Because Ideas Have Consequences

IMPRIMIS

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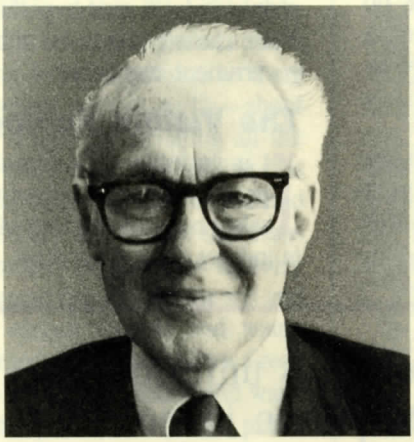
"How Genetic Engineering Got a Bad Name"

by Bernard Davis



The often alarmed layman's attitude toward genetic engineering—sometimes known as bioengineering—is part of an even broader public ambivalence towards science and technology. University of Chicago sociologist Edward Shils has called it an antiscience movement, and he suggests, moreover, that it is more serious than most scientists think; we tend to look upon it as a mere nuisance when it is actually hurting our morale, our credibility, our level of support from the outside world, and our ability to recruit bright new people into science professions.

Bioengineering in the '70s and '80s

About a dozen years ago a wave of intense public concern was created over the new technique of moving genes from one organism to another. The scientists responsible for developing bioengineering were the first to ask, "Could this be dangerous?" Unfortunately, they precipitated tremendous public anxiety in their quest for an answer.

The Recombinant DNA Advisory Committee (RAC) was formed under the auspices of the National Institutes of Health to provide guidelines for research on recombinant bacteria laboratory and industry use. Initially, RAC set very restrictive guidelines, but these were eventually relaxed. Today, no federal approval is required for

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by Donald L. Ritter

There seems to be a serious condition afflicting America today which I and others have labeled "chemophobia." It is often communicated through misinformation, sensationalism and political activism, but its real source is a mix of utopianism, fear of the unknown, and hostility towards science and the established order of society itself. It feeds on scientific illiteracy, is contagious, and generally extends to all Western industrial nations.

Fear and Ignorance

To those with healthy, positive views of who we are as a nation and as a people, science is an invaluable tool for protecting and enhancing life; but to those in the grip of chemophobia, science seems to be an instrument of environmental and biological degradation born mostly of corporate greed. The media, seeking subscriber dependence, with most reporters lacking science backgrounds, seems determined to advance this dark view. Since we depend on television news and the national and local press for nearly all of our information, it has had a devastating impact. Armies of activists, lawyers and white knight politicians join the media in claiming to protect our interests against alleged impending disaster.

Meanwhile, our educational system continues to do a poor job

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Editor's Preview: **There is no doubt that we live in a world revolutionized by science. From disease control to environmental management, biotechnology has offered new discoveries and new techniques for a healthier, safer world.**

During the March 1988 Center for Constructive Alternatives seminar, "Biotechnology: New Cures and New Dilemmas," papers were presented on renewable resource utilization, vitamin research, animal agriculture, medical innovations and a variety of other topics. Ethical dilemmas involving "fetal farming," chemical release, and patent law were also discussed.

In this issue of *Imprimis*, two of America's most well-known advocates of scientific innovation discuss public misperceptions about the safety of one of the most important areas of biotechnology: genetic engineering.

About the Authors

BERNARD D. DAVIS, a leading expert in microbiology, is a professor emeritus at the Bacterial Physiology Unit of Harvard Medical School. After receiving his medical degree from the same institution in 1940, he went on to become director of the U.S. Public Health Service Tuberculosis Research Laboratory; chairman of the pharmacology department at NYU Medical School; and chairman of the bacteriology and immunology department at Harvard Medical School. Currently on leave from Harvard, he is a Fogarty Scholar at the National Institutes of Health. Having served on editorial boards of more than a dozen journals, including the *Journal of Bacteriology, Molecular Pharmacology,* and the *Journal of Cell Biology,* Dr. Davis is co-author of the widely-used college text, *Microbiology,* and nearly 300 articles and professional papers. His essay here is co-written by Lissa Roche.

DON RITTER is currently serving his sixth term in the U.S. House of Representatives for the 15th district of Pennsylvania. One of a handful of House members with a technological background and the only one at the doctoral level, he earned his M.A. and Sc.D. degrees from the Massachusetts Institute of Technology in metallurgy. Before his election to Congress, he taught and was a research administrator at Lehigh University. He has also served as a consultant to industry in the fields of materials and manufacturing. In the House, Dr. Ritter serves on the House Energy and Commerce and the Science, Space and Technology Committees. He also chairs the Republican Task Force on High Technology and Competitiveness.

Bernard Davis
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such experiments unless pathogenicity (the rare ability of a microbe to cause disease) is involved.

After a few years, the public forgot its fears and there was little, if any, major media attention directed towards the alleged danger posed by engineered bacteria. Experience simply revealed that there was no cause for alarm. There has not been a single case of illness or harm caused by recombinant bacteria; they are now safely used in high school experiments.

Scientists have also improved safety precautions which prevent bacteria from escaping in the lab. Biological containment means even more protection: Bacteria can be modified so that they will die if removed from a special laboratory environment.

As genetic technology has jumped from theory to practice, it has gained new advocates everywhere. Many valuable products are now a reality whereas the dangers are still conjectural. Once feared, recombinant bacteria are now regarded as a tool to promote safety. For example, hormones derived from human tissues can be contaminated by viruses and can even cause death. Producing the same hormone in a bacterium that doesn't carry the virus is a tremendous medical advance. Bacterial pesticides are often much safer than chemical varieties. The list of benefits goes on and on.

We have also come to realize that there is nothing really novel about the process of genetic modification—it occurs in nature. Bacteria naturally contain all the necessary enzymes and the potential to absorb DNA. All one does in the laboratory is to work out methods for improving the efficiency of the process.

As I have intimated, the first wave of fear over bioengineering eventually subsided in the early 1980s, but people are still prone to demand that scientists give one hundred percent guarantees. Now, one cannot say with absolute certainty that this or that disaster won't happen, but somehow scientists are supposed to do so. In short, new scientific technology is unreasonably regarded as guilty until proven innocent. And even though recombinant bacteria have thus far evidenced safety, they are still suspect.

The second wave of fear over engineered bacteria, milder but still potent, is upon us in the late 1980s. As research has reached the point where it is useful to introduce certain new engineered bacteria into our environment, public "spokesmen" like Jeremy Rifkin have been trying to scare people to death over hypothetical dangers. Their clarion call is for more and more government regulation.

The Visible Ecologists

It is perfectly clear that any marketed product is going to have to meet some safety requirements and will be regulated in indirect if not direct ways. Some bacteria have been marketed for agricultural purposes for decades. But does an engineered organism require more scrutiny and regulation than natural organisms?

A decade ago, our response was to form the RAC and broad guidelines. This allowed for some flexibility and within a very short time extreme restrictions which proved unnecessary were removed. But now with pressure from environmentalist special interest groups (whose goals may be laudable but who possess no hard evidence to corroborate their claims) the Environmental Protection Agency, and to a lesser extent, the Department of Agriculture and the Food and Drug Administration, are churning out excessively restrictive regulations. Those whom I refer to as the "visible ecologists" have clearly taken over, discriminating against engineered bacteria that the majority of microbiologists consider completely safe.

> "New scientific technology is unreasonably regarded as guilty until proven innocent."

I disagree with these visible ecologists on the basis not only of empirical observation but also of principle. When a principle has been firmly enough established, it is not necessary to challenge it again and again. And it *is* well established that most natural bacteria do not cause disease. After years of experimentation, microbiologists have demonstrated that they can engineer bacteria that are just as safe as their natural counterparts.

The visible ecologists cry for more testing and still more testing. But, as I have already suggested, science can't conclusively prove that something cannot possibly cause harm. (After all, you can drown in water, or peanut butter, for that matter, but that doesn't mean either is always harmful.) All scientists can do is to make an informed judgment, based on experimentation and principle, about the pathogenicity of an organism and about what we know of nature.

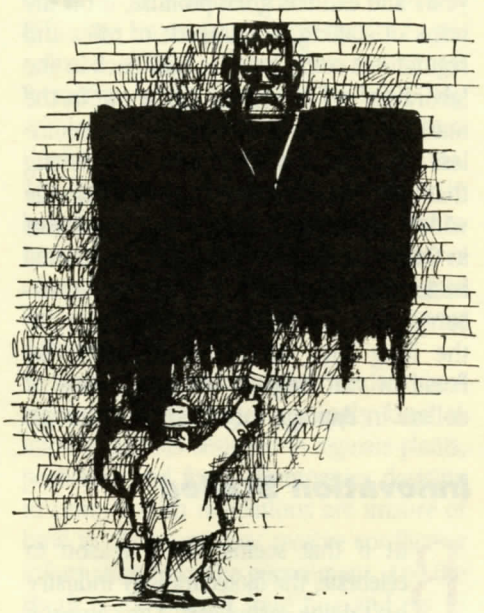
The microbial world is incredibly rich. One shovelful of average topsoil contains about as many living organisms as there are human beings on this earth—about three billion. These are mutating all the time so that every time they double this population will produce at least a thousand new mutants. They also exhibit enormous variety because they exist to chew up every organic compound that reaches the soil and turn it into carbon dioxide and water, which is returned to the atmosphere. Green plants absorb the carbon dioxide and water and make more plants, animals eat plants and drink water, plant and animals die, decompose and are transformed into more carbon dioxide and water by bacteria—that's the grand cycle of nature—but the public often forgets the essential role bacteria play.

Our experiments in the laboratory are puny compared to what is going on in the microbial world every day. But we have developed some important innovations to accomplish various purposes: from nitrogen fixation in or around plants ridding farmers of the necessity to add fertilizer, to organisms that prevent frost damage to plants, to bacterial pesticides, to disease-resistant hormones in animals and humans.

Let me return for a moment to some of the specific fears about engineered bacteria. There are two fundamental questions to ask: Will it spread on its own? If it does, will it do harm?

Ten years ago, we were worried about such bacteria escaping from the laboratory, but now engineered bacteria are deliberately let loose in the environment. The farmer buys a genetic product and puts it on his crops; the public asks, will it spread to his neighbor's fields or even farther? It is feared that engineered bacteria are just like smallpox or anthrax. But laboratory-created organisms are not competitive with those found in nature, because they have disturbed the adaptation created by evolution. They have a strictly local, temporary effect if released. You can start an epidemic with a single case of smallpox; no matter how much Frostban you dump on a field, it's not going to spread.

The visible ecologists often bring up our unhappy experiences with some "exotic transplants" when discussing engineered bacteria. Well, most of our ornamental and food crops originated in other lands. (In return, we've exported our own plants like maize and potatoes.) Along with thousands of useful transplants, a dozen or so have been imported which cause harm: the Japanese beetle, starlings, kudzu vine, etc. It's understandable that ecologists, who are deeply involved in combatting such unwelcome guests, are concerned that engineered bacteria might cause similar trouble. However, the comparison between imported plants and animals and engineered bacteria is a poor one.



With the removal of a natural organism from one geographical location to another, what are you doing? You are removing an organism that nature has adapted for perhaps billions of years of evolution to fit into a specific ecological niche, where it is well-fed and in balance with its predators and parasites, where it procreates and dies at a more or less predictable, steady rate. The rabbit was transplanted from such an environment in Europe to Australia. The fine climate and ready food supply were not counterbalanced by predators and parasites, so the rabbit population exploded. But with engineered bacteria, you change the rules of the game. An organism is modified to fit a certain environment; it can't survive or grow outside of it.

Domestication is a practice that makes for a much better comparison. It is an ancient tradition, begun thousands of years ago when primitive men first learned to tame wolves and coyotes, then goats, horses, and cattle. All domesticated animals arose from wild ones, and in the domestication process, men chose to encourage breeds which better served their own ends. The same selectivity was employed with plants. Wine and beer, for example, were made first with wild yeast, but men learned to cultivate strains with better flavor production, thus domesticating the microbial world.

Sorcerer's Apprentice?

The message is clear: We've been altering organisms all along, so engineered bacteria really isn't new or radically different. The visible ecologists and the environmental doomsayers are not being candid with the public when they suggest otherwise.

Yet people are afraid and we are still riding a second wave of the anti-genetics movement. Why? Because the whole new world brought to us by science and technology has not given us the free lunch we supposed they would. We have discovered that there are costs—from toxic waste, resource exhaustion, and thermonuclear danger to ethical medical dilemmas involving life and death.

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"The scientists responsible for developing bioengineering were the first to ask, 'Could this be dangerous?'"

Bernard Davis
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Because we must grapple with the consequences of any choices we make, surely there ought to be close scrutiny of new scientific methods. But we should not lash out at science, or at every innovation just because they may mean we have had hard choices to make in life. Who would wish to return to an existence in which a plow was only a sharp stick or patients underwent operations without anesthesia or in which vaccines were unknown just because these factors kept the growth of the world population at a "manageable" rate?

The visible ecologists would have us delay experimentation with engineered bacteria. "What's the hurry?" they ask. "A few years of testing will simply ensure that these new creations are perfectly safe." And they produce elaborate mathematical formulas to prove their case.

But much of the work that is being done in biotechnology is by small entrepreneurial firms. They can't survive years of delay or raise millions of dollars to wait for official regulatory approval. Nor should they wait on the grounds that a few more years' testing will prove anything more conclusive than what experience and principle has proven now.

The danger of overregulation in the sciences is mirrored by other ill-fated attempts to make the world conform to unreal standards. Americans' search for equal opportunity, for example, has been perverted into an irrational insistence on artifically-imposed measures like quota systems and the denial of individual capacities, talents, and drives. Just as there are differences among people, there is great diversity in the genetic world, and room for much more. Engineered bacteria are not some sort of sorcerer's apprentice threatening nature or humanity; they can be a great handmaiden to both.

Don Ritter
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of teaching the basic biology, chemistry, math, and physics skills which are essential to an understanding of science and technology in the world.

Most Americans are concerned about pesticides, air pollutants and the like. But they are unfamiliar with crucial facts about the hazards of daily life, like the fact that the cancer hazards of most "harmful substances" regulