are the ones who are chiefly resisting this. This is another demand that should probably be added to our list.

Comment from the floor:

I'd like to suggest a restructuring of society somewhat milder than the previous speaker. I address my words mostly to scientists but surely to all would-be scientists as well. The point was made earlier that the military is a self-serving organization; that is to say, if an army exists it will find a rationale for its continued existence and perhaps expansion. And the same thing is true of military-oriented industry. I believe that the military industrialists are not generally idealists except insofar as they are making a good deal of money, and this is a good ideology for them. Therefore, I would suggest that we apply our expertise to showing the industrialists how they could make a better profit by reorganizing their work toward peacetime pursuits; transportation has been suggested, the construction of whole new city complexes, and I'm sure this is only a beginning of what could be a very long list. It is perhaps in a sense pandering to the greedy instincts of these people, but it might nev-

ertheless be effective in diverting this alliance between the military and industry.

Feigenbaum:

I'd like to ask if possible that further remarks be addressed to practical suggestions to our organization here at MIT and nationally, because I think we've heard since approximately nine o'clock this morning that there are many grave problems facing us, and we've heard many aspects of them. We've heard the threat of annihilation, the insane way in which our government uses and produces weapons. On the other hand I don't think we've heard enough about the other kind of catastrophic approach to human values as contained in the word injustice, but I think that's another atrocity that our government is capable of. It mixes the two, and I think we can call them oppression. But in any event I'd like to get back to the concept of organization, and I think that as scientists, we are one powerful constituency in the country. Congressman Brown, who I must say surprised me because his remarks were so intelligent for a Congressman—I mean that seriously—said that one percent of the population can be powerful. I think that's a very bad situation. Given the emergency situation that we are living in, we have to take advantage of that situation with the hope of making it possible for 50 or 60 percent to be necessary to influence American policy. But I'd like to talk about what we've been doing at MIT and what other people have been doing around the country. At MIT I think we have between 250 and 300 students who have been working on photography exhibits related to this day, who have been writing poetry, producing posters, who have been turning this day into a kind of celebration. But now we want to organize. And that's what I'd like to ask you to address yourselves to.

Professor Fleischman is quite appropriately here at this time because he represents a group that came into existence about the same time as SACC, which is Scientists for Social and Political Action. The SSPA is led in California by Marty Pearl and Charlie Schwartz, and they are in the business of organizing scientists just as we are. If we could organize plumbers, we would. I would hope that plumbers would organize. I would hope, incidentally, that college administrators would organize. I think that there are over a thousand colleges in the country, and I think that it would be a very

nice thing if college administrators would organize to resist the pressures which, I've heard them say, are exerted upon them. If they were organized, I think they would have our support. So I'd like to ask Dr. Fleischman to talk about SSPA.

Fleischman:

Now I come on as a scientist. Twenty years ago I was a premature draft resister in the first peacetime draft in 1948, worked myself into a psych-4F after trying for a conscientious objector status, but I didn't believe in God. I'm also a premature anti-Stalinist, and therefore I'm not quite in the mood of the new left because I'm for liberation everywhere. I don't think that the Communist society is a society where anybody can (as Eric Mann) wind up calling the name of the system and not be declared a radical or a revolutionary or be dead or be in prison. I don't think I'd last more than two weeks in any of the Communist countries. Now I've got a list that I'd like to pass around for anybody interested in SSPA. It was organized at the American Physical Society meeting about three weeks ago, where a number of people from the March 4th movement here also spoke. Unfortunately faculties are as inefficient in their operation as students in terms of doing organizing, and none of the people who signed did their homework in the Boston area.

It's a one-man, one-vote organization. Students and faculty (and that includes undergraduates) are invited. One of the first things we did at the APS meeting was push for a graduate student on the national Board of the American Physical Society, as well as engineer a majority vote against our next meeting in Chicago. My division, by the way, voted not to go to Chicago regardless of what happened. Over a thousand people voted at that massive business meeting—nobody ever goes to business meetings in general—against having our next meeting in Chicago. However, the national board decided that that vote gave it only the duty to send out a national referendum on this question, and we'll all be receiving it in the mail if you're a member of the American Physical Society. There is a newsletter put out by the organization, which I received last week, and there are two lovely pages on the difficulty of graduate students getting jobs in physics now, and what could be done. One of the things that was suggested was that perhaps the seniors who have summer support, donate their summer support money to

graduate students during the summer, and do their research without money during the summer so that we do something to get out of the financial bind.

Comment from the floor:

I want to redirect the conversation because it seems to me that it's not really aligned with what we came here to discuss, and in line with that I want to make some semiprovocative remarks. I want to explain exactly what the aim of these proposals is in relation to MIT. Now we all have grandiose visions of revamping the whole system, which we may happen to think is unjust or otherwise, and in fact I sort of agree with Eric Mann this morning that there is nowhere to drop out and you have to start where you are and start from the bottom. And we're at MIT, and MIT happens to be an integral part of the military-industrial complex. So we're going to try and change MIT because in that change, repercussions, the publicity, the waves that are sent across the nation generate more change. The effects from Chicago are still going on now. There were maybe ten thousand people involved, but the effects must have affected millions of people. We're starting at MIT, and these proposals are going to change the fundamental character of MIT; they're going to be resisted, and they have to be negotiated and talked about. Nobody here is talking about them, and I think it's time we started.

Kabat:

Can we make a plea for having this meeting focus on the proposals, what you people think about them, and what other kinds of proposals you would like to see. We welcome comments from the administration if they care to give them, off hand and off the record.

Comment from the floor:

I'm a graduate student in psychology at Northeastern. I'm not going to speak directly to the proposals for MIT, but I'm going to say something that I believe has to be said. I think that what this meeting shows perhaps more than anything else is that scientists like other people in an academic community are very verbal people. They're impressed by verbal resolution, verbal proposals, verbal argument. I myself would be rather more impressed at such a meeting if it were a meeting of the local inhabitants in a barn in Iowa of a similar number of people. I imagine that the meeting would take a somewhat different form. The clergyman who spoke earlier talked

about the difficulty and meaninglessness of verbal approaches to problems with respect to convincing most people in this country. And I think one thing that anyone who thinks about this sort of problem has to address themselves to (and I'm suggesting it for this group) is how to communicate the things that we're trying to talk about to people who are not quite so verbal, so that we and they can make sense together.

Kabat:

You're right, but I think that the first job is to get ourselves together and I'm not sure that we've reached that point.

Comment from the floor:

This is addressed somewhat to the way in which we might implement the proposals. I heard the words power, win, fight, attack, expressed quite a bit today, and this brings about a frame of mind involving us and the industrial-military complex, and I recall a thing by Nietzsche: "He who too long fights dragons becomes himself a dragon." We have to be careful about the way in which we psychologically and sociologically go about doing the things that we're going to be doing. For one thing, when in twenty years we've attained a position of greater power, we want to be open to people who are younger than we are, and I've already seen our lack of openness, for instance, in graduate students to people in high school.

Comment from the floor:

Somebody mentioned the phrase "speaking truth to power," and I'll agree with the speaker just before me because there's too much verbalism here. But I think first we have to speak. Very few people have spoken—have spoken out or have spoken with others. Very few people have really addressed a group and tried to defend any of the positions that they are taking. We have some very useful proposals, some very cogent proposals. Some that have to get through, many that will have a very hard time getting through. And we've got an organization that will get these through in the only order that can work. I think the first problem that we have to address ourselves to is gaining support in a large movement, and I think we're going about this in completely the wrong way. We're trying to gain support for a relatively small number of specific proposals, but I look around this room and even counting the number

of people who have come and gone, there's a conspicuous absence of the Cambridge scientific community. Very few scientists have come. Very few scientists have expressed real support. Very few of those who have come will do anything or have even brought it up at a luncheon meeting. I think we have to bring these big issues to a very immediate reality, and I think that the first action everybody in this room and everybody who has attended this symposium has to begin to take is to begin to communicate in a very small way. If we really do believe in our own reason and logic, it should be sufficient just to ask those around themselves to make a commitment. I'm not trying to refute any of the proposals that have been made. I just want to assure that nobody leaves here and does nothing.

I was very appalled this morning. I went to one of my classes at Harvard, and I raised my hand at the beginning of class and said that if the majority of the class was interested, it would indeed be appropriate to discuss the issues movement. The class had to do with automata theory, and somebody said, "Well, I don't think that computing machines have done any harm to many people." And everybody was quite happy to accept the fact that the issues weren't relevant to them, that they weren't doing defense work, that they were on defense money, but not really. One thing I'd like to see everybody do is just bring this up for discussion and get this community aroused. And I don't mean this in any small way. It took about three years, academic years, for the academic community to get really excited about Vietnam.

Kabat:

Before we go to the next speaker from the floor, these proposals were presented fairly abstractly, and I think it might be instrumental if we talked a little about the things that we think are wrong here at MIT and that we think should be corrected. And to that point Sid Kolowsky will talk.

