

The following article, entitled "Can Scientists Be Trusted on Hazardous Research?" appeared in *The Chronicle of Higher Education* August 2, 1976.

Can Scientists Be Trusted on Hazardous Research?

That is the central question as university neighbors in Cambridge and Ann Arbor weigh potential danger of work using a controversial genetic-research technique.

Our time is cursed with the necessity for feeble men, masquerading as experts, to make enormously far-reaching decisions. Is there anything more far-reaching than the creation of new forms of life?

- from a letter by Columbia University biochemist Erwin Chargaff to *Science* magazine

By CHERYL M. FIELDS

Cambridge, Mass.

A potentially hazardous genetic research technique that proponents say could revolutionize man's understanding of life has focused attention on how much scientists can be trusted to consider the public when making decisions about research.

The issue has stirred wide-ranging controversy and is a political issue in two university communities where scientists want to use the technique.

A three-year debate in scientific circles about the potential hazards and benefits of advanced genetic research spilled over into a noisy public arena here last month when a packed city council meeting passed a resolution calling upon Harvard University and the Massachusetts Institute of Technology to agree to a three-month moratorium on the so-called "recombinant D.N.A. research."

Michigan Regents Approve

D.N.A. or deoxyribonucleic acid
-- from higher organisms into simpler organisms such as bacteria so that it can be studied in a simpler environment.

One major issue in both communities was whether or not scientists who wanted the research to go forward would realistically estimate the hazards it might pose to other workers in buildings housing the labs, as well as to the surrounding community.

Critics said the genetic material injected into the lower organisms conceivably could give them undesirable new properties when it began functioning in concert with the genes of the simpler bacteria. They warned that new diseases might be produced, or that the bacteria might become resistant to substances normally used to control them.

Supporters argued that the potential benefits of the research were so great that the research should proceed just as soon as the proper facilities and safety measures were available. By studying the operation and effects of the transplanted genes, researchers have said they hope to learn more about how the hereditary process functions, how viruses work in producing cancer, how to use the procedure to produce medical compounds such as insulin, and how to produce improved plants for agricultural purposes.

Lack of Understanding

While many agreed that scientists should give non-scientists more information about research with potentially far-reaching results, another problem, as one Michigan scientist put it, was, "How in the dickens do you get anybody to say anything intelligent when they don't know what you're talking about?"

A third issue in the genetics debate was whether scientists had carefully weighed the possible long-term effects of their research and whether man should learn to alter the forms of life existing on earth.

Many supporters of the research in Cambridge, Ann Arbor, and elsewhere said scientists took extraordinary pains to consider the possible hazards. Genetics researchers themselves called attention to the possible undesirable or profound effects of their work after the techniques were refined and generally available for splitting the normally entwined strands of D.N.A. that make up genes -- thus allowing segments to be put together in new combinations.

They called a voluntary moratorium two years ago so that the risks and benefits of the research could be weighed and national guidelines formulated. Those guidelines were issued by the National Institutes of Health in June after an advisory committee had spent several months drafting them.

Very Hazardous Tests Banned

The guidelines called for progressively stricter safeguards for laboratory procedures as the possible hazards in the types of experiments increase. The guidelines continue a ban on some types of experiments with genes from very hazardous organisms.

The level of research under debate both in Cambridge and in Ann Arbor is known as the "p-3" or "moderate"-risk level, which entails controlled access to laboratories as well as special air-flow systems and the decontamination of D.N.A. materials before disposal. The "p-4" or "high-risk research is not expected to be done on many campuses because of the even more elaborate and costly -- and some scientists say, cumbersome -- facilities it would require.

Supporters of the research emphasize that the guidelines, require not only such physical containment of possibly hazardous genetic combinations, but also "biological" containment. That is, the genetic material is to be inserted only into special laboratory strains of bacteria that are weakened, are unlikely to survive outside an artificial laboratory environment, and do not grow well in people.

In addition, they said, the small number of genes to be transplanted are unlikely to produce dramatic, new hazardous qualities in the bacteria.

"I think it is fair to say that the majority of scientists are not worried" about the research, says Walter Gilbert, professor of molecular biology at Harvard and a developer of some of the new research techniques.

