

THE TRANSFORMATION OF THE LEFT  
IN SCIENCE:  
Radical Associations in Britain in the 30's  
and the U.S.A. in the 60's

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For many reasons I believe as you do that science is entering a period of crisis graver than that of the fifth century [B.C.], which is accompanied, as then, by a moral crisis and a subservience to purely political values, in other words, to power.

Simone Weil, *Seventy Letters*

The criticism of religion is always, as Marx said, the condition for all progress; but what Marx and the Marxists have not clearly seen is that, in our day, everything that is most retrograde in the spirit of religion has taken refuge, above all, in science itself. A science like ours, essentially closed to the layman, and therefore to scientists themselves, because each is a layman outside his narrow specialism, is the proper theology of an ever increasingly bureaucratic society.

Simone Weil, *Oppression et Liberté*

**A**S AN HISTORIAN OF BIOLOGY involved the last four years at a large state university in the undergraduate education of non-science majors and of future high school science teachers, and currently engaged in specialist, premedical-oriented undergraduate and professional-graduate training at Johns

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Hopkins, I have developed strong opinions on the political nature of teaching about science. In particular, justifications for a heavy dose of science education for students *not* destined to become specialists reveal intriguing political beliefs and hopes. The fundamental rationale seems to rest on continuing belief in the distinction between pure and applied science, coupled with an effort to direct students' attention to large-scale science-related social problems, especially environmental ones. The popular propaganda for science continues to stress a special form of reason, scientific objectivity. Persons trained to think in a certain manner might become better citizens, better able to disentangle the issues and avoid unwarranted political turmoil in searching for practical solutions to immense difficulties. The liberal ideology surrounding population and energy issues supports this bias. The more the scientific mode of thought pervades the political arena, the better off we all will be. Despite continuing waves of revulsion against science—a familiar current in cultures marked by modern science—the ideal of its special brand of objectivity continues to fuel powerful educational and political ideologies.<sup>1</sup> Science education for responsible political behavior naturally does not encourage a radical activist approach to environmental, population, or armament issues. One can hear the great sighs of official and popular relief that the unsettling student revolts are over, from the Berkeley Free Speech Movement to the offensive theater at meetings of the American Association for the Advancement of Science. It is now time to write histories of the deviant protests of the sixties. The Indochina war is over, and economic problems hold center stage. Science, especially in pre-defined development projects, is again secure for all but a few romantics like Theodore Roszak or quaint gurus.<sup>2</sup> Even funding is less threatened; for example, the National Science Foundation budget is at an all-time high, although scientific unemployment and specialist training continue to be troubled areas.

I think it would be useful in this context to look at the nature of criticism of the scientific establishment in two recent periods, the thirties in Britain and the late sixties in the U.S., times which share many dimensions. The purpose of the comparison is to examine some of the implications of teaching about science and society in today's high schools and colleges. The question of the proper role of science in modern culture is so large that I would

like to restrict this paper to a glance at the opinions and organizations of dissident scientists themselves in periods of major world and national crises. The settings will be the British Association for the Advancement of Science from about 1930 to the World War and the American Association for the Advancement of Science from the recognition of the Indochina War to the rambunctious meetings in Philadelphia in 1971.

Both the BAAS and the AAAS share a loose structure linking together diverse fields and a great range of people with disparate political opinions. The organizations themselves are not loci of power in the modern state. That ambiguous role is reserved to the complicated scientific advisory apparatus which has taken on its current shape especially in the period after World War II.<sup>3</sup>

But the general scientific associations do represent science and the opinions of scientists to the public and to their own members. The associations serve to reinforce prevailing ideologies about science and its proper role in society. These ideologies are windows through which to view important power relations in the modern neo-capitalist state.

Gary Werskey of the Science Studies Unit in Edinburgh has examined the British leftist critics of established science in the thirties. He uses the term the Visible College, both to call attention to parallels with the Invisible College preceding the foundation of the Royal Society in London in the seventeenth century and to stress their common commitment to "knowledge which hath a tendency to use."<sup>4</sup> The British scientific left was made up of men like Joseph Needham, J. B. S. Haldane, J. D. Bernal, Lancelot Hogben, and C. H. Waddington: all workers of considerable fame in their own fields. The social origin of these Oxbridge dissidents was middle class; their opinions were greatly formed by the disasters of World War I and the consciousness of class divisions in twentieth-century British society. They addressed themselves to the proper place of scientific rationality and expertise in a troubled world mired in economic collapse and racing to war. Their Marxist viewpoint led them to a deep commitment to public scientific education and to rejection of the traditional distinction between pure and applied science. All knowledge, they agreed, no matter what the personal motives of a particular scientist, is conditioned by the concerns and especially the economic structure of the society which nurtures

the work. The way of asking questions, the particular problems which attract the mind, the possibilities for funding, and surely the social results of any body of theory all testify to the inextricable embedding of science in culture. Werskey calls his little band of radicals the Visible College to indicate their preoccupation with making science known, visible, to common people. A glance at titles of their books published before the war highlights the concern: Bernal's famous *The Social Function of Science*, Hogben's *Mathematics for the Million* and *Science for the Citizen*, Waddington's *Daily Worker* only hint at their prolific productions.