Kolowsky:

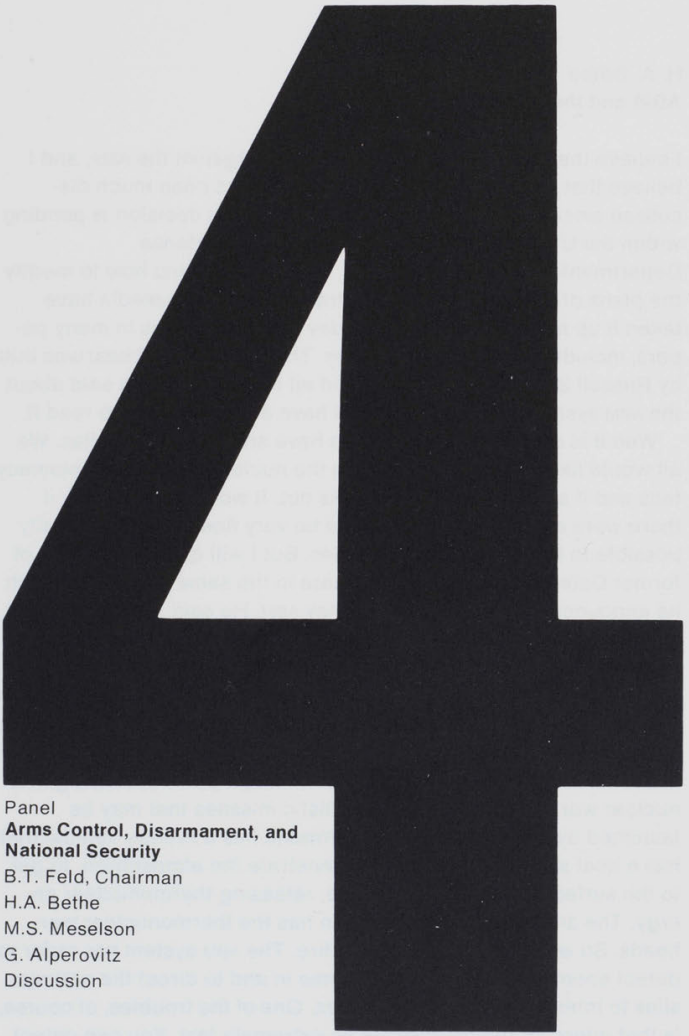
Rather than focusing on things that are wrong with MIT, I think that there's a general realization that many people here would like to see MIT take a different direction, that is, to become more heavily oriented in socially useful research. And in this same way many research corporations on Rt. 128 face a similar problem. Many people there would like to see their companies (now heavily engaged in military research) take a new direction. Most people are very con-

cerned about the practical measures that they can take. Just this morning there have been some discussions about what can be done in the way of forming a clearinghouse for information on what support would be available for research that engineers and scientists might propose in new fields. Some people in some of the companies thought that establishing a clearinghouse and having an in-company liaison person circulating ideas from engineers and scientists in that company to the industrial-engineering-scientific community, and having a place to receive information in each company to encourage people to make bolder proposals that make realistic financial sense for the company, would be a big step in the right direction. I think that to a large extent the same thing applies to the laboratories associated with MIT—those at MIT proper and in the Instrumentation Lab and Lincoln Laboratory. What I think we would like to see would be some committee formed by the various research groups at these laboratories to begin to look into how their particular skills might be utilized or updated so that they can be applied to a larger set of problems, not directly concerned with military application. We think that representation on committees to look into these problems is important, and we hope that it would include members of the working academic and scientific staff of these laboratories so that in fact they will feel that they have a stake in retaining their relationships with these labs as funding changes and as the interests of government funding changes. In a similar way we hope that here at MIT students in cooperation with faculty and research staff of the various departments and laboratories can also form effective groups, as is already happening in the mechanical engineering department. We hope that students in coordination with staff and faculty can begin to see how the scope and the focus of departmental and laboratory research can be reoriented toward what we consider to be more socially valuable work. At this point I would like to stress that the composition of the committees or of the proposed board be wide, that is, they should include students, staff technicians in the laboratories, all people concerned with redirecting, and that a clearinghouse here at MIT be established for that purpose.

Comment from the floor:

The first thing in Proposal 5, you mention that the school must change its attitude toward the Instrumentation Lab and Lincoln

Labs. I agree; in fact, I think that we should put on all the pressure that we possibly can. But more so, the scientists within these laboratories are intelligent men, and their number can be reached. I think that we have to move beyond the university and move out to these men and make them each aware that when they are doing this kind of research they're making a moral decision, or that they should be making a moral decision as to what they are doing with themselves. A further suggestion with regard to abolition of ROTC. Once again I agree with the proposal, but I think that what's needed also is to reach the entering freshmen. They should be told what it is, why we are opposed to ROTC, our feelings toward the military-industrial complex. They should be told that when they take a scholarship from ROTC they are effectively bought. These people aren't being reached right now.



Panel
Arms Control, Disarmament, and National Security
B.T. Feld, Chairman
H.A. Bethe
M.S. Meselson
G. Alperovitz
Discussion

H. A. Bethe

ABM and the Strategic Balance

I believe that most of the audience here is against the ABM, and I believe that I am here to tell you why. ABM has been much discussed since this meeting was first called. The decision is pending within the United States government—in the Defense Department—whether to install it, in what form, and how to modify the plans of the previous administration. The news media have taken it up in force. Nearly every day you see articles in many papers, including the *New York Times*. The article I liked best was that by Russell Baker, which I think said all that needs to be said about the ABM system, and I hope you all have an opportunity to read it.

Well it is obviously a fine idea to have antiballistic missiles. We all would like to be protected from the nuclear war if our diplomacy fails and if such nuclear war breaks out. It would be very fine if there were an ABM system; it would be very fine if it were actually possible to intercept enemy missiles. But I will quote the words of former Defense Secretary McNamara in the same speech in which he announced the decision to deploy ABM. He said, "It is important to understand that none of the ABM systems at the present or foreseeable state of the art would provide an inpenetrable shield over the United States. Let me make it very clear that the cost in itself is not the problem, that the penetrability of the proposed shield is the problem."

Let me first say what the ABM system is. What we are facing in a nuclear war is intercontinental ballistic missiles that may be launched by our enemies. Such a missile has a reentry vehicle that has a heat shield permitting it to penetrate the atmosphere, to get to the surface, and then to explode, releasing thermonuclear energy. The antiballistic missile again has the thermonuclear warheads. So we are fighting fire with fire. The ABM system has radar to detect enemy missiles that may come in and to direct the antimissiles to intercept the enemy missiles. One of the troubles, of course, is that intercontinental missiles go extremely fast. You can detect them maybe ten minutes before they arrive. At that time they are approximately 4,000 kilometers, 2,500 miles away from their target. Accordingly, the radar you set up has as its main feature long

range: it will detect quite small objects at long distances. The PAR, the so-called Perimeter Acquisition Radar, can detect missiles at distances of several thousand kilometers. It is a long-wave radar because it is known in radar technology that with long waves you can detect the enemy missiles much farther away. Once it has detected these missiles, it observes their trajectory, and it uses Newton's Laws to compute the future trajectory, to compute where the missile will come in and where it will be at any one time.

When the trajectory is sufficiently computed, a command is given for sending up the antimissile, e.g., a big missile known as Spartan, which carries a warhead of megatons. This antimissile is directed by the so-called Missile Site Radar, MSR, which operates at a much higher frequency. The Spartan can go a long way, several hundred kilometers in both distance and altitude, and it can therefore protect a large area. You have what is called an area defense. There are only a few so-called farms of missiles around the country, and this is the main virtue that is claimed for the system. You try to protect the entire country. This is certainly an attractive feature as long as everything goes well. There are, however, possible failures. For instance, an enemy missile may try to destroy the radar and for this reason other missiles are provided, so-called Sprint missiles, which have very short reaction times and which are a last-ditch defense that can protect the radar when an enemy missile has penetrated the Spartan defense. The Sprint missile goes only some tens of miles; it's called a terminal defense system.

Both of these missiles, Spartan and Sprint, intercept with a certain accuracy, with sufficient accuracy to get their target. The mechanism is different in the two cases. The Spartan missile works above the atmosphere; it carries a megaton weapon, and megaton weapons have the property of emitting their energy mostly in the form of x rays, and so it is x rays with which you attack the enemy missile. The x rays are a form of energy; they go into the heat shield; they evaporate the surface of the heat shield; they drive thereby a shock into the heat shield that shatters the heat shield of the enemy missile. You may thereby destroy the enemy missile if you are lucky, but you only know whether you have been successful when the enemy missile reenters the atmosphere. The last-ditch Sprint defense is different. Since it is to operate much closer to the

ground, it has a small warhead, kilotons instead of megatons. It relies mostly on the emission of neutrons that penetrate the enemy warheads; they may then melt the fissionable material inside the warhead and thereby render this enemy warhead inoperable.

Now all this is very nice as long as it works. However, there are many tricks the offense can use to penetrate the defensive system. These are known as penetration aids. The first type of penetration aid is given naturally: the offensive missile is launched by means of a booster; the booster in many cases will shatter, and each of the fragments of the booster presents a radar target that will confuse the radar of the defensive system. It is more effective if the offense adds to its missiles so-called decoys, and the simplest decoys are balloons. A balloon, as you know, is a very light object. You can make a big balloon weighing maybe a pound and reflecting radar. You can make this balloon just spherical, and you can surround the reentry vehicle by a similar balloon, and then to the radar it is totally indistinguishable, which is the Toni. It seems to me that it should not be very difficult for any potential enemy to develop such balloons. You bring them up in the offensive missile, and then you release them once the offensive missile is outside the atmosphere; you inflate them and you disperse them so that the sky is filled to some extent with balloons. Of course, once these balloons reenter the atmosphere, you can tell them apart from the reentry vehicle because they will be stopped, or they will burn up, and so you don't have to contend with them when they are very close to the target. But that's too late for the Spartan. The Spartan has to operate above the atmosphere. It has to be launched long before the reentry vehicle has reentered. But above the atmosphere there is no way to tell a balloon from a reentry vehicle. There are other, more sophisticated devices, e.g., there are compact decoys. They can be made to give radar signals similar to a reentry vehicle. Their development is more difficult, but certainly possible. The ultimate penetration aid is to give each decoy a warhead; that is to say, to have not one warhead launched by a missile but several. This was one of the origins of the multiple reentry vehicle which, as you know, has been developed by both the United States and Soviet Russia. In this case the defense has to shoot at every one of the targets, and if you then add a few decoys that do not carry warheads, the confusion indeed becomes great.

Another penetration aid is chaff. Chaff consists simply of thin wires, maybe a thousandth of an inch thick, which you can cut to various lengths. If you cut these wires to a length equal to half the wavelength of the radar, each such wire will give the same reflection as a reentry vehicle. And you can easily figure that ten million such wires weigh just a couple of hundred pounds, and therefore it is very easy to carry them. It is not so easy to disperse them. This is, in fact, an art that certainly the Chinese would find somewhat hard to learn. But you cannot say that it is impossible. Furthermore, the offense may use countermeasures, jamming of the radar made by emission of radio waves of similar frequency.

Finally, there is my favorite penetration aid, which is radar blackout. Any nuclear explosion will make ionization; it will tear electrons from atoms, and the electrons are very good radar reflectors. In fact, the way radio propagates around the world, the way you can hear radio at large distances, is by the reflection of the radio waves by the ionosphere, which is about 100 kilometers up and consists of electrons. Now a nuclear explosion makes many more electrons than are in the ionosphere, and it can therefore reflect radio waves of much higher frequency, such as those used in the defensive radar. There are two sources of such electrons. One is directly from the blast made by the nuclear weapon that ionizes the atmosphere. If the burst is at very high altitude, let us say at 100 miles or more, then the ionization is of a type that persists for a long time, for many minutes. The second source is that any nuclear weapon, as you know, makes fission fragments that are radioactive, which emit radioactive beta rays that themselves make ionization lower down in the atmosphere, at an altitude of fifty to sixty kilometers. This is the so-called beta-ray blackout. It also will persist under reasonable conditions for something like ten minutes. And it can extend, again under reasonable conditions, over a radius of about 100 kilometers. Now, therefore, you can imagine that above your defensive radar there is a shield about 100 kilometers in radius, 200 kilometers wide, 50 kilometers up: then the radar will have considerable difficulty in looking out under that shield; most of the sky is blacked out.

There are two possible causes of blackout. One is that the defensive Spartan missiles themselves cause blackout when they explode. The other is that the enemy may use this tactic; it may send

huge missiles, making lots of fission, to explode at a suitable altitude, and he may thereby cover a very large portion of the sky for each of the PAR radars such that no observations can be made about that blackout shield for ten minutes. I told you before that it takes about ten minutes for a vehicle to come from the first observable point to your target. Now if one nation deploys antiballistic missiles, what will its potential enemies do? The strong, sophisticated power will build penetration aids of the kind I have described. This is what we did when we got the first indication that the Russians might deploy an antiballistic missile system. They indeed have deployed one around Moscow. It isn't very extensive; it doesn't cover the whole country, but the first indication was enough for us to put penetration aids into our missiles. The Russians can do the same thing. Now including penetration aids in the intercontinental missiles does not increase the total destructive power of the ICBM force. On the contrary, these penetration aids have weight; they take away some of the weight that could otherwise be used for warheads, and therefore they somewhat decrease the destructive power of the offensive force. This is sometimes used as an argument for the antiballistic missile. Multiple warheads also generally do not increase the destructive power. There is, in this case, no escalation of destructive power. This road is open to the Soviet Union. They have, in fact, tested multiple warheads.

But if the antiballistic missile system of power A becomes *very* strong, then power B may doubt whether it can penetrate the ABM. And then it has recourse to a much more dangerous tactic; namely, it can simply increase the number of its missiles. This would stimulate the arms race to a tremendous extent, and this is what I am really afraid of. Now it is not stupid or even vicious of a country to do this. By the way, you can identify country A and B with whatever you like according to your political inclinations. Each of the two great powers has what is called an assured destructive capability, by which is meant that each of these countries can absorb a first strike from the other country and still be able to retaliate in such a way that it inflicts tremendous destruction on the attacking country. This is a defensive strategy aimed to prevent an aggressive nation from succeeding in a surprise attack. Assume two nations, A and B, both very strong, with lots of missiles , living in a period of great po-

litical stress, and such periods occur. Then A may launch a surprise attack, and, to protect himself against retaliation, he will first destroy B's war-making capability, especially his strategic missile force. This would have been very easy in the bomber days in the early 1950s, when many bombers were concentrated on one airfield, and a single atom bomb could have destroyed all these. Such an action, such a surprise attack, would disarm country B, and A could then destroy the cities of B as it wished and force B to surrender. In this situation the country that strikes first will necessarily win unless elaborate precautions are taken. This premium on first strike encourages aggression, encourages each of the two countries to be trigger-happy.

In the last decade both the United States and the Soviet Union have moved to protect themselves from such a calamity by making their missiles invulnerable. They are either in submarines or in deep, strong silos. You need at least one missile to destroy one of these silos and, therefore, there is no point in any aggressive, first attack. Some of the aggressors' missiles will not reach the missiles they are aimed at, and so if you have two countries with the same number of missiles, the aggressor launches all his missiles to destroy the defenders' missiles; then the defender will have some left, and the aggressor will have none, which is fine. Both the hard silos and the Polaris submarines are guarantees against surprise attack; they are second-strike forces. It is most regrettable that radicals in various countries have made demonstrations against Polaris, apparently not aware that this is a peace-keeping force. The Russians are now also developing and deploying missile-carrying nuclear submarines, and I welcome this because it will make them disinclined to launch a first-strike attack.

Now assured destruction, which is the guarantee against first strike, would be put in question by a really effective antiballistic missile system. If A had such a system, he could launch his attack against B, and the few remaining missiles of B could not penetrate the defenses of A. A could then launch his attack with impunity. To guard against this, B will therefore build more missiles. And we have a renewed arms race. I want to remind you that during the Kennedy-Johnson administration Secretary McNamara kept the number of missiles down to the number that was planned originally

in 1961. You will also know that this was not done by Russia. Russia had to catch up, and she did catch up. She now has a missile force that is equal to our land-based missiles in number and is superior to ours in the megatons it can carry.

You can have an arms race between offensive and antiballistic missiles. It is generally cheap for the offense to offset any amount of ABM by increasing the number of his offensive missiles. This is measured by the so-called exchange ratio. Suppose you want, for instance, as the ABM proponents would like, to reduce the number of fatalities in the case of a nuclear war from 50 percent to 20 percent and this everybody must agree is a highly desirable goal. If this is attempted, however, then the offense can negate this by spending only one-fourth of the money that the defense spends. The ABM race is a losing proposition. If you want ABM to be effective, it can be countered with a very cheap addition to the offensive force. There is furthermore a great trouble with these calculations, because they assume a perfect system on both sides; they assume perfect knowledge of the other side's capabilities. Now, if you look at offensive ICBMs, you can tell pretty much when you see them launched how much of the weight they can carry, how many megatons they can carry, what's their accuracy of hitting a target. For a defensive system this is much more difficult, partly because of the difficulties I mentioned before. So if we believe that the Soviet ABM system can bring down a hundred of our reentry vehicles, we shall certainly be tempted to be on the safe side, and so we will not add one hundred missiles to our force, but we'll add 200 or 500. We will overcompensate, and I expect that the Russians will do the corresponding thing. Therefore, after all this is done, ABM will make us less safe than we were before. Instead of reducing the possible fatalities in case of a nuclear war, they will have increased, because the offense has more than compensated.

The Sentinel system was announced as a system against China. China is a somewhat different matter. She is not a sophisticated missile power. In fact, at present she has no ICBMs. She may be testing ICBMs, sometime. For some years, even after the Chinese deploy an ICBM system, our ABM could probably keep ahead of their ICBMs. But their deployment would undoubtedly be modified by our Sentinel system. They would try to deploy penetration aids early in

their development rather than late. How long our ABM could keep ahead and would remain effective against China is anybody's guess. It may be a few years, it may be a few months, it may be many years, I don't know. But if we start a race with a growing Chinese capability and if we overreact the way I expect—that is, if they have 50 ICBMs, we build antimissiles to bring down 200 of their ICBMs—then the Russians will probably react to that by building 1,000 ICBMs against us. By this chain of argument, a very small Chinese force can bring us into much greater danger than we were before, if we respond with ABM.

I believe the only way out of an arms race is an arms control agreement. The Johnson administration, as you probably know, made a proposal in January 1967 to the Russians to negotiate an agreement to prohibit antiballistic missiles. The Russians first did not react to this at all. Gradually they liked the idea better but insisted that we discuss both offensive and defensive missiles. This was accepted by the United States. Everything was prepared for a meeting in August of 1968 when there came the Russian invasion of Czechoslovakia. I hope that President Nixon will soon take up the possibility of such negotiations and not wait very long. It seems to me that an arms control agreement is of such great interest to both sides that we must not let political difference stand in the way, however much we may have been horrified by the Czech invasion. The nonproliferation treaty, which will probably be signed soon, involves an obligation for the United States and the Soviet Union to enter strategic arms talks. If such an arms control agreement is concluded, then perhaps we can avoid the escalation which otherwise ABM will bring.

I have told you my views on the antiballistic system. There is, I am happy to see, strong opposition against it in the Senate. Such opposition in the Senate and in the public could not have arisen if there had not been informed opinion among scientists on the antiballistic system. I could not have given you the arguments tonight, nor could I have given similar arguments a year ago, which had some influence on the opinion in the Senate, if I were not what Victor Weisskopf yesterday called an "in" man. Without arguments based on facts, you cannot persuade anybody. In fact, without the in men you probably would never have known that the antiballistic

system is dangerous. After all, it saves lives, doesn't it? After all, it is a defensive weapon. That is the superficial view that anybody will have of such a weapon if there are no people who are inside, who study what such a weapon means and know the technological background of both the offense and the defense. It is the responsibility of a scientist and an engineer not to be satisfied by something that appears on the surface as saving lives, but to penetrate below the surface, to *know*. Our great need is to know and, at the same time, not to forget that what we really are after is the preservation of mankind.

M. S. Meselson

Controlling Biological and Chemical Weapons

Chemical and biological weapons, like nuclear ones, are capable of killing very large numbers of people, especially civilians. Nerve gases are comparable with the uranium bomb, in the sense that a single large bomber dispensing one of the more toxic ones under meteorological conditions favorable to the attacker could kill most unprotected individuals within an area the size of the high casualty zone at Hiroshima or Nagasaki. You may recall the accident last year at Skull Valley, Utah, where gas from a test escaped and led to the death of 6,400 sheep over an area of some 200 square miles. Biological weapons, employing anthrax spores, or other potential biological agents, are even more powerful than nerve gas because less is required to kill a human being, and therefore less is required to attack a given area. For example, a standard United States field manual, "The Employment of Chemical and Biological Weapons," states that a single fighter plane can spray enough biological agent to cause 50 percent mortality in an area of 300 square miles.

Fortunately, chemical and biological weapons have never been used in this fashion. Nor does any nation in the world today prominently threaten the use of chemical and biological weapons as they do nuclear weapons. The United States and the other major nuclear powers do not need chemical and biological weapons to deter strategic attacks against themselves. These weapons are not needed to maintain the so-called balance of terror. Nuclear weapons do that. Chemical and biological weapons would simply get in the way by complicating the calculations and expectations of the respective sides in any strategic crisis.

These weapons offer no ability to limit damage from enemy strategic nuclear forces, since the latter can be easily protected. The proliferation of chemical and especially biological weapons would greatly increase the threat to nuclear nations by offering relatively cheap strategic destructive capabilities to the nuclear nations. In short, for a country like the United States, chemical and biological weapons are the worst imaginable strategic weapons.

There are some important properties of chemical and biological weapons that concern their capabilities for tactical use. In my opin-

ion these properties should make the United States eager to prevent chemical and biological weapons from ever being used. Chemicals are very cumbersome weapons to defend against. When chemical weapons are used in combat, soldiers must be provided with protection if the enemy is able to retaliate in kind. This means masks, protective suits, and lugging along enormous amounts of decontamination equipment. The more complicated and interdependent a fighting force is, the more will these protective measures reduce their fighting efficiency. Sophisticated forces would often be placed at a disadvantage with respect to less sophisticated ones. Mortar cartridges loaded with nerve gas have a much higher kill radius than conventional ones. And, as we know, large numbers of mortar shells can be deployed even by guerrilla forces. In other words, the violence level of tactical combat would be enormously increased if lethal chemical weapons were legitimized and came to be used—and their employment could be more advantageous to the enemy than to us.

Gas and germ weapons are difficult to confine—witness the death of the 6,400 sheep, 30 miles away from the test site. This is a case, we are told, in which the most extreme precautions were taken to be sure that no such accident would occur. Under not uncommonly stable meteorological conditions, the tactical employment of moderate quantities of nerve gas could create lethal concentrations as far as 100 kilometers or more downwind from the battlefield. Thus, although fighting forces can be well protected against gas, its tactical employment could easily kill large numbers of civilians. For example, a few days of tactical nerve gas employment in Europe could quite easily kill tens of millions of civilians.

Another feature of these weapons that should make them anathema to the United States is that they are prohibited by international law. The major existing international agreement that prohibits their use is the Geneva Protocol of 1925, which specifically prohibits the use of "asphyxiating, poisonous or other gases, and of all analogous liquids, materials or devices" and of "bacteriological methods of warfare." The Geneva Protocol was proposed by the United States.

Finally, I wish to add one more consideration that is enormously important, and that is that these weapons are particularly abhorred

by mankind. We should do nothing to erode this view because it may be the decisive safeguard against the proliferation of weapons that would gravely threaten the security of the United States as well as that of others.

In view of these circumstances, one would think that the overriding purpose of United States chemical and biological warfare policy would be to prevent the proliferation, legitimization, and use of these weapons. We are the pacesetter in military matters, or at least a coequal pacesetter with the Soviet Union. Therefore, our actions, our statements, our policies, will influence the nature of warfare in the future. Unfortunately, unwisely, it is not the case that the overriding purpose of U.S. chemical and biological warfare policy is to prevent the spread, legitimization, and use of chemical and biological weapons. This is not to say that the United States is at present using lethal chemical and biological weapons or that the United States is pressing hard to abolish the worldwide agreements and restraints against the use of these weapons. Rather, our policy is ambiguous, internally inconsistent, and looks menacing and provocative to the rest of the world. There's only one country whose policy I consider to be worse than our own. This is the country that has used poison gas against unprotected villagers in the Yemen—apparently Egypt, although she denies it.

Now when I say that the policy of the United States is unwise, confused, provocative, and dangerous, I don't primarily mean our research and development policy, although I would include some aspects of that. And I don't mean our work on defensive measures, although some of that I think is unwise, and it is done in unnecessary secrecy. And I don't mean our efforts in intelligence to find out what other countries may be doing in this area, although it is improperly used and badly exaggerated to stimulate higher appropriations for CBW. I don't mean any of those things if they serve the purpose (which I think should be overriding) of preventing the legitimization, proliferation, and use of chemical and biological weapons. What I do refer to are two things. First, our use of "nonlethal" chemical weapons in Vietnam, specifically the agent called CS or super-tear gas and chemicals used to attack food crops. And secondly, I refer to our international policy. I'd like to say something briefly about these policies and actions.

First, regarding the use of nonlethal gas in Vietnam, it is true that the agent we use in great quantity, CS, is not lethal in the open when used for police purposes. It can kill when used in confined spaces. It is less lethal to a variety of experimental animals than the kind of tear gas usually used by police. But we really aren't sure that this comparison holds for man. CS is a very reactive chemical and, as used by the military, it penetrates to the deep recesses of the lungs. Almost nothing is known about its possible long-term aftereffects.

However, regardless of the toxicity of CS when used by itself, the idea that war can be made more humane by the use of such chemicals is a myth. Nonlethal gases introduced into the field of combat will come to be used in any way they possibly can to increase the effectiveness of bullets, bombs, and other lethal weapons. We have used nearly 14,000,000 pounds of CS in Vietnam since 1965. Most of it is used for purposes that cannot be considered nonlethal. It is supplied to our forces in Vietnam in grenades, mortar shells, rockets, 105 mm and 155 mm howitzer projectiles, with ranges up to 15 km, and in bulk disseminating devices and aircraft cluster combs up to 1,000-pound size. The distinction between lethal and nonlethal gases might be made in the laboratory under conditions of controlled use. But that distinction loses its meaning when nonlethal gases are massively used in order to kill, in close coordination with conventional lethal weapons.

The myth of humane chemical war could be a reality, but not in today's world. If all lethal weapons were put away and if men still fought wars (that's hard to imagine), then nonlethal gases could be used in war without much killing. But that's not the situation. In proposing the use of nonlethal weapons, the military have never proposed that the lethal ones be put away.

I think that nonlethal gas warfare is worse than a myth; if it were just a myth you'd say, well, it's not going to do anything except disappoint those who thought that it would save lives. It won't be much worse than regular conventional weapons. The use of nonlethal gas in war is highly dangerous. Its use sets the stage for the use of other gases—for the use of lethal chemical weapons. Although that hasn't yet happened in Vietnam, it did happen in World War I. The first gases used were tear gases. The French and Germans used

them in regular military operations. In one artillery barrage alone, at Neuve-Chapelle, 3,000 tear gas artillery shells were fired. This was all before the famous German use of chlorine gas at Ypres in 1915.

Nonlethal gas sets the stage for escalation because it makes men wear masks. It teaches officers and men the rather special techniques of gas warfare. It teaches them to look for favorable situations in which to use gas. It causes the military to ask for gases that are more effective. It causes military establishments in all countries to review their previous policies and to consider procurement of their own gas weapons. It erodes the general expectation that gas will not be used in war.

Finally, a strong case can be made that the use of nonlethal gas violates the 1925 Geneva Protocol, even though the United States claims it does not. This treaty, ratified by over 60 nations, prohibits the use in war of poisonous, asphyxiating, and other gases, and of all analogous liquids, materials, and devices. In 1930, the United Kingdom, France, Rumania, Spain, the Soviet Union, China, Italy, Canada, Turkey, Czechoslovakia, Yugoslavia, and Japan declared that they viewed the use of tear gas in war as prohibited by the Geneva Protocol. The United States, which has not yet ratified the Protocol, was the only nation that disagreed with this view. However, two years later, at Geneva, even we agreed that the use of tear gas should be prohibited in war.

I'd like to turn to the second aspect of what I consider to be foolish and dangerous U.S. policy for chemical and biological weapons. This concerns our international policy. I'd like briefly to trace the development, or I should say the fluctuations in that policy, since World War I. I've described how World War I gas usage began with tear gas, then went to chlorine, mustard, phosgene, and other poison gases. Following that war, language was introduced into the Treaty of Versailles affirming a general prohibition against the use of asphyxiating, poisonous, and other gases (the same language that is in the Geneva Protocol) and specifically prohibiting their possession by the defeated powers. Subsequently, in 1922 at the Washington Disarmament Conference, a prohibition against the use of asphyxiating, poisonous, and other gases, and all analogous materials, liquids, and devices was agreed upon by the nations rep-

resented there, including the United States, which introduced it. The Senate recommended ratification of that treaty without a single dissenting voice, and the United States ratified it in 1925. Unfortunately, the Washington Treaty never came into effect because it contained an article on an unrelated matter dealing with submarine warfare to which the French objected. A clause in the treaty required French ratification.

In 1925, there was a meeting in Geneva to discuss the worldwide sale of arms. The United States was represented at that meeting and asked the delegates if they would place on the agenda the question of gas warfare. It was the policy of the United States at that time to press for prohibition of gas warfare. The other nations supported our initiative, and the Geneva Protocol was born. It was signed by the United States and 37 other nations present. However, the Senate failed to approve the Geneva Protocol. It was debated but never came to a vote. The Senate debate on the Geneva Protocol was partly in secret and partly in public. The public part began with the reading of a letter from General Pershing, who wrote,

> I cannot think it possible that our country should fail to ratify the Protocol which includes this or a similar provision. Scientific research may discover gas so deadly that it will produce instant death. To sanction the use of gas in any form would be to open the way for the use of the most deadly gases and the possible poisoning of whole populations of non-combatant men, women and children. The contemplation of such a result is shocking to the senses. It is unthinkable that civilization should deliberately decide upon such a course.

General Pershing's letter was the only strong statement in favor of the Protocol. An effective lobby was organized at the time by the American Chemical Society, the Army Chemical Corps, the American Legion, and parts of the chemical industry. They opposed ratification of the Protocol, and it was referred back to the Foreign Relations Committee and never came out again. The supporters of the Protocol had been caught by surprise. Thinking it would pass through the Senate as easily as the Washington treaty four years earlier, they failed to do their homework and to organize public support. Subsequently, at the Geneva disarmament conferences in the 1930s, the matter came up again, and representatives of the United States and other nations agreed to a treaty covering a large

variety of weapons that prohibited the use of gas in war, specifically stating that tear gas was subject to the same prohibition as all other gases. The United States agreed to that stipulation in 1932. This treaty never came into force because the approach of World War II disrupted the meetings.

At the start of World War II, the French and British exchanged assurances with the Germans and Italians that gas would not be used and that the Geneva Protocol would be obeyed. And so it was. In all of the combat in World War II on land and on the sea, neither gas nor biological weapons were used at all in Europe. Gas is thought to have been used on several occasions by Japan against China before we entered the war. In essence, however, biological and chemical weapons were not used in that global conflict. Incidently, both the United States and Germany produced large quantities of tear gas weapons, but not even these were used.

In the middle 1950s, the United States budget for chemical and biological warfare research and development ran around ten million dollars a year, and our efforts were mainly directed at defense. In the late fifties a large increase began, an increase which in the course of the next five years multiplied the budget more than tenfold. The earlier emphasis on defense shifted to a new emphasis on employment of CB weapons. At the time of the changes, in 1959, Congressman Kastenmeir of Wisconsin introduced a joint House-Senate resolution stating that its sponsors did not oppose research and development, did not oppose expansion of the program, did not oppose readiness, but did feel that the United States should reaffirm her long-standing World War II policy of never using chemical or biological weapons, except in retaliation.

Unfortunately, I think foolishly, the Defense and State Departments at the time opposed the Kastenmeir resolution and in separate letters to Congress explained their reasons. The State Department letter of 1959 stated, "Similar declarations might apply with equal pertinency across the entire weapons spectrum, and no reason is conceived why biological and chemical weapons should be singled out for this distinction." The State Department was not perceiving the Geneva Protocol. At the time of the increase in the budget in the late 50s and early 60s, Army manuals added language to say that the United States was not a party to any treaty that

would prevent us from initiating the use of chemical and biological weapons, and new field manuals were issued emphasizing the offensive employment of gas and germ weapons. And then, as you know, nonlethal gas was used in Vietnam. When nonlethal gas was first used there, it caused a storm of questioning and criticism. At that time Secretary Rusk said that the expectation was that such gases would be used "only in riot-control-like situations," and "not in ordinary military operations." Indeed he may have expected that, but it's not what happened. As you have seen, gas is now used on a very large scale and is used in close support of ordinary, conventional lethal operations.

In 1966, the Hungarians introduced a resolution in the United Nations General Assembly calling upon all nations to observe the Geneva Protocol. The resolution was cast in rather harsh language. The United States at first opposed the resolution, but then the Hungarians indicated that they were willing to soften the language, and it became apparent that essentially all other members of the United Nations were in favor of the resolution. The United States ultimately voted for and even cosponsored the revised resolution. I'm glad to say that we did so.

In the course of the debate, however, our delegate Mr. Nabrit said (departing from the actual text of the Protocol),

> The Geneva Protocol of 1925 prohibits the use in war of asphyxiating and poisonous gas and other similar gases and liquids with equally deadly effects. It was framed to meet the horrors of poison gas warfare in the first World War and was intended to reduce suffering by prohibiting the use of poisonous gases such as mustard gas and phosgene, but it does not apply to all gases. It would be unreasonable to contend that any rule of international law prohibits the use in combat against an enemy for humanitarian purposes of agents that governments around the world commonly use to control riots by their own people.

I leave it to you to evaluate the accuracy and the wisdom of this statement.

Our policy at present is riddled with internal inconsistencies, and I might mention just a few. The first is, do we or do we not feel that the prohibition against gas and biological weapons of the Geneva Protocol is binding upon ourselves? The field manuals still say that we are not bound by any such treaty. The State Department, on De-

cember 22, 1967, on the contrary, stated, "We consider that the basic rule set forth in this document has been so widely accepted over a long period of time that it is now considered to form a part of customary international law." But Deputy Secretary of Defense, Cyrus Vance, on February 7, 1967, said to the Foreign Relations Committee, "We have consistently continued our *de facto* limitations on the use of chemical and biological weapons." This statement sounds as though it is merely a matter of present policy subject to change.

The question is, do we or do we not consider ourselves bound by the Geneva Protocol, which prohibits first use but does not prevent research, development, or retaliation? Another question that might be asked of the United States is, do we believe that the use of nonlethal gases in order to kill is covered by the Geneva Protocol? As I mentioned, Secretary Rusk said that the anticipation was that these weapons would be used only in riot-control situations. The facts are very different. Another question: The Defense Department stated before the Senate in 1967 that "it is clearly our policy not to initiate the use of lethal chemicals or lethal biologicals." I question why the Defense Department specifies *lethal* biologicals. Does this mean that it is not against our policy to initiate the use of so-called incapacitating germ weapons?

These are hard questions. The United States, of all nations, should be the first to wish that chemical and biological weapons not be legitimized and not come into general possession and use. These questions had better be answered soon. There's a possibility that better and more consistent answers will be forthcoming because a number of things are taking place on the international scene today with regard to chemical and biological weapons. Unfortunately, none of these has occurred at the initiative of the United States. It's a pity; all of these things could have been done by the United States. The General Assembly has asked Secretary General U Thant to prepare a study on chemical and biological weapons for the use of the Eighteen Nation Disarmament Committee at Geneva, and that study is now going on. The United States has a representative on the study, but the proposal did not come from us. The United Kingdom has proposed at the Eighteen Nation Disarmament Committee in Geneva a total ban on biological weap-

ons, including a prohibition against their use even in retaliation, and also a prohibition on their production.

What should the United States be doing in this area? It seems to me that we should be pressing for universal ratification of the Geneva Protocol; it should be resubmitted to the Senate for advice and consent as to its ratification. I think that the United States should clearly state that we do not intend to separate gases according to their types and kinds and that we are willing to refrain from using tear gas and anticrop chemicals in war. We should welcome the British proposal, and we should review our multimillion-dollar-a-year investment in chemical and biological warfare research, development, and procurement to make sure that whatever is done, is done in consonance with what should be the overriding objective, namely, to prevent the legitimization, proliferation, and use of these weapons.

What can scientists like ourselves do about this matter? Possibly a great deal. These are not the weapons upon which the deterrence of war rests. Reasoned argument in this area can have effects. I believe that even a relatively small amount of attention given to these matters by a few citizens can lead thoughtful officials and legislators to look into the matter. I believe that there's a good deal of room for careful study and papers. There is no careful study, of which I'm aware, on the history and legal status of nonlethal chemical and biological weapons in war. There's no careful paper of which I'm aware on the reasons why nonlethal gas warfare is a myth. The subject is interesting to the general public. Newspapers, radio, and television are generally receptive to anybody who wants to present responsible views on this subject. This is an area where scientists can be effective by learning facts and by expressing their views to officials, legislators, and to the public.

G. Alperovitz

The History of Atomic Diplomacy

I'm flattered to be here among scientists because I'm a historian, and historians always feel that somehow scientists have a closer regard for something we call truth than some of my historian friends have. But I'm not sure that's true. Nonetheless, it's good to be here.

I want to talk, though, as a historian, about the work of scientists, and therefore I feel free to comment on their search for truth and their attempt to discover what was really happening. I want to talk about it in perhaps the most dramatic setting of twentieth-century science—the production of the atomic bomb and the use of the atomic bomb. Now as a historian, I'd like to isolate only one aspect of that which is relevant to the discussions we are having tonight; a very narrow question, but I think a very deep one. It's this: if one regards what we take as the evidence of what men did at that time, on the one hand we have brilliant scientific work. Men were dedicated with extreme care to finding out the facts in their laboratories, to developing those facts, to testing out hypotheses, to making choices, to building upon choices, to doing the hard work to achieve the result; and finally, through that very difficult process that some call the scientific method (but we historians call simply the application of intelligence), there was in fact a discovery and a production of nuclear weapons.

What is an interesting fact for the historian is not this scientific event. Rather—and now I want to talk about the great majority of scientists (and I exclude particularly men like Neils Bohr, Leo Szilard, James Frank, Eugene Rabinowitch, and many others) involved in that day-to-day application of intelligence, who at the very same time were not involved in a careful estimation of precisely what the facts were in relation to the application of what they had done. These same men who diligently worked in their laboratories to find out precisely how to make the bomb had no diligence, the great majority of them, in finding out precisely what its use was to be; whether, in fact, it was as necessary as other secretaries of war and defense at that time said it was. These men were not careful when they listened to what were called statements, but in fact were hy-

potheses, arguing that it was necessary. They did not choose, but stood back, as to what their own view of the facts was and how they might respond to those facts, and made no effort to apply any diligence, intelligence, and systematic hard work to organizing themselves if they did make a decision against the use of the bomb. In this aspect of their lives they did quite the contrary of that which they did ten to twelve hours a day in their laboratories. These two modes of one life were so differentiated, one might almost use a word that I do not choose to use but only suggest: schizophrenia. We take that, too, as a historical fact.

There were some men, however, indeed some very great men, who attempted to apply sustained intelligence not only to the discovery of these weapons, but also to the question of whether these weapons were really necessary, and whether they should be used, and, if not, how one should stop them. I think that is why we remember people like Szilard, Bohr, Frank, and Rabinowitch. But the others did not. And it's a fact, a piece of evidence that is now 25 years old, that they did not.

So to consider now what the role of other scientists and other men is to be, perhaps it is important to consider how and why they did not in one part of their lives apply that which was the daily means of the other part of their lives. Let me be a little more precise. I am a historian of this period, and in the last four years there has been a great deal of information released from the government archives that was not available to outsiders, and much of it has been published recently. I want to talk about not only what the evidence of what was really happening in Washington was—what the "in" men did or didn't know—but also whether or not scientists could have found it out had they applied that kind of intelligence to the question of whether this weapon was necessary or should have been used.

There are a few facts to bear in mind. The atomic bomb was first dropped on the civilian population of Hiroshima on August 6, 1945. The common argument is that it was dropped in order to prevent a massive invasion that could have cost a million casualties. It's important to know that that massive invasion was scheduled for the Spring of 1946, eight months after the date on which the first bomb was dropped. There was also scheduled for November 1, 1945, a

minor landing on the island of Kyushu, which at most, the experts estimated, could have cost 31,000 casualties. There were three months—and this is the important fact—between the day Hiroshima was scheduled to be destroyed and that time in which possibly, and that word "possibly" is very important because the invasion date was a planning date and not a decision date, there might be a minor landing.

In the middle of June 1945, almost two months before the bomb was used, the Japanese Cabinet and the Emperor decided to seek peace by sending a special envoy, Prince Konoye, to ask Moscow to mediate and to end the war. The instructions to him were to seek peace and the only question was the technical formality of unconditional surrender. If that could be modified, as indeed it was in the final surrender (and as indeed the President at the time said was no problem), surrender could be accomplished easily. These facts, recorded in the cables, were known to the President of the United States and the Secretary of War and the Secretary of the Navy, by their own admission. You'll find that published even in the official documents of the Potsdam Conference, which indicates which documents the President subsequently reported seeing, and all of this is now available to the public.

The point is not whether the Japanese would in fact have surrendered as they said they would in these cables a month and a half before the bomb was used. That point is a very minimal point. There were at least three months, four in fact after the cables came in, but three after the date for Hiroshima, in which all of this could have been tested: the evidence suggests very powerfully that surrender could have been arranged. The evidence could have been tested, either with a demonstration, or with a modification of the unconditional surrender agreements, or even more easily, for all of the experts at the time argued that the fact that Soviet Russia was going to declare war (and did so on August 9), that shock, that new effect of all the powers united against Japan was, in the estimate of the intelligence community, almost certain to bring surrender long before not only the 1946 invasion but also the November 1945 landing.

Much of this has been written about, and many experts have studied it, and the conclusion is quite clear. I quote only from one of the most cautious and conservative of those who have studied the

situation. A man named Herbert Feis, who has had access to all of the official documents, concluded in 1961, and in a new book concludes again, "There cannot be a well grounded dissent from the conclusion reached as early as 1945 by members of the U.S. Strategic Bombing survey that certainly prior to 31 December 1945 and in all probability prior to one November 1945, Japan would have surrendered even if the bombs had not been dropped, even if Russia had not entered the war, and even if no invasion had been planned or contemplated." And of course, taking those last clauses out, Russia *did* enter the war, there *could* have been demonstrations, there *could* have been a modification in the surrender agreements, and assurances for the Emperor, which all confirm this estimate.

Now there are two interesting points about all of this. Many people of the highest stature in the government argued this view at the time, and second, those who cared to work very hard, who applied very great critical intelligence, who were not taken in by what it was that a particular military branch thought was right at that particular moment (men like Szilard, Bohr, and Frank) saw that this was in all probability the case well *before* Hiroshima. And many of you know the story of how they attempted to organize scientists, through petitions, through campaigns of letter writing, through the Frank report, through the Jeffries report, and through a number of other activities on the basis of their view, first, that in all probability the bomb wasn't necessary, and second, that there were very important questions relating to Soviet Russia that had to be solved before any bomb would be used. As Leo Szilard demonstrated, they also found ways—directly from the key officials—to confirm their view that the Japanese were likely to surrender without the use of the bomb. My point is not to review those details but to say that there were some who by their example suggest other examples for today, who did work hard, who did bend their time and efforts in this sphere of their work just as they had done in the laboratory.

Just to make it a little clearer and to suggest even more strongly that the judgment that the bomb was unnecessary is not just hindsight, I want to give you a little more evidence from people at the time. Surprisingly, I suppose, I start with a man many of you know to be not particularly peace-oriented in his point of view, General Curtis LeMay, who at least had a certain sense of honesty and di-

rectness about the issue. Shortly after the bomb was used, he was widely quoted (and there are good references on this in most of the sources) that even without the atomic bomb and Russian entry, Japan would have surrendered in two weeks. "The Atomic Bomb had nothing to do with the end of the war." A man perhaps slightly closer to the scene was the Assistant Secretary of War, John McCloy, who is speaking here about his discussions with the Secretary of the War: "I tried to tell Stimson to advise the Japanese that we had the bomb. I am absolutely convinced that had we said that they could keep the Emperor, together with the threat of the atomic bomb, they would have accepted and we would never have had to drop the bomb." Here is Admiral William D. Leahy, the McGeorge Bundy or the Henry Kissinger of the time, Chief of Staff to the President: "It is my opinion that the use of this barbarous weapon at Hiroshima and Nagasaki was of no material assistance in our war against Japan. The Japanese were already defeated and ready to surrender."

I'm not going to read all the various quotes to you, but I do want to conclude with one final one, because this man directly advised the highest authorities at the time. At this point, the quotation refers to a discussion with the Secretary of War as to what his view was and what he believed could be seen by all the nations. This is Dwight David Eisenhower in 1945:

During his recitation of the relevant facts, I had been conscious of a feeling of depression, and so I voiced to him my grave misgivings, first, on the basis of my belief that Japan was already defeated and that dropping the bomb was completely unnecessary, and secondly, because I thought that our country should avoid shocking world opinion by the use of a weapon whose employment was, I thought, no longer mandatory as a measure to save American lives. Sometime later the General was quoted as saying quite simply, "It wasn't necessary to hit them with that awful thing."

Again, these are facts that a historian can find, both about the hindsight evaluation and also about the views of men at the time who knew or felt that that particular application of science was not necessary—did not have to be used to destroy thousands of lives or maim thousands at Hiroshima; I won't go on. But again, my point is not about what in fact was happening: it's about how scientists chose to apply intelligence to finding out what was happening. If

you look carefully, and if you've been in Washington for any time, you know what was really happening in those much-documented discussions in the Capitol. In fact, while a few interested scientists were out talking to their friends in Chicago and a couple more in Los Alamos, organizing petitions, worrying about whether they were getting too far out of line or not, whether they were rocking the boat too much, while a few brave men made determined efforts to see the President, and tried to agitate to build strength and support in Washington, the response of the administration was "Well, let's form a committee to handle those guys." Which they did. Although these efforts have been greatly documented, in fact, that's about all that happened, and even the famous Frank report was never received by the Secretary of War, but handed to a secretary. The President didn't even know about its existence until many months after it had been written and long after Hiroshima had been destroyed. I say that rather harshly because there is no point in glamorizing what happened with those few scientists who were very great and who worked very hard to change things. Coming close only counts in horseshoes. And they did not achieve their goals; they did not stop the bombing, which was one of their objectives; they did not even succeed in getting a test demonstration in a non-populated area, although that too was an objective of some of them. They failed. Again, as a historian, that is a simple fact that we must face despite the great activity and the great honor of these men. They did not apply as much intelligence, as much energy, as much doubting of weak evidence that the bomb was needed, as much hard work on the question of how their work would be used as they did on the work to produce the bomb itself; and they failed.

Now it's not my contention that they would have succeeded had they tried harder, though we do know and I do feel that a strong stand by scientists has much greater impact than many feel, particularly at this great university. We do know that other scientists have stopped other developments, or slowed them down, and the record of what some scientists in Nazi Germany did at the time—and I do not mean to make the comparison directly—but nevertheless those men acted. (It's important to note, and I suppose it's ironic and a bit shameful, that most of the men who took the leadership in the American fight were not Americans; Bohr, Szilard, Rabin-

owitch, and Frank were Europeans.) But my point is not whether these men could have stopped that event, but simply that there were some men who tried to do so, and today we begin to see the echoes of that kind of work developing in the ABM fight and other fights of men who will not produce napalm, for instance. And there were some men who did not try to change things—then, and now.

I want to go a bit deeper into the issue about how at that time they applied their intelligence to the question of finding out whether their work would or would not be used for a good purpose. Oppenheimer was asked about this many times. And he was asked how he as a scientist could go along with that decision. Many times thereafter he expressed wavering doubts about it, sometimes yes, sometimes no, very often confused and in-between statements; the record is replete with them. But the best one, I suppose, for our purposes, is Oppenheimer's statement that "We didn't know beans about the military situation in Japan. We didn't know whether they could be caused to surrender by other means, or whether the invasion was really inevitable. But in the back of our minds was the notion that the invasion was inevitable, because we had been told that." My point here is that the certain aloofness, the disbelief until it is proven to be so that characterizes (for me) the best of the scientists' method, was not followed. Oppenheimer believed what was not the case because "he had been told that." And on that thin belief, Oppenheimer also asked other men not to go forward in their activities to stop the bombing or to have a test demonstration. Edward Teller has given us a sense of the way it was:

> Oppenheimer told me, in a polite and convincing way, that he thought it was improper for a scientist to use his prestige as a platform for political pronouncements. He conveyed to me in glowing terms the deep concern, thoroughness, and wisdom with which these questions were being handled in Washington. Our fate was in the hands of the best, the most conscientious men of our nation, and they had information that we did not possess. Oppenheimer's words lifted a great weight from my heart. I was happy to accept his word, and his authority. I did not circulate Szilard's petition. Today, I regret that I did not.

And then, twenty years later, "I was positive then, and I am positive now, that we made a mistake."

But this is all history, and it's the case of the other men, who did not, as I said, carry through the day-to-day work of the laboratory

and the method which I had thought, as a historian, would dominate their lives, but who did not carry that approach into the more critical question of whether their work was used for good or not. That is history, and what counts is the future. I'm a historian, so I can say nothing more about that than any of the rest of you. We have a right, however, to postulate some of the questions that are bound to come forward later about how men constituted themselves and how they acted in very similar kinds of situations. I'm sure future historians will look for the Bohrs, Szilards, Franks, and Rabinowitches, and they will ask whether part of their life was divorced from other parts of their life, whether they were used by men who told them that the "best" decisions were being made in Washington, whether in fact they believed what was being said about the necessity of the time, or whether they doubted that overwhelming necessity, as Hans Bethe doubts the ABM's necessity now, and whether, once they doubted, they found ways seriously to organize themselves, to present the information, and to organize the power that is the power of the scientist, which I think is very great, and whether they applied themselves to those tasks with as much intelligence and seriousness as they applied themselves to the laboratory.

We all know there will be excuses: "It's really not our business to get into policy," that "the work I'm doing is really not related to Defense" (although the Defense Department thinks so, and they pay for it), that "one man can't do much," that "the University should be free for research," that "we shouldn't rock the boat," and that "we should let others take it to the nation before we act." I think those *are* excuses, frankly. And the test again is whether what men do with their work is used as they would have it used. There is no way, in my view, to separate the question of what scientists do from how their output is used.

If I may be permitted one personal word, I think these are questions for all of us. And I can only record a discussion I had with a young graduate student the other night, a scientist, who was talking about this problem. We were trying to figure out what it was that kept the great majority, and today still keeps the great majority from action, from investigation, from changing, from doing. Steve Marcus said to me that mainly its some sort of insecurity that makes them frightened or competitive. It's something in the system that

they don't quite know how to handle, in which they don't really come to peace with themselves as men. I'm not sure that's true, although I'm sure it is something in the system that the great majority haven't found a way to change. But for Steve Marcus the answer was a very personal answer, and it was very simple. The way he found to reconcile his life in the laboratory with the use of what he produced was simply to refuse to do any work on military expenditures or defense work until it was proved absolutely necessary—not by somebody's say-so.

I suppose that his decision poses the most important question that each one of those scientists twenty-five years ago had to face, and each scientist must ask today.

Discussion

Question from the floor:
Will Professor Bethe reminisce for a few minutes on the period referred to by Dr. Alperovitz?
Bethe:
Dr. Alperovitz certainly speaks to our conscience, to the conscience of everyone who was present in making the atomic bomb. And I confess and admit that I was not among the enlightened people who thought of the consequences. One of the reasons was that we were far too busy, and while I tremendously admire the great men who did stand up and whom he mentioned, they did not themselves participate very much in the technical work immediately prior to the making of the bomb. So they were not busy. Now being too busy is of course a fault, and I apologize for it. It was probably the greatest race for time that I have ever seen. It kept us all permanently occupied.