Prepared for the Worst

s turned into a political issue by Cambridge's Mayor Alfred E. Vellucci, a flamboyant figure who is known in the community for suggesting such things as asphaltting Harvard yard to help solve Cambridge's parking problem.

Mayor Vellucci asked the city council whether research at the p-3 level should be conducted in the city after a visit from George Wald, a Nobel Prize-winning biologist from Harvard. Mr. Vellucci originally proposed a two-year moratorium in the city on the research and said, "We want to be sure the people of Cambridge won't be affected by anything that could crawl out of that laboratory."

Mr. Wald; his wife, Harvard biology professor Ruth Hubbard; and some other faculty members working in Harvard's biological laboratories building had opposed the construction of the laboratory despite approval of it by the research policy committee and the committee on the regulation of hazardous biological agents of Harvard's faculty of arts and sciences.

"We are bringing together living elements that have not been together before, and therefore we have no way of predicting what will happen," Ms. Hubbard said.

Some of the opponents said they didn't want to work in a building housing the research. They said that some organisms from the research would inevitably escape, and that the old building had plumbing and insect problems and was not an appropriate site for the lab.

The hazardous-agent committee said, however, that the structure would meet and even exceed some of the N.I.H. requirements for a laboratory handling viruses and recombinant D.N.A. research.

The Cambridge city council considered the issue of D.N.A. research at two lengthy, tense meetings that drew vocal supporters and critics from both Harvard and the Massachusetts

Institute of Technology. M.I.T. has some labs in a cancer research center that could qualify for p-3 research with "moderate alterations," according to a university spokesman.

After an inconclusive debate at the first meeting, the council, in a second session, passed a resolution calling for a three-month moratorium on such research and ordered the city manager to develop a plan for a Cambridge Laboratory Experimentation Review Board.

Spokesmen for both Harvard and M.I.T. said the moratorium would have little practical effect, since neither university was ready to begin recombinant D.N.A. studies.

City Manager James Sullivan says he plans to appoint the members of the review board soon and says it will work in liaison with the city health commissioner's office. The board members would not come either from Harvard or M.I.T., Mr. Sullivan says, but would probably include the city's health commissioner, a hospital administrator, and other "reasonable, rational" people who could make sure "that what the N.I.H. guidelines say should take place does take place."

Some Cambridge scientists are uneasy with the idea of the community review board, but opponents of the research, some of whom belong to a group of faculty members and graduate students called Science for the People, say it is a step in the direction of getting the public more involved with scientific issues.

The board "shows that scientists can't just do what they damn well please any more," says Jonathan Beckwith, a professor of microbiology and molecular genetics at Harvard. "As a scientist, I could accept outside judgment. If someone feels my research is dangerous, I don't feel I am objective enough to decide."

Mr. Beckwith says he was "very impressed" with the "sophisticated knowledge" about D.N.A. research that Cambridge city council members had gained.

Exaggeration Charged

The opponents' fight has created bitterness among some supporters of the research, who say that to get the public interested in whether the work should be done, critics grossly exaggerated the danger, misrepresented the facts, and caused unnecessary worry.

"Do you have to terrify people to bring them in?" asks Mark Ptashne, professor of biochemistry and molecular biology at Harvard.

"I guess it is inevitable that people may become over-excited," Mr. Beckwith acknowledges, "but I am more concerned about the danger being downplayed."

The D.N.A. battle was "frustrating," says Mr. Ptashne, "because a lot of people are not motivated by scientific considerations; they are concerned that the common people control research. Of people with technical knowledge, I know of only one person in the entire country -- Robert Sinsheimer, chairman of the biology department of the California Institute of Technology -- who has his opposition not based on an ongoing political rationale."

Some Scientists 'Embittered'

of scientists, as well as the public, he says. One N.I.H. officials, he says, indicated "50 per cent of the advisory committee members were planning to be involved in D.N.A. research. The experts had a vested interest" in allowing the research to be done.

"N.I.H. held a one-day public hearing, I think because of the pressures from critics," says Mr. Beckwith. Although the committee got a lot of letters and suggested guidelines from outside groups, he says, "I get the strong impression they had some effect, but very little."