What did these leftists have to say about the social relations of science and how did they relate to the much larger group of British scientists represented by the BAAS, speaking through the pages of its magazine, *Nature*? The radical Marxists were, after all, a tiny minority among their scientific peers. The radicals were never organized in a tight structure; some could be found in the Labour Party, some among the Communists, some working through the Association of Scientific Workers. Despite a general trend toward the left, theirs was hardly a mass movement, any more than would be true for leftist scientists 30 years later in America.<sup>5</sup> Further, the members of the Visible College did not always agree on the political interpretation of science. But they did share key attitudes toward scientific rationality and the ideal relation of government (in a socialist state) to science. And these attitudes, termed for convenience Old Left viewpoints, are precisely the ones rejected by dissident scientists of the last decade, while ironically adopted by the utilitarian liberal establishment of Big Science-Big Government.<sup>6</sup>

Bernal, Waddington, Haldane, and their confrères believed fervently in science. Marxism told them that history too could be scientific. Political and social laws, to be sure, could not be reduced to physical, chemical, or biological ones; society and history were on a different dialectical level. But a blend of Darwinism and Marxism indicated the inevitability of progress, the historical nature of all things, and the material base of history. Scientific attitudes were proper for the age; and those who practiced this form of reason, scientific objectivity, as a profession were especially well prepared to plan the modern state for the benefit of humanity. Planning, centralized authority, the superiority of science over all other forms of knowledge were

not questioned. Quite the opposite; these were to be the aspects of science effectively used for the common good once the exploitative structure of capitalist society was replaced. A concrete expression of these leanings can be found in the reaction of British scientific leftists to developments in the Soviet Union and to the Soviet delegation to the International Congress of the History of Science and Technology held in London in 1931.<sup>7</sup> The British were much impressed by the Russians' description of the union of research and development, the large place given to scientific research in the Five Year Plan, and the union of theory and practice in the rejection of the illusory split between pure and applied science. Vavilov impressed the English with his tremendous collections of seedlings gleaned from all over the world to underlie great strides in Soviet agriculture. The tragic ironies of all this would not be evident for some years.<sup>8</sup> Waddington's *The Scientific Attitude* and Bernal's *The Social Function of Science* were both the most explicit and the most influential tracts pointing to the promise of scientific reason in a socialist state, or more generally, for Waddington, in a well-run liberal state based on devotion to the greatest good for the greatest number, quantitatively determined of course.

But for better or worse, the actual place of science and its practitioners, especially the biologists, in Britain fell short of this ideal. British scientists were outsiders in politics and the state. They fit neatly neither into the traditional critical intelligentsia, nor into political parties whether Labour or Conservative, nor into the reaches of government. This description fits the liberals of the BAAS as well as its radicals. It is precisely the powerlessness of British scientists coupled with the ideology of the great benefits to be expected from a larger visible role of science in society that formed the ground for a united front of liberal and radicals in the late thirties, the so-called Science and Society Movement. In 1938, following a complicated series of debates and in response to criticism from within itself, the BAAS formed a Division for the Social and International Relations of Science for the purpose of *discussing* the issues. Its goal was not to form a coherent political program for science nor to agitate openly. But for all its modest charge, the Division symbolized the common cause of scientists in seeking a larger role for themselves within government. Faced with chronic modest status within British society and troubled by widespread under-funding and

unemployment throughout the thirties, scientists could agree on the arguments for greater coordination of planning and development with their research. Imminence of war accelerated the integration of scientists into state planning; in this sphere the benefits offered by the technical elite were all too obvious then as now. The rationalist utilitarianism of the Old Left and of Liberalism was a strong glue. By the time the scientific liberal-radical front broke up after the war in renewed serious disagreement on specific issues, the social position of science was forever changed. All that is symbolized by the bomb and the organization which produced it meant that science could never again pretend to innocence, and its practitioners would be constant subordinant presences in councils of power. Even if they disagreed with decisions of governments, as they often would, scientists would by their presence lend a certain prestige to the growth of planning and centralized technocratic authority. Opposing the BAAS Division and the Science and Society Movement, Michael Polanyi's Society for Freedom in Science—which stressed the legitimacy of the ideal of pure research on the basis of the transcendent values of service, search for truth, and mutual criticism within the scientific community—would seem poignantly anachronistic in the post-war world.<sup>9</sup> The movement from “outsider” to “insider” politics of science would condition future reflection on the role of science in the good society.<sup>10</sup>

In summary, the dissident scientists of the thirties developed a critique of the place of science that was congruent with confidence in large scale planning, objective rationality, and an expanded role of experts in political questions. That they also had socialist visions, hoping for fundamental transformation of social structures, has turned out to be less important than their adherence to an underlying utilitarian and rationalist political ethic and an associated theory of knowledge.

It is a considerable leap from pre-war Britain to the recent past of the United States; there is danger that comparisons will be facile. But drawing parallels is tempting, and it might well be instructive in our own working out of the political nature of science and its pedagogy. It is worth risking a false analogy, and the story of the New Left scientific critics is interesting in its own right. The obvious parallels include economic crisis and unpopular war (World War I), rise of new hopes and fears from

science, especially biology, and the resurgence of a vocal leftist minority within the sciences as well as other areas of society. The analogy between the sixties and the period between the two wars is most often made between Germany and the United States, the so-called Weimar analogy, with obvious intent to point out signs of the rise of fascism, the ambiguous rich explosion of intellectual and cultural creativity in a decadent context, and the spiritual affinity of the Indochina War with the crimes of the Nazis. But let us redirect the analogy to Britain and the U.S. and to their scientific associations responding to crisis.

Since its founding in 1848, the AAAS like its model the BAAS has been a loose association of scientists whose major common activity has been an annual meeting, supplemented after 1900 by the publication of an official journal, *Science*. In reflecting in 1971 on the threatened “demise” of science in America—that is, lowered funding, more outside controls, and public unpopularity—Arnold Thackray sketched the evolution of the association within the changing context of U. S. science.<sup>11</sup> The early period was the heyday of elegant amateurs in whose hands was established the tradition of oligarchic decision making in whatever matters caused science and government to interact.<sup>12</sup> The latter years of the nineteenth century witnessed the professionalization of science in America as in Europe, and the establishment of numerous specialist societies splintering off from the AAAS. The special societies, such as the American Chemical Society, have been much more relevant to scientists’ research than the general parent body. The “elegant amateurs” were replaced in the leading areas of American science by professionals and specialists of different social class and political expectations. Like its British counterpart, and unlike French and German models, the AAAS had been founded in a cultural context of individualism, localism, pluralism, and laissez-faire ideology. The poorer professionals inherited from their predecessors the ideal of “freedom of research,” i.e., the avoidance of explicit, organized involvement in politics, and the continuation of the easy pattern of oligarchic decision making when government and science needed each other.<sup>13</sup> The post World War II period has seen the rise of dominant dukes; in Thackray’s terminology: skilled and ambitious scientific entrepreneurs very much involved in science politics and Big

Science-Big Government. We have seen that Werskey analysed the parallel evolution in Britain as the transformation from outsider to insider politics.

The AAAS has had to respond to these general changes in the structure of the scientific community and its relation to government.<sup>14</sup> By the middle of the twentieth century it was abundantly clear that the individual specialist societies were taking on the function of advancing research and communicating its results. The focus of the AAAS was then to be on science and society, on promotion and interpretation of science to the larger world of culture and politics. A statement made its way out of policy meetings held at Arden House in 1951 which emphasized that the AAAS should concentrate on tasks of interest to more than one discipline and to society as a whole. Around 1954, the AAAS, never a hurried body, began implementing some of the Arden House concepts, for example, initiating new programs in science education, launching the News and Comment section of *Science* magazine, and later (1962) bringing in Phillip Abelson as an administratively competent and scientifically sophisticated editor.

The structure of the AAAS has been extremely unwieldy. In the early 1970's it had around 300 loosely affiliated societies and some 133,000 individual members. More than half of these people were in academics and approximately one quarter in industry. Biomedical areas have been emphasized in meetings and biomedical personnel have shown up more frequently on governing boards, in part because biologists never formed a single powerful discipline-wide organization, but split into many bodies, such as the Society for Developmental Biology, Cell Biology, Marine Biology, etc., and thus had more organization votes. The Council has been the nominal governing board, a group meeting once a year and made up of more than 500 individuals elected by every little body affiliating with the AAAS. The Board of Trustees, which selected its own replacements by itself, tended more to control things. But the permanent staff and especially the executive officer have really handled most policy matters. Planning for the annual meeting has not tended to be very coherent; and as is obvious from the above, until very recently the decision-making structure of the motley AAAS has been anything but democratic. An elite within the disorganized group really controlled things; little was at stake in any case. The



transformation of the AAAS in the last few years takes us into the story of leftist dissidents within science.

Any discussion of the left in science in the U. S. must begin with a keen appreciation of the influence of the Indochina War on the perception of the science-society relationship. Although considerable public and scientific response to the threat of nuclear war and questions of control of The Bomb had long been part of the political world, there was no pervasive, grass roots resistance to the use of scientific expertise by the military and other branches of government until the Vietnam conflict hit the American consciousness. From roughly 1966 on, even a superficial perusal of the pages of *Science* shows a steadily increasing gradient of concern with chemical and biological warfare, with Fort Detrick, the place of the Institute for Defense Analysis on major U. S. campuses, with herbicide use and coverup reports by the military and its hired analysis agencies, with military recruiting on campus, with security black lists of scientific personnel proposed for National Institutes of Health advisory committees, with classified research at the major scientific institutions in the country, with plans to deploy the ABM and MIRV, and so on. The pre-Watergate litany is familiar. It did not take a Marxist political analysis for scientists eventually to join the general intellectual disaffection from the war policy. Recognition of the war exposed the questionableness of a great many aspects of American science which had once seemed perfectly proper to the vast majority of World War II-raised scientists in and out of the scientific advisory apparatus.

In addition to noticing the war, the public somehow became conscious that the environment was in trouble. It even became generally clear that race, sex, and sexual-preference biases affected the structure of society, including the bastion of rationality and resistance to prejudice, science. Of course, it was not accidental that these issues came to the fore; and the agitation of radicals prior to the vaccination of the body politic with an attenuated strain of their critique is a concern of this paper.

Fundamental to the development of the new scientific left has been its often implicit incorporation of the thinking of the chief contemporary critics of the ideology of scientific rationality: Herbert Marcuse, Jürgen Habermas, and later, Theodore Roszak.<sup>15</sup> It would be useful to summarize briefly the main points and political implications of these three thinkers. Marcuse

emphasized the hidden political content of technical reason. He analyzed a form of thought extolled as apolitical and indeed used as a justification for urging and charting "the end of ideology" just a few years ago. From the Freudian left, Marcuse pointed to the expansion of personal and international domination and oppression in the guise of technical rationality.<sup>16</sup> He traced the root cause to the loss of all subjective content in the idea of nature. Through science, nature became simply an object properly subject to ever expanding technical control. In fact, knowledge itself came to be equated with a particular kind of rationality which logically resulted in domination of self, nature, and others.

Habermas considered Marcuse's critique obscure and went on to sharpen the criticism of science as apolitical objective knowledge. He argued that the old class antagonisms stressed by traditional Marxists were insufficient to expose the problem of knowledge and technical rationality. The Old Left analysis of science and society, such as that of Bernal and Waddington, was badly deficient. Habermas stressed the fact that modern, mass, advanced capitalist society, with sophisticated techniques of control, manages the population through concealing "differences between progress in systems of purposive-rational action and emancipatory transformations of the institutional framework. . . . Publicly administered definitions extend to *what* we want for our lives, but not to *how* we would like to live if we could find out, with regard to attainable potentials, how we *could* live."<sup>17</sup> Waddington's vision of a scientific utopia managed by those who are best prepared to understand the laws of history because they understand the laws of nature makes little sense in this context.

Finally, Roszak makes the logical next point: knowledge is wider and deeper than science. He argues that higher knowledge restores a sense of mystery and subjectivity. We have been led from wisdom by those who have told us that information is the highest form of rationality. Plato knew better, and so should we. These opinions on the nature and place of scientific rationality and its associated ideology of objectivity clarify the political alternatives in terms of a choice of a philosophy of knowledge. The narrowly rationalist utilitarian approach is compatible with advanced capitalist forms of political advantage and exploitation, masked as technical progress. The Marcuse,

Habermas, and Roszak critique points to a society more anarchist than capitalist, which values a sense of nature, mystery, and subjectivity.

All of this has become part of the popular wisdom; its power has been drained by the usual means of appropriating the crust of criticism and annihilating the core. But in the lively years of the late sixties the criticism of scientific objectivity was a powerful backdrop to the life of the scientific left.

To return to a more mundane analysis, what were the dissident groups within science in the late sixties and the early seventies and how did they relate to the protean AAAS? Let us begin with the liberal camp wedded to political forms such as lobbying, educational propaganda in the form of scientist speaking responsibly to layperson, and electoral politics. These groups are heirs of the old British Science and Society Movement's Division for the Social and International Relations of Science after the advent of science advisory, insider politics. The prototype is the Federation of Atomic Scientists organized by those who opposed the May-Johnson Bill's approach to control of the atom. Its tactics were Congressional lobbying and education of the public. It was resurrected in 1969 as the Federation of American Scientists, this time directed against military and Congressional misuse of science, such as the ABM and the SST. More recently it has worried about political control of science funding and research in conflicts between the National Institutes of Health and the Department of Health, Education, and Welfare.<sup>18</sup>

In 1962 the Council for a Livable World was founded by the nuclear physicist, Leo Szilard, to organize political support for candidates supporting general disarmament. The membership of both the CLW and FAS is replete with scientists from elite research centers such as MIT. These groups do not fundamentally challenge the ideology of scientific rationality, nor do they develop any socialist vision of the ideal role of science in society. Theirs is more an effort to reform obvious abuses while keeping the federal money flowing into science as now practiced. The Society for Social Responsibility in Science, founded in 1949, differs from FAS and CLW in that it is international. Its concern with the impact of science on the quality of human life is again interpreted in educational terms, resulting in symposia on the moral responsibility of the scientist.

The formation of two other groups, however, points out key

differences between old and new left approaches to the relation of science to society, as well as the enduring distinction between liberals and radicals on the question. Here we are returned to the suggested parallels and contrasts with the earlier British situation. The two groups grew out of the events of March 4, 1969, centered largely on the campus of the Massachusetts Institute of Technology, although around thirty campuses had some action on March 4. The context was specifically the role of science in the Vietnam War. Originally a group of physics graduate students at MIT—including Joel Feigenbaum, Alan Chodos, and Ira Rubenzahl—met to discuss a research strike to focus attention on the dangerous misuse of scientific and technical knowledge.<sup>19</sup> The idea spread to the faculty and to other departments, including such figures as Noam Chomsky and Victor Weisskopf. A joint student and faculty group soon broke into separate organizations which issued separate statements, both focusing on the same substantive criticism of the misuse of science. The faculty evolved into the Union of Concerned Scientists, the students into the Science Action Co-ordinating Committee. The original anti-war focus broadened to include general issues such as social and environmental problems and the inappropriate ethical neutrality of scientists and engineers. Students wanted to stress a research *strike*; faculty preferred the moderate term *stoppage*. The difference in approach between students and faculty did not seem large until after March 4 when tactics in relation to the individual researcher who wished to continue to work on defense-related matters became critical; the difference turned on the old pivot of freedom of research and the radical-symbolic-outsider *versus* establishment-reformist-insider politics. A specific issue was a pledge not to participate in war research or weapons production. The UCS tended not to see any merit in such symbolic gestures and turned its attention to lobbying and insider politics.