I would, however, look at the problem in a different way. I also heard the words of Oppenheimer which Mr. Alperovitz mentioned, namely that very wise men in Washington made the decision. And in retrospect it is questionable whether they were all that wise. But I question very much whether even with the best of intentions and with the greatest of effort any of us scientists at that time could have known, could have found out about the situation as it was just now described to us. I have heard this description before, namely that Japan was essentially defeated, but this information was kept very secret and would not have been accessible to any of us. So all we could have done would be to try harder to get the ear of government. There is still another point: in those days the connection of science with government was very much less developed than it is now. It was very much more difficult to get access. I have no idea whether we could get that access now, but it certainly was enormously more difficult at the time.

For our excuse I want to say that almost immediately after the bombs were dropped, we did become aware, and I think we did achieve a few things, small as they were. We couldn't turn back the clock of history, but I think if the bombs did anything they certainly awakened many of the scientists. Scientific pressure made Atomic

Energy a civilian, not a military, agency. Later on there was another debate that was not as directly concerned with life and death, but in which certainly scientists did extend their efforts very far, and I know there are several people in this room who were engaged in this debate. This was the attempt of the scientists, particularly of the General Advisory Committee to the AEC, to prevent the crash development of thermonuclear weapons. By that time we had learned our lesson; by that time I think as intense an effort was made on making our opinions known to government as on actual development. But at that time we were no longer in the race that existed at the time of the atomic bomb development. As you know, the attempt to prevent the crash development of the hydrogen bomb failed, and our best efforts were not enough.

Question from the floor:

Drs. Bethe and Meselson, don't you think that it is the obligation of the scientist not only to express an opinion about the use of his research but also to act in some way concerning the possible use of his research?

Bethe:

I believe it would be entirely impossible to do this. And I don't know whether Dr. Alperovitz really said what the questioner put in his mouth, but if he did I deeply disagree with him. I think it is certainly impossible for a scientist to foresee the consequences of his invention with very few exceptions. I have seen many cases in military development when an invention that seemed initially to be destructive turned out afterward to be very favorable, and also the opposite. I would think the ABM is one case in point, which I illustrated sufficiently. It is often impossible to prove whether a weapon system is "good" or "bad" until you know what it is like. And so we just have to know; then we can see whether we like it or not. Furthermore, I think in a democracy it is not up to the scientist to decide. It is up to the scientists to say what they know, to give to the public all the information about the device that they have invented, to make it very clear in such cases as the atomic bomb, the hydrogen bomb, the ABM that in their opinion these are weapons that should not be used. Once we know the properties and capabilities of a weapon, I think it is our duty to tell these facts to the public. On the other hand, it is the duty of the people, through their elected representa-

tives and through their government, to decide whether they want or do not want this particular weapon.

Meselson:

I would like to emphasize a different answer to this question, although first of all let me say that I didn't say I was merely opposed to the use of chemical and biological weapons, I said that such research and development that *is* done should be done in order to achieve the overriding purpose of preventing their use. It may be decided in an individual case that it is necessary to have detection equipment, or it is necessary to be able to figure out what might be done. Those, I think, are very individual cases. The important thing is to establish a fundamental policy that can be used to decide what to do. But more important than that, it seems to me, is that the shield of secrecy that has traditionally been interposed between the public and matters of the public defense should be removed in large part. I don't think the secrecy is necessary in most cases. For example, on the question of the ABM, the secrecy has largely been removed, and I think now that a very valid question would be, do the American people, after hearing discussion about ABM, want it. That is, this is their defense which is being talked about. It is not proper for a small group of persons in government to arrogate to themselves the sole responsibility for deciding what course in history, specifically with respect to defense matters, the American people want to follow. I think that the approach that the scientist must take is that he cannot move only when he has absolute certainty. It is fairly impossible. I couldn't have come here tonight if I had had absolute certainty about all of the consequences of my coming. But what can he do? There are at least two things he can do. One is that if there is some area in which he can make a relatively careful investigation, and if he's so motivated, he should certainly do so. And the other is that he should, it seems to me, energetically speak up for, and work for, public consideration of these matters. It is not necessary to understand quantum mechanics to talk about nuclear deterrents, and yet I think it is not a wild overstatement to say that this country has for the last fifteen years labored under the impression that this is a subject that only experts could talk about. I don't think that's the case. Now the country realizes that it's not the case because, in the case of the ABM debates, there are experts on every

side of the question; and outside of government (that is, not in the currently most active parts of government), the majority of those seem to be saying that ABM would be a mistake. So I think that these are two things that scientists can do.

Question:

Dr. Alperovitz, why do you believe the United States made the decision to drop the bomb on Hiroshima and Nagasaki?

Alperovitz:

I wish I could do this as briefly as I would like. The evidence we now have is not absolutely conclusive. What it indicates is that there was a momentum of decision (which many commentators have noticed); a thrust was going forward, and it's usually argued that the reason that was so was because of some overriding military considerations to end the war quickly. If, however, you examine very closely which of the leading military people were arguing which positions, it turns out about like this: (I gave you General Lemay's quote.) General MacArthur was not asked, although he was the Supreme Commander—he later said many times the bomb was unnecessary, that the war would have ended without an invasion; I gave you Admiral Leahy; Admiral King felt the same way; General Marshall (that completes the Joint Chiefs except for General Arnold) felt that the Russian declaration of war was likely to end the war before the invasion, and so advised the President. Secretary of War Stimson advised the President that a change in surrender terms was likely to end the war, and General Arnold, of the Air Force, argued that the bomb was unnecessary to end the war. This is very important, because most historical treatments simply have not looked for the overriding military reasons that are supposed to have sustained the momentum. They just weren't there. There were people who felt we absolutely needed to use the bomb, but each of the critical military figures knew there were other ways to end the war, and everybody knew there were three months to test those ways, before there would be a landing, and seven months before the invasion.

If you begin to look deeply, it's true, I think, that there was a momentum, and what you look for is what sustained the momentum, why did the President not even consider, as Eisenhower considered, the arguments against the bomb? Why were they dismissed?

Why did he and the Secretary of State look the other way when the basic points were raised? The more one looks at that, it becomes clear that the overriding sustaining momentum, by June and July 1945 (but not in April and May—it was changing in a very complicated way), was a strong sense, as the Secretary of State told the President, that this bomb will allow us to "dictate our terms" to the Russians. Or as he put it to Secretary of War Stimson, "If we can have it in our pocket, we'll have a much stronger position." Or as Secretary of War Stimson later wrote, the diplomacy with Russia was being conducted "with this bomb rather ostentatiously on our hip" (is the way he put it). Now the evidence is not conclusive; but the strongest case I think can be built, which shows that the only way you can really explain why men either consciously or unconsciously ignored the evidence that the bomb was not needed, is a strong momentum that was not military, but largely diplomatic, to end the war *before the Russians got in*, and also so as to be in a much stronger diplomatic position, because the bomb would show its "master card" strength, as Stimson put it, in other negotiations.

Again, and I think many of the scientists have raised the question about Nagasaki, I think the only way you can understand why Nagasaki was tripped off, automatically, bing-bing, just like that, with no consideration, is this tremendous rush to end the war—*not* just to end the war before an invasion, which was a long way off, but *immediately*! In that context you can understand the one-two punch, very fast; otherwise we could have waited. And then you ask why so fast? We had three months before a landing and eight months before an invasion. What was the rush? Well, P. M. S. Blackett, another Nobel prize winner, saw in 1945 that the only way you could explain that immediate, fast one-two punch, was the fact that the Russians were in fact scheduled to enter the war on August 9. And it's in that context, to end the war, not just before an invasion, but bam, like that, that you explain Nagasaki on August 9.

List of Contributors

Gar Alperovitz is a historian at the Cambridge Institute. His experience as a legislative aid in Washington has led to his present interest in arms control and the development of atomic weapons.

Hans Bethe is Professor of Theoretical Physics at Cornell University. A Nobel Prize winner in 1967, he is an experienced author and analyst in the field of arms control.

George Brown is Congressman from the 29th District of California. In the Congress since 1963, he has been especially concerned with the problems of converting a military economy to a civilian one.

Noam Chomsky is Professor of Linguistics at MIT. He is widely regarded as the founder of the generative transformational approach to grammar and is an active critic of American society and government.

David Dayton is Executive Director, Technical Development Corporation, and President, Synergistic Technology Incorporated. His concern in these organizations has been to apply the resources of research and development to social needs.

Joel Feigenbaum, a graduate student in physics at Cornell, studied at MIT during the 1968–1969 academic year. He was one of the founders of SACC and an early proponent of March 4.

Bernard Feld is Professor of Physics at MIT. He specializes in nuclear physics and has served as Group Leader on the Manhattan Project. For some years he has been deeply involved in disarmament work.

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Jonathan Kabat is a graduate student in biology at MIT. He is one of the organizers of SACC and was active in the planning of the March 4 activities.

Sid Kolowsky is a graduate student in biology at MIT. He has been active in SACC affairs.

Francis Low has been consultant to the Atomic Energy Commission and specializes in theoretical atomic and nuclear physics. He is Professor of Physics at MIT.

Salvador Luria, a recent Nobel Prize winner in biology, has made several discoveries concerning mutation and the properties of viruses. He is Professor of Biology at MIT.

William McMillan is a staff member in the RAND Corporation Physics Department and Professor of Chemistry at UCLA. He has served the federal government in many capacities, most recently as Science Adviser to Generals Westmoreland and Abrams.

Eric Mann has been New England regional coordinator for the Students for a Democratic Society. Recently, he has been involved in several actions of the Weatherman faction of SDS.

Matthew Meselson, who has recently testified before the Senate Committee on Foreign Relations, is an expert on chemical and biological weapons. At Harvard, he is Professor of Molecular Biology.

Father Anthony Mullaney, one of the "Milwaukee 14," has been an outspoken opponent of the draft and U.S. military involvements. He is currently serving a prison term for his part in the Milwaukee incident.

Ronald Probstein is Professor of Mechanical Engineering at MIT. Recently, he has been applying his background in fluid mechanics to several social problems, including pollution and desalination.