A geneticist at the University of Michigan who was on the N.I.H. advisory committee, Ernest H.Y. Chu, defends the panel. All the advisory committee members copies of all correspondence, criticism, and counter-proposals that the committee received. The guidelines are as reasonable as scientists can construct with the knowledge they now have, he says.

Mr. Chu and others involved in the Michigan controversy say that the scientists who want to be involved in the research there spent a lot of time explaining their research to the campus community and the public. One faculty member organized a course on recombinant D.N.A. research that was open to everyone on campus. Robert B. Helling, associate professor of biological science, estimates that he and other faculty members gave about 40 speeches about the research to campus and local groups, including the Kiwanis Club and the local Democratic Party organization.

Although a resolution that asked for a copy of the N.I.H. guidelines and contained what supporters felt were distorted statements was introduced at one Ann Arbor city council meeting, it was quickly tabled, and the research did not become a major political issue outside the campus, as it did in Cambridge.

The research also appears to have been given a longer, more publicized, formal university consideration at Michigan. At the request of faculty members, a study of Michigan's involvement in recombinant D.N.A. research began early in 1975. Eventually two committees were appointed -- one, Committee A, to review the technical aspects of renovation of three laboratories for the research, and a second, Committee B, composed of faculty members from a variety of disciplines to study the longer-range, philosophical issues.

"When Committee B began, we knew that it was important to get people with feelings about this to come forth," says Alvin Zander, chairman of the committee and associate vice-president for research at Michigan, "so we put letters in the University Records [a publication circulated to faculty members and administrators], we had announcements made at the faculty assembly, I sent letters to all the deans... and not a soul came forth."

Eventually, however, a group of critics developed, led by Susan Wright, an assistant professor of humanities in the engineering department. They circulated a detailed critique of Committee B's final report, which supported the research. The critique emphasized the possible safety hazards of the research, said Committee B should have included representatives from outside the campus community as well as support personnel from Michigan science laboratories, and questioned whether the potential benefits of the research claimed by geneticists were likely to be as quick or extensive as supporters had indicated.

One member of Committee B, history professor Shaw Livermore, Jr., filed a dissent to the report based not on "fear of the laboratory hazards," but on the possibility that the research could lead to "the development of capability to alter life in a fundamental way."

"While it clearly would present opportunities for meeting present sources of human distress, I believe that the limitations of our social capacities for directing such a capability to fulfilling human purposes will bring with it a train of awesome and possibly disastrous consequences. Decisions will be made by individual, groups, and perhaps whole societies that may well have unintended but irreversible effects," he said.

To consider those criticisms, four public forums were held on the D.N.A. research questions at the university in March. Since the medical-school faculty, the biochemistry department, and other scientific groups at the university were generally in favor of the research, Ms. Wright's group brought in outside critics, some of them the same persons who have opposed the research in Cambridge, including Jonathan King, associate professor of biology at M.I.T., and Richard N. Goldstein, assistant professor of microbiology and molecular genetics at Harvard Medical School.

In addition, a private forum of advocates and opponents of the research was arranged for Michigan's board of regents, a publicly elected group. "It was a very good meeting, three hours, very tense. I think that really settled it," says Mr. Zander, although the critics also spoke at the next regular board meeting, at which the regents voted 6 to 1 to let the research go on.

"What discredited the opponents with the regents was that they couldn't bring in large numbers of distinguished scientists who opposed the research," says Mr. Helling.

Acknowledging that scientists cannot promise exactly what specific, practical benefits will emerge from the D.N.A. research, he says that "we know that it will greatly increase our knowledge of life and eventually should lead to benefits in medicine and agriculture."

"I think scientists have come up with much tougher rules than other groups have done for themselves. In fact, the research is going to be very difficult to do" under the N.I.H. and university guidelines, he says.

Nonetheless, Mr. Helling says, "We clearly solicited criticism. I don't know if that was wise. I know it's been disastrous for our productivity... but in the long run the public debate may have been a good thing. Nowhere has the issue been handled in a more orderly way than in Michigan.