Journal of the Minnesota Academy of Science

Volume 39 | Number 1 Article 9

1973

Some Moral and Ethical Dilemmas of Science in the 1970's

Yvonne C. Condell
Moorhead State College

Some moral and ethical dilemmas of science in the 1970's

YVONNE C. CONDELL*

ABSTRACT – Some critics of the scientific community – scientists and non-scientists – believe that scientists should become more socially responsible, that science should be tolerated only as long as its results are socially beneficial, and that science must be constitutionalized and controlled if it is not to destroy civilization.

The Scientific community has fallen upon hard times. Hard times being defined in terms of loss of funds for research, loss of prestige and influence, loss of goodwill, and loss of integrity among certain segments of the citizenry. There are scientists who would quickly deny that there are hard times or that any of these statements is true; who would say there are no problems in the scientific community; there is no crisis in science today.

From the beginning of this decade, science has been criticized by many citizens who are disenchanted with scientists, scientific research and all that they represent. Such disenchantment has prompted a number of high level symposia and seminars devoted to a study of the social roles and responsibilities of scientists. Notably among these are the Conference of the British Society for Social Responsibility in Science held in London June 20-30, 1971, and the Ciba Foundation Symposium, Civilization and Science in Conflict or Collaboration, held in London, November 26-28, 1970.

M. H. F. Watkins, addressing the Conference of the British Society for Social Responsibility in Science, pointed out that the disruption of scientific research in Japan and the United States was due principally to general student unrest and political frustration with science, with its organization, and its social priorities. Herbert Block, Chairman of the Ciba Foundation Symposium, June 28-30, 1971, stated:

> The establishment of research priorities, the evaluation of scientific projects, science policy in the context of various social and political systems, and policies affecting research institutions were among the important issues raised and exhaustively reviewed at the Ciba Foundation Symposium on *Decision Making in National Science Policy* held in 1967. Today not only are these issues still with us, but newer and more disturbing problems are giving the decision makers for science policy, and the rest of us, more to review exhaustively than any experts can manage. (Ciba Foundation, 1972)

I share with you in the following paragraphs some of the signs that I feel add up to an increasing hostile environment and attitude toward science, scientists and scientific research.

In August, 1970, a research laboratory at the University of Wisconsin at Madison was blown up, killing one research scientist. Again, in January, 1973, the University of Wisconsin witnessed the bombing of another research laboratory. A bomb caused minor damage to an enzyme research institute. Students there complained that the institute was doing research on genetic control.

Some critics of the scientific community were actually blaming the sciences for the youth rebellion. To these critics, students were no longer willing to accept science as a discipline with honesty and integrity. A very outstanding artist and professor of art at an eastern university commented on the increasing enrollment in art in colleges and universities throughout the country. He felt that the increased enrollment in art was due partly to youthful rebellion. Professor John Gregoropoulos stated, "Art is a rebellion against the sciences. I think the young feel betrayed by the sciences."

In order to verify Professor Gregoropoulos' position, a study was made to see if, indeed, students were rebelling against the sciences; that is, were enrollments in the sciences actually declining. Since high school enrollments might serve as a barometer for college enrollments, an investigation was made of the patterns of course offerings in public secondary schools for the 1970-71 academic year. A report by Bertler and Barker (1972) showed some interesting findings. First year biology attracted the greatest number of pupils enrolled in the natural sciences, accounting for 21.4 percent of the enrollment in that subject area. The second most popular science course was grade 9-12 general science, representing 13.3 percent of all enrollment in the natural sciences. General science courses enrolled about the same number of pupils as a decade ago; yet, a decade ago they represented 56.6 percent of the natural science enrollments, while in 1970-71, they comprised 36.4 percent. There is a downward trend in general science enrollment.

Because of the tremendous amount of attention and concern over and about the rapid deterioration of the environment, one might suspect that a significant number of students who normally took a general science course would enroll in ecology/environmentally-oriented courses and might explain the downward trend in general science enrollment. The report by Bertler and Barker (1972) did not show this to be the case. Four hundred and thirty-nine schools offered courses in ecology, representing 1.7 percent of the total schools, but enrolled only 0.3 percent of the pupils enrolled in science courses. A course in environmental science offered by seven hundred schools, representing 2.7 percent of the total schools, enrolled only 0.3 percent of the pupils enrolled in science courses.

An investigation of course offerings in the social and behavioral sciences, fine arts and languages was undertaken to

*YVONNE C. CONDELL is Associate Professor of Biology at Moorhead (Minnesota) State College. She earned the Bachelor of Science Degree at Florida A. and M. University in Tallahassee and the Master of Arts and Doctor of Philosophy Degrees at the University of Connecticut.

verify the second aspect of Professor Gregoropoulos' position. Are students actually rebelling against science by enrolling in the arts, social and behavioral sciences and languages?

The report by Bertler and Barker (1972) was studied and the findings are interesting. Six courses showed significant increases in pupil enrollment from 1960-61 to 1970-71, as shown in the table.