The 1970 anniversary observance of March 4 was totally a faculty production with little advance organization or notification. The antagonism over very large military contracts held by special labs at MIT, whether to honor current contracts, coupled with the pledge, had split the faculty-student coalition. The SACC largely joined with the SDS splinter group, the Rosa Luxembourg Students for a Democratic Society, to organize

demonstrations against MIRV research at MIT. While faculty liberals (excepting staunch types like Chomsky) were arguing that an institution such as MIT could not break military contracts unilaterally and were trying to forge a national scientific constituency and conduct effective lobbying, the students adopted outsider, symbolic political action. They argued that the stress on the individual responsibility of the scientist was a liberal dodge of MIT's institutional and structural involvement. The issue here is not whether the faculty or student approach was more effective in eliminating offensive research, but rather the vision of politics and the science-society relation. Considering "symbolic" protest as less practical and therefore less real is a good illustration of reductionism—judging meaning only by technical efficiency. Meaning need not be more powerful only when cast into efficient forms. The new critics directed their attention to the structure of the scientific community in its relation to government and were horrified; their Old Left predecessors would have been encouraged, had the government only been socialist. A key source of corruption was provided by the multiple roles scientists played in the Scientific Establishment—government advisor, distributor of funds to other scientists, public educator, lobbyist, and even sometimes researcher. Thus, behind the "individual responsibility" rhetoric of groups like the Union of Concerned Scientists, the Scientific Establishment was in reality tied to status quo politics, secrecy in advising, and Big Government-Big Science. Or so the radicals argued.

Another radical group entered the scene at this point, one which absorbed the more activist, leftist elements of the student group in Cambridge and elsewhere, and one which best illustrates the difference between the new left scientific critics and the old guard leftists like Haldane and Bernal. Scientists and Engineers for Social and Political Action (SESPA) grew out of the failure of the approaches of groups like UCS in the physics community to persuade the professional scientific societies to take overt political stands on the Vietnam War. The founders of SESPA were largely physicists; they began organizing in early 1969, and by late 1969 the magazine *Science for the People* began to appear bimonthly. Membership came to include many biologists and engineers. It is from the magazine and from the

actions of SESPA and Science for the People groups at AAAS conventions and elsewhere that one learns of the political and philosophical implications of their science-society analysis.<sup>20</sup>

*Science for the People* (SftP) reveals an organization whose ideology is replete with participatory democracy, feminism, and New Left Marxism. It is directed to scientific workers and rejects the pure/applied distinction in favor of the ideology of the union of theory and practice. There is no central line in SESPA—its structure virtually precludes one—but it is possible to establish its distinguishing marks. It grew from almost exclusive anti-war concern to a general criticism of science in advanced capitalism. For example, recent issues reflect concern with developing a radical critique of the Green Revolution, the Limits to Growth hypothesis, and population-control propaganda; organizing technicians and other non-elite groups in science; replacing sexist health care for women; and defining SESPA's ideology and directions through the seventies. The recurrent themes are opposition to elitism, militarism, sexism, racism, and imperialism defined concretely in a particular magazine issue by reference to specific issues. The overall opposition to evil and to the withdrawal from insider politics would surely distress a Bernal. SESPA itself is a loose coalition of chapters, defined as three or more people meeting together around a project (to distinguish it from prayer!). It shares the general ideology that science will inevitably be put to evil use by big governments or corporations, that scientific work in a system which excludes the "people" from setting research priorities is unacceptable, and that political solutions to social problems are more meaningful than technical ones. The Marxist content is expressed by the objective to make the organization into "an anti-imperialist socialist organization based on a class analysis of all workers but especially scientific workers . . . [with] the eventual aim . . . to develop discipline and accountability of chapters."<sup>21</sup> Projects of affiliated chapters range from actions at the National Science Teachers Association meetings, organized by the Boston SESPA Science Teaching Group, to building a solar pump for the DRV, to opposition to XYY chromosome screening of newborns as a way of blaming social determinants of aggression on biological causes.

Some activists in SESPA have also achieved considerable distinction in their research. Their reactions to their success, in particular to their role in the National Academy of Sciences, summarizes the science-society critique of today's radicals in

contrast to that of their predecessors. Richard Lewontin of the University of Chicago, elected to the NAS in 1968, resigned in protest in 1971 when the Academy refused to pass a motion designed to end its projects involving classified work for the military. James Shapiro, a young researcher who was fast reaching the top levels of the highly competitive molecular biology community, quit research altogether in 1970 in favor of full time political activism in SESPAs, citing as his reasons the points listed above as defining the organization's ideology.<sup>22</sup> John Beckwith—who with Shapiro and Lawrence Eron had issued the November, 1969, warning about likely misuse of their isolation of a pure gene—remained in research but has been a pointed critic from the point of view of Science for the People.<sup>23</sup> Finally in 1974 Richard Levins, Science for the People activist and population geneticist, refused election to the National Academy of Sciences, citing the lack of success of such people as Lewontin in altering its involvement in military research. Levins pointed out that the NAS through its research arm, the National Research Council, was quite literally carrying out its correct mission, stated clearly in its original Congressional mandate of 1863 to give advice to the government. Replacing the president of NAS, Phillip Handler, with a more liberal sort would accomplish nothing fundamental.

There is the elitist myth that history is made by the important people who are in the know, which happens to include us, which makes the loss of credibility with the powerful people a terrifying prospect. . . . And there is the acceptance of the pervasive ideology which has been so much a part of our own careers—the separation of thinking and feeling which makes strong commitment suspect; the faith in technique which sees problems as yielding best to well-financed expertise; the individualism which avoids any collective action as an abdication of self; and what C. Wright Mills labeled 'crackpot realism,' an overwhelming preoccupation with short-term feasibility that produces acceptance of the present as necessary. In short, NAS concentrates and imposes the worst features of American academic ideology.<sup>24</sup>

Comparison with *The Social Function of Science* or *The Scientific Attitude* reveals a basic change by leftists in the perception of the nature of scientific rationality, in spite of much else they continue to share.

It was at the AAAS meetings around Christmas in Boston in 1969, Chicago in 1970, and in Philadelphia in 1971 that public attention through the mass media was focused on the new critics

in science. Groups and individuals congenial to the approach of Science for the People chose the AAAS for their attention, not because they thought that their actions there would in Levins' words have much "short term feasibility," but because the AAAS is a *symbol*. There was no liberal-radical front in the AAAS corresponding to the tenuous one in the BAAS of the thirties. Rather, separation over the proper character of political action, based on fundamental disagreement over the nature of scientific rationality, made a liberal-radical coalition unlikely. In significant respects the New Left science critics had left behind the utilitarian, rationalist ethic liberals and radicals used to share.

The contrast was especially vivid since these were the very meetings in which the AAAS showed its new, socially relevant face.<sup>25</sup> Many sessions centered on problems of the defense establishment in science, the need for an AAAS evaluation of the defoliation issue in Vietnam, crisis in the environment, how science might better serve human needs, and so on. The AAAS even restructured itself in response to internal criticism, producing the democratized constitution put into effect in 1973. Why were the radicals not happy? Why did they bring their theater to Boston, Chicago, and Philadelphia? They were not happy because they did not share the same fundamental model of the relation of science to society. They parted company with liberals over "freedom in research," and over the nature of science education of the public. While the AAAS reflected the model of scientist educating layperson so he/she could make more informed political choices—an individualist, pluralist framework—the radicals were organizing activist workshops and talking about scientific workers and seeking direction *from* the people, however oddly defined.<sup>26</sup> The actions of the dissenters in all three years reflected their commitment to symbol and meaning: They offered Edward Teller of nuclear fame the Dr. Strange-love Award; indicted Glen Seaborg of the Atomic Energy Commission for using science for the benefit of corporate America; gave William P. Bundy, who had been State Department Assistant Secretary in Charge of East Asian Affairs during the Vietnam escalation, a very hard time; and insisted on referring to the AAAS as the AAA\$. In 1970 the Women's International Terrorist Conspiracy from Hell (WITCHES) put a hex on the AAAS meetings which ironically unified Roszak's plea for mystery, Marxist attention to the niceties of science and society, and



feminist critique of the exclusion of women from just about everything except the family: "Science and Technology. We declare its use a sham. And subject all who use it ill to the witches' damn."<sup>27</sup>

But one must not take the liberal-radical incompatibility too far. The reforms within the AAAS reflect some interesting responsiveness, albeit in limited ways, where the goals of the radicals do not fundamentally threaten the utilitarian, rationalist ethic. It is clear that many forms of equality and democratization ideologies do not threaten, but reinforce, that ethic. The AAAS response to science's racism and sexism reveals such a juncture. In 1968 a Committee on Minorities was appointed by the Board to study ways to improve minority students' education in science. Blacks had had their own separate organization in science since the mid-sixties. The Committee on Minorities reported that the problem in AAAS was as much a result of the oligarchic, closed structure of elite leadership in science, including the AAAS, as of specific educational issues. They recommended formation of a Youth Council to work to broaden the base of decision making in the association. In 1970 the Youth Council suggested sweeping changes in the AAAS, a major step in leading to adoption of the democratized constitution in 1973. (For example, the membership now elects the Board, and the Council has been cut down to manageable size and its constituency restructured to better reflect the make-up of AAAS—not exactly a world revolution, but useful.) The old Board nervously eliminated the Youth Council after it made its report; but its members largely went on to other AAAS committees, bringing their experience in eliciting change in bureaucracies with them. Before it disbanded, however, the Youth Council was party to another reform move in the association.

The Women's Caucus formed at the Philadelphia meetings in 1971, largely as a result of the work of Mary Clutter and Virginia Walbot from Yale. The Caucus drafted a resolution asking the Board to establish an office in the AAAS with money, staff, and programs to study and take action on the provision of opportunities in science for women. The Board responded by appointing an ad hoc committee, chaired by the AAAS president-elect Mina Rees, which met in February. Meanwhile, as its last action before dissolving, the nearly dead Committee on Minorities followed the Women's Caucus model by requesting a

staff, office, money, and programs to replace the structure of volunteerism which had prevailed in furthering minority employment and education. The Youth Council endorsed both women's and minorities' resolutions. The result was creation of a rather effective Office for Opportunities in Science headed by AAAS' Janet Brown with an office in Washington, D.C.

It is simplistic to identify radicals simply by adoption of outsider, symbolic politics and by rejection of the ideology of objectivity and the consequent privileged place for science in society. Dissent in science has been complex and nuanced, and reform has occupied much humane energy in the last decade. But it is significant that the issues which permit a liberal-radical coalition and the resulting creation of formal, respectable structures for ensuring effective action are those which continue to reinforce the utilitarian, rationalist ethic in the guise of an ideology of equality.