Eugene Rabinowitch has been editor of the *Bulletin of Atomic Scientists* since its conception. He is Professor of Physics at the University of New York at Albany.

Ira Rubenzahl is a graduate student in theoretical physics at MIT. Active in SACC affairs, he was also involved in the planning for March 4.

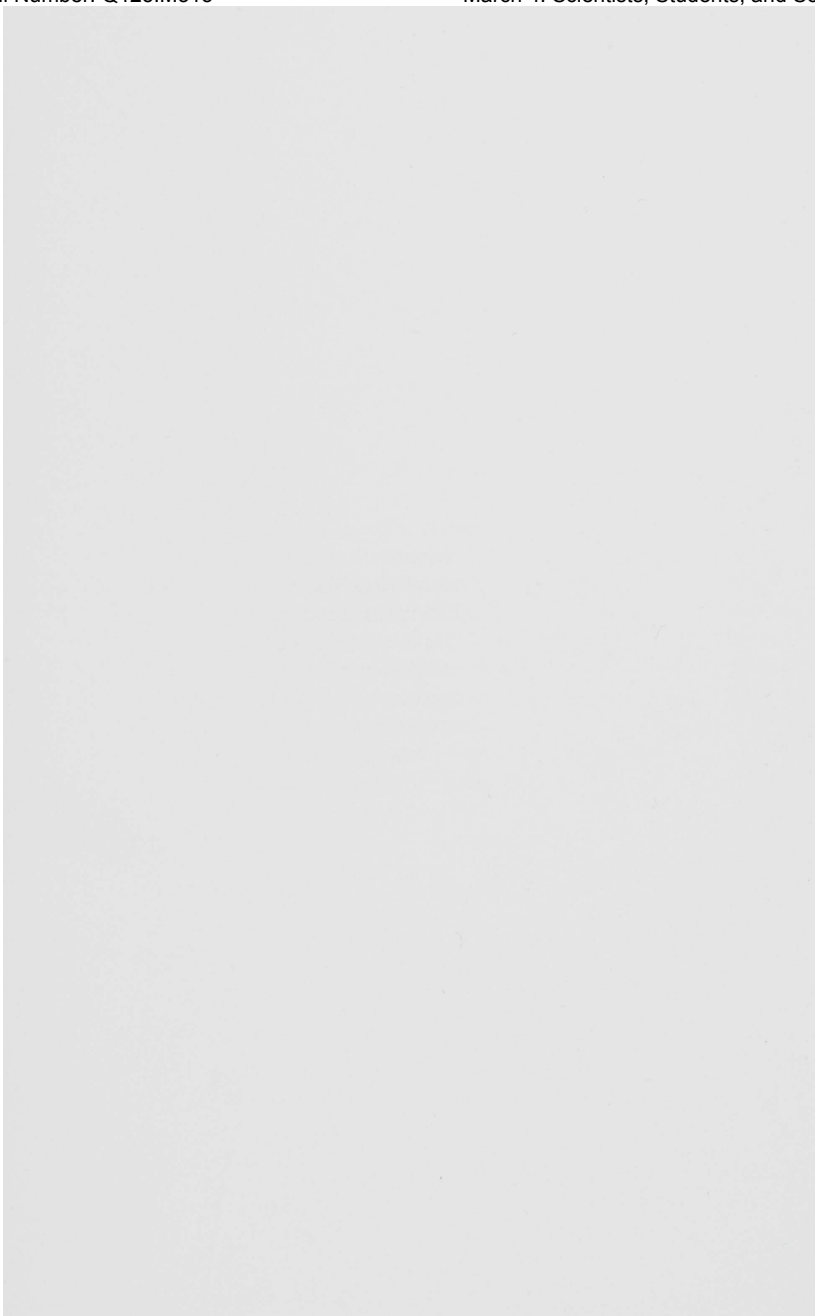
Thomas Schelling is Professor of Economics, Harvard University, where he is associated with the Center for International Affairs. He is the author of several books, the most recent of which have dealt with arms control.

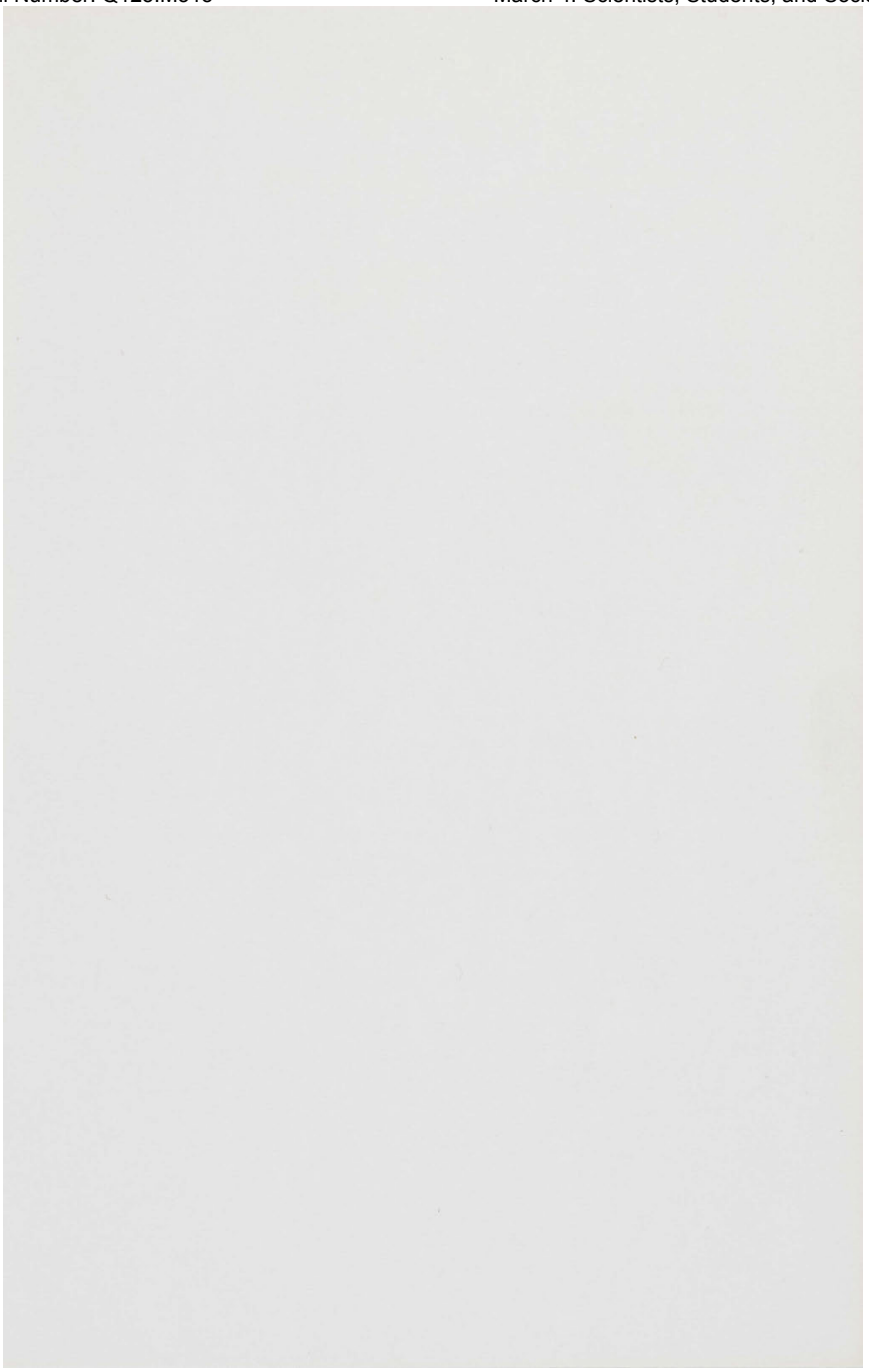
Franz Schurmann is Professor of Sociology and History at the University of California at Berkeley. He is a scholar on China and U.S. foreign policy and is active in the antiwar movement.

Leon Trilling is Professor of Aeronautics at MIT. His professional interests include gas dynamics, kinetic theory of gases, and gas surface interactions.

George Wald is Professor of Biology at Harvard and a Nobel Prize winner. Since March 4, he has devoted much of his time to problems of the military and society.

Victor Weisskopf is Chairman of the Physics Department at MIT. An authority in theoretical physics, he has also been Director of the CERN laboratory in Geneva.





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March 4: Scientists, Students, and Society
Allen, editor

A movement of scientists and students concerned about the misuse of science and the proper relation between science and society, beginning to a large extent at M.I.T. and spreading rapidly to other campuses, emerged as a public force, "March 4." Sponsored on the M.I.T. campus by the Union of Concerned Scientists, this was a *positive* protest and the time was used in intensive examination of alternatives.

It differed in other ways from many recent forms of protest. It was planned from the start as a joint effort between faculty and students. And the protestors — students and Nobel Laureates alike — set out to examine what could *actually* be done — done now or in reasonable time — by taking fully into account the reality and inertia that keep priorities out of balance in the present system.

The text of this book consists of an essentially unedited transcription of the talks and panel discussions presented at March 4, thus preserving the intellectual flavor of the event, with its air of spontaneous groping toward mutual understanding among various groups of participants.

The full text of George Wald's moving address, "A Generation in Search of a Future," is included. This address, largely extemporaneous, has already had a far-reaching impact in published form through reprints and extracts distributed by several newspapers and magazines. Its influence will be extended now that it is available in the permanence of book form.

Two other addresses are also available in the book: "Reconversion for What?" by Congressman George E. Brown, and "Protesting the Draft" by Father Mullaney.

The remainder of the book reports the deliberations — the agreements and the disagreements — of five panels. These take up in turn a number of large but definable problem areas: the responsibility of intellectuals; reconversion and nonmilitary research opportunities; the academic community and government; Science Action Coordinating Committee proposals for further action; and the questions of arms control, disarmament, and national security. These panels were manned by some of the sharpest critics of national policy and some of the most thoughtful students of the American scene to be found today. Among others, including several students, Eugene Rabinowitch, Victor F. Weisskopf, Noam Chomsky, Howard Zinn, Salvador Luria, Francis Low, Thomas Schelling, Franz Schurmann, Bernard Feld, Hans Bethe (speaking on the ABM), and Matthew Meselson (on biological and chemical weapons) served as members or chairmen of panels.

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