Course Title	Percent of Schools Offering 1960-61	1970-71	Percentage of Enrollment 1960-61	1970-71
Advanced English	1.4	15.3	0.1	1.8
Creative Writing	3.7	16.4	0.3	1.5
Music Theory & Harmony	3.1	5.4	0.3	0.4
Psychology	10.4	32.0	1.2	2.8
Sociology	19.5	33.2	2.5	4.3
Spanish IV	3.8	15.6	0.1	0.3

A similar analysis was undertaken to assess the enrollments in the sciences and social aciences, arts and humanities at the college level as indicated by the number of students earning the Bachelor's or first degree in these areas. Figures for 1965 and 1970 are used to study trends. In 1965, 25,304 bachelor's/first degree degrees were awarded in the biological sciences, 87,346 in the social sciences, 17,916 in the physical sciences, 14,105 in foreign languages and literature, and 17,412 in fine and applied arts (Renetsky, 1968).

In 1970, 37,389 degrees were awarded in the biological sciences, 154,013 in the social sciences, 21,439 in the physical sciences, 35,901 in the fine arts and 35,901 in foreign languages and literature, 21,109 (Reitman, 1972). The percent of increase in enrollment for the biological sciences was 1.4 percent, 1.87 percent in the social sciences, 1.2 percent in the physical sciences, 2.1 percent in the fine and applied arts and 1.5 percent in foreign languages and literature. The statistics seem to support Professor Gregoropoulos' position that the increased enrollment in art represents rebellion against the sciences.

During the student uprising over the bombing of Laos, I was involved in discussions focused on the concerns and attitudes of members of the faculty and student body on our campus. The students felt that faculty members and students in the arts, humanities, and social and behavioral sciences were very much disturbed about the United States' involvement in an amoral war. The faculty and students in biology, chemistry and physics actually resented their demonstrations against the war, the students stated. They believed that the scientists' "business as usual attitude" was responsible for the emerging anti-science attitude on the part of a large segment of the citizenry.

Some support for this position is alluded to by Block in his address to the participants of the Ciba Foundation Symposium (1972), when he pointed out that the question of the worthwhileness of scientific activities was almost taboo when it was mentioned in a previous symposium in 1967. In 1971 scientist as well as non-scientists were saying that scientists should become more socially responsible, that science should be tolerated and supported only as long as its results are socially relevant, and that science must be constitutionalized and controlled if it is not to destroy civilization. Block further pointed out that the scientist's lack of values has left him helpless to prevent science from being used for exploitation and destruction.

That science and scientific research are no longer top priorities for funding are borne out by the fact that drastic cuts have been made in the budgets of some of the most prestigious laboratories in the country. During the decade from 1957-1967 the American scientific and technical community was presented funds in seemingly unlimited amounts, pressed upon it by a space-conscious nation still smarting from the embarrassment that the first Sputnik had brought to the American image of pre-eminence in basic research and development. Federal research and development outlays in the decade starting with Sputnik soared from $5 billion annually to $17 billion. The percentage of federal spending devoted to research and development went from 6 in fiscal year 1958 to 12 in 1964-66. In 1969 NASA put the first men on the moon, but in 1970 its budget was slashed and its main installation for advanced research in electronics at Cambridge, Massachusetts was phased out before it was formally opened.

Enthusiasm for research and development began to ebb in the last half of the 1960's partly because outlays for the $25-billion Apollo program had peaked – and partly because the growing involvement in the war in Viet Nam began to take an even larger slice of the budget.

In recent years the amount of federal research and development dollars has remained the same, but research and development's percentage of the federal budget has declined. Its share of the new bedget is approximately the same as it was 15 years ago, when the boom began.

The dismantling of the scientific research establishment by the federal government came as a shock to many. Unofficial reports at the beginning of 1973 hinted that the Nixon administration planned to abolish the White House's two top advisory agencies on military and civilian science and technology. The reports further hinted that the administration planned to eliminate the Office of Science and Technology – at least in its existing form – and to abolish the President's Science Advisory Committee.

Since the second inauguration of Mr. Nixon, nearly half of the top thirty government positions in science are vacant due to the elimination of positions and resignations. In the Office of Science and Technology, both the director and the deputy director resigned amid rumors that the office would be merged with the National Science Foundation or with the Office of Management and Budget. The director for science and education in the Department of Agriculture resigned and the office was abolished. Two assistant directorships at the National Science Foundation have been vacant for several months. In the Department of Interior, the Deputy Under Secretary for Science has left and his post abolished. The post of science advisor in the Department of Interior has been vacant since 1970. The Assistant Secretary for Research and Technology in the Department of Housing and Urban Development, the Deputy Assistant Secretary for Science and Technology in the Department of Commerce, and the

Assistant Secretary for Science and Technology at the National Bureau of Standards have resigned.