What, then, are the implications of all this for teaching science? First, it seems clear that movements for serious political change in science must be and have been based on fundamental philosophies of knowledge—beliefs about the nature of *thought*, especially scientific objectivity and its relation to culture. It is misleading to allow students to believe that scientific reason is objective in the sense of inherently apolitical. No thought is privileged in that sense; and politics begins with the adoption of a theory of knowledge and a related system of ethics. The justification for much science education in America has rested on the model that scientific thought is privileged and that exposure to it will make better citizens. Clearly the model is appropriate only if we do not acknowledge the “difference between progress in systems of purposive-rational action and emancipatory transformations of the institutional framework, between technical and practical problems,” in Habermas' words. We have seen how the British leftists analyzed the relation between science and society in terms of their utilitarian, rationalist notion of science, history, and politics and how their critique led them to technocratic utopian socialist visions. Reflecting on the example of Science for the People, we have seen how for many New Left scientist critics—who also adopt a Marxist view of the union of theory and practice and the economic base of systems of knowledge—development of anarchist, feminist, and Freudian leftist critiques of the organization of technical rationality has led

to very different political organization. We must not let the utter powerlessness of dissidents in the short range in advanced capitalist conditions deter us from learning from them about the political implications of our particular way of teaching about scientific thought.

## NOTES

1. See R. M. Young, 1971, "Evolutionary biology and ideology: then and now," in *The Biological Revolution*, Watson Fuller (ed.), (N. Y.: Doubleday), for a bibliography on the ideology of objectivity.
2. See the Summer, 1974 issue of *Daedalus*, entitled *Science and Its Public: The Changing Relationship*, for a range of perceptions of the contemporary context of American science.
3. For a sketch of the genesis of the presidential science advisory bodies and the U. S. National Science Foundation, see Detley W. Bronk, 1974, "Science advice in the White House," *Science* 186: 116–21. For debate about the form current science policy advice should take on the national level, see E. B. Skolnikoff and H. Brooks, 1975, "Science advice in the White House? Continuation of a debate," *Science* 187: 35–41. The major point to be gleaned from the discussion of national science policy is that technical and scientific expertise is unquestionably part of the management ideology of the post-world war order.
4. P. G. Werskey, 1971, "British Scientists and 'insider' politics, 1931–1945," *Science Studies* I: 67–84. Additional material is drawn from Werskey's dissertation, *The Visible College: A Study of Socialist Scientists in Britain*, Harvard, 1972.
5. See Neal Wood, 1959, *Communism and British Intellectuals*, New York: Columbia University Press, especially Chapter V, "Utopians of Science," for discussion of the place of Marxist scientists in the overall left of the period.
6. That adoption and transformation into post-war orthodoxy have profound consequences for the possibility of rational resistance to official interpretations of world problems in the 1970's. For example, after the world food conference in Rome in late 1974, U. S. national news network commentary ridiculed the Soviet, Chinese, and Vatican dissent from the neo-colonialist scientific opinions on the population explosion and food crisis in the developing countries. Analysis of population patterns is only one of the more recent examples of political interest posing as objective scientific understanding. See David Harvey, 1974: "Population, Resources, and the Ideology of Science," *Economic Geography* 50:256-77.
7. *Science at the Crossroads*, Reprinted 1971, London: Frank Cass. This volume contains the papers of the Soviet delegation and a new introduction by P. G. Werskey.
8. See David Joravsky, 1970, *The Lysenko Affair*, Cambridge: Harvard University Press, for a discussion of the place of agricultural scientists in early Soviet millenarian hopes for a solution to Russia's age-old depression in the countryside.
9. Michael Polanyi, 1946, *Science, Faith, and Society*, London: Oxford University Press. Polanyi represents a current of thought which has little in common with the utilitarian base of either Marxism or liberalism. His theory of knowledge and of the community is spiritual heir to Medieval

Thomist notions of service and insight. His plea for pure science is far more sophisticated than the argument that science has to be left alone so that it can better produce the goodies for society than if its directions were directly planned. Polanyi sees science almost as spiritual play or joy, akin to Roszak's notion of wisdom. But more of that later.

10. A large literature exists on the rise of the scientific connection to government. See especially Daniel S. Greenberg, 1968, *The Politics of American Science*, London: Penguin Books; Stuart S. Blume, 1974, *Toward a Political Sociology of Science*, N.Y.: The Free Press; Don K. Price, 1962, *Government and Science*, N.Y.: Oxford University Press; Joseph Ben-David, 1972, *The Scientist's Role in Society*, N.J.: Prentice Hall.
11. Arnold Thackray, 1971, "Reflections on the decline of science in America and on some of its causes," *Science* 173: 27–31.
12. Nathan Reingold, ed., 1964, *Science in America: A Documentary History*, New York: Hill and Wang. Reingold sketches the oligarchic tradition in vivid detail in the establishment of the National Academy of Sciences in 1863. A small influential group of American savants (the Lazzaroni or scientific beggars) including Louis Agassiz, Alexander Bache, and Benjamin Pierce, convinced a less than passionately involved Congress of the need for an elite group of scientists—one of whose tasks would be to give advice to the government and its agencies on request. The National Academy was designed to be a prestigious home for the scientific elite, something the motley membership of the AAAS, which could include everyone interested in science, could not provide. The NAS did not acquire much importance in control and direction of research until the establishment of its operating arm, the National Research Council, in World War I.
13. For a treatment of the development of science politics and the relation of science to private industry in the great era of the ideology of cooperative individualism, see Robert H. Kargon, 1974, "Introduction: The New Era: Science and American Individualism in the 1920's" in *The Maturing of American Science*, Washington, D.C.: AAAS. Kargon notes that the dukes of American science in the 20's—such as George Ellery Hale, Robert A. Millikan, and Simon Flexner—argued the importance of science for industry and the nation. They felt support for science should come through *private* initiative and that the National Research Council of the National Academy of Sciences should link major corporations, private foundations, and research. In the years before World War II, they worked to create a large National Research Fund from private corporate sources. Distribution of support would be determined by the scientific community. Establishment of the National Science Foundation in 1950, reflecting the growth of insider politics, put a final end to such a model of scientific funding. It is useful to compare the arguments of the National Research Fund proponents with those of the liberal wing of the BAAS and the Science and Society Movement in Britain of the thirties. The British were less wary of government funding structures. Both groups made strong cases for major increases in support of basic research in the interests of national and industrial development. "Knowledge which hath a tendency to use" was taking on its current justification.
14. The organ of the AAAS, *Science*, in a fit of introspection prompted in part by the protest to be discussed below has published several articles in the last few years on its own nature and history. See especially Phillip Boffey, 1971, AAAS(I): "Facing the questions of what it should be and do"; AAAS(II):

- “What it is and what it tries to do”; AAAS(III): “Is order of magnitude expansion a reasonable goal?” *Science* 172: 435–58, 542–58, and 656–58. *Science* has been more of a science news magazine than an official mouth-piece of the AAAS, which moreover does not have one mouth; and it is very hard to find out what languages all its many mouths are speaking.
15. Herbert Marcuse, 1964, *One Dimensional Man*, Boston: Beacon Press; Jürgen Habermas, English text 1970, *Toward a Rational Society*, Boston: Beacon Press; Theodore Roszak, 1969, *The Making of a Counter Culture*, Garden City, New York: Doubleday; and Roszak, 1973, *Where the Wasteland Ends*, Garden City, New York: Doubleday.
  16. See the moving film *State of Siege* for unmistakable illustration of the critique of technical rationality as political domination.
  17. Habermas, 1970, p. 120.
  18. See Stuart S. Blume, 1974, *Toward a Political Sociology of Science*, New York: The Free Press, especially pp. 148–76, and Barbara J. Culliton, 1975, “FAS attacks politicization of NIH,” *Science* 187: 47.
  19. For discussions of the history of March 4, see in addition to Blume, Bryce Nelson, 1969, “Scientists plan research strike at MIT on March 4,” *Science* 163: 373, and Nelson, 1969, “MIT’s March 4: Scientists discuss renouncing military research,” *Science* 163: 1175–78. On after effects see, Andrew Hamilton, 1970, “MIT: March 4 revisited amid political turmoil,” *Science* 167: 1475, and Thomas P. Southwick, 1971, “Visitors ask MIT faculty to renounce military research,” *Science*, 171: 156. A broader discussion of the significance of the events can be found in Martin Perl, 1970, “The ‘new critics’ in American science,” *New Scientist* 46: 63–5. For the papers and speeches of March 4, see J. Allen, ed., 1970, *March 4 Scientists, Students, and Society*, Cambridge: MIT Press. The pun from March 4 to March Forth was, of course, deliberate.
  20. SESPA’s magazine has been published from 9 Walden Street, Jamaica Plain, Mass. Al Weinrub, who taught physics at Boston University, has functioned as coordinator from the beginning. Each issue is planned, written, and issued by a collective which works together for several weeks. No one, at least ideally, concentrates authority in the organization. The participatory ideal of early SDS continues to function. See “SESPA—A History,” *Science for the People* 2: 3, 1970.
  21. “Future directions for Science for the People,” *SftP* VI: 37–8, 1974.
  22. James Glassman, 1970, “Harvard geneticist researcher quits science for politics,” *Science* 167: 963. Discussion about quitting research was common in 1969–70 in the elite graduate schools. Many quietly dropped out, many stayed; but recognition of the dangerous nature of science and of the ideology of objectivity in contemporary society was widely shared.
  23. See Frederick Ausbel, Jon Beckwith, and Karen Janssen, 1974, “The politics of genetic engineering: Who decides who’s defective?” *Psychology Today* 8: 34–43. All three are active in Science for the People.
  24. Richard Levins, 1974, “SftP Activist rejects National Academy,” *Science for the People* VI: 25.
  25. There is little question that the major visible effect of the scientific radicals has been to goad the liberals into adopting obviously positive reforms. That result should not be under-valued.
  26. The model for the liberal analysis of the social responsibility of the scientist is Berry Commoner’s approach expressed in the Committee for Environmental Information, which grew (1967) out of the former (1958) Commit-

tee for Nuclear Information, and its magazine *Environment*. The magazine analyzes various science-related issues in a most sophisticated manner for the educated, non-scientific public. Citizens are supposed to act; scientists have done their job by educating. The very effective film, *Assault on Life*, put out in the mid sixties by Commoner and others (not so ironically including Waddington), shows this model in relation to growing reproductive and genetic technology.

27. For description of all this, see the pages of *Science*: James K. Glassman, 1970, "AAAS Boston meeting: Dissenters find a forum," *Science* 167: 36; Phillip Boffey, 1971, "AAAS Convention: Radicals harass the establishment," *Science* 171: 47-49; and John Walsh, 1972, "AAAS meeting: Pro forma protest and constitutional reform," *Science* 175: 42-44.