In an editoral in the April 10, 1973, issue of *Science,* the waning status and prestige of science is discussed. Abelson (1973) states: "The reality is that the status of science and scientists has changed. Once scientists were regarded as supermen, and academic research was supported as the key to national security and commercial leadership. Scientists had an influence on national policies that far exceeded their numbers. Today scientists are regarded as mortals – fairly intelligent, fairly well-meaning, but still merely mortals. As pressure groups go, they are one of many, and their numbers are inconsiderable. When they make statements, however meritorious, their views are discounted just as those of any other group."

A few years ago this statement would have been considered heresy. The worth and value of scientific activities were beyond question. Now we are confronted on all sides by fierce demands for more responsibility in science. Some scientists admit privately that a day of reckoning was needed. Many critics of the scientific establishment complained that large amounts of research and development money were being spent on senseless frills. The Mohole project is perhaps a prime example of that complaint. The project, to drill a deep hole in the earth's crust, was dropped after cost estimates had soared from $20 million to more than $100 million. More than $36 million was spent on the project before it was abandoned.

With science plagued by all of the above problems, what will become the role of science in the 70's and 80's? For the past several years anti-science types as well as dissenting young scientists have urged a shift in priorities in science. They want science to divest itself of its military and profit-motivated type of research in favor of an emphasis on socially useful applications of science. Toda, in *The Chronicle of Higher Education* (1973) prefers to call it the science of civilization. In which directions should scientists proceed towards rebuilding science? Six suggestions are offered.

1. Establish clearer ideas about the nature of science. The typical scientist works within a narrow, fixed framework. The scientist is able to answer the questions that he asks of himself. Often these questions are the same questions that were raised by his doctoral research. Such a narrow approach is very suitable for the individual scientist working in his own, private laboratory, but is inadequate when applied in a broader framework which involves answering questions with social conotations and implications. The scientists must investigate problems that get beyond his own narrow range of interest. For example the problems of an ecological nature require the consideration of all parts of the environment however small.

2. Much more study should be directed toward the social, historical, economic, political and philosophical aspects of science. Similarly, much needs to be done to bring these studies into science education in schools and universities and into popular presentations of science generally. The scientific societies such as AAAS, AIBS, American Chemical Society, etc. should play their part in broadening the perspectives of science.

3. It is very important that science should become a part of all other areas of human endeavors particularly the arts. Activities which combine the activities of science and the arts should be developed. In rebuilding, science should be integrated with art to enhance the quality of life.

4. There must be a re-ordering of research priorities within science. Involved here, perhaps, is putting more effort into studying the effects of the application of science endless effort into research such as the Mohole project. Hopefully, science for social goals will produce a change of scientific methodology so that it moves away from percent emphasis on so-called "pure-science."

5. Since scientists have worked closely with the Federal government in research and development programs, scientists must take an active role in shaping governmental policy regarding scientific activities. To limit their role to that of advisors no longer seems tenable. Scientists have not performed well in the area of influencing policy that directly affects their research efforts, perhaps scientists have been far too naive in this respect.

6. The scientific community must work to change its image with the non-scientific community. Scientists often are portrayed as "loners" who have little or no contact with others like the poets, the artists, the historians, etc; who in their own activities have become estranged from the rest of society. The scientists have done precious little to help others understand the nature of science. Scientists will have to take the time to translate their efforts into the language of the non-scientists. It then becomes their responsibilities to share their work with a citizenry that has supported scientific research financially for many years. It becomes necessary for the scientists to explain to the non-scientists their research and why they do it.

Scientists cannot solve the problems alone. The help of the rest of society is greatly needed. The problems are jointly those of society and of science and must be solved by scientists and non-scientists working conjointly.

References

ABELSON, PHILIP. Additional Sources of Financial and Political Support for Science. *Science,* April 10, 1973 p. 259.

BEN-DAVID, JOSEPH. 1971. *The Scientist's Role in Society.* Englewood Cliffs, N.J. 207 p.

BERTLER, DIANNE B. and BARKER, LINDA A. *Patterns of Course Offerings on Enrollments in Public Secondary Schools, 1970-71.* Superintendent of Documents, Catalog No. H. E. U.S. Gov. Printing Office, Washington, D.C. 1972.

The Cronicle of Higher Education February 5, 1973 p. 3

CIBA FOUNDATION. 1972. *Civilization and Science in Conflict or Collaboration?* Elsevier – Excerpta Medica, London. 227 p.

FULLER, WATSON. 1971. *The Scoial Impact of Modern Biology.* Routledge & Kegan Paul, London. 256 p.

McLAUGHLIN, DONNA S. Then, Student and Teacher Now, Colleagues and Friends. *The Connecticut Alumnus.* December, 1972. p. 14.

WALSH, JOHN. Federal Science: Filling the Blanks in Policy and Personnel. *Science,* Feb. 2, 1973. pp. 456-458.

REITMAN, JERRY J. and GREENE, JON S. (Editors) (1972) *Standard Education Almanac.* Orange, New Jersey: Academic Media, Inc., 118-122.

RENETZKY, ALVIN and KAPLAN, PHYLLIS (Editors) (1968) *Standard Education Almanac.* Los Angeles: Academic Media, Inc., 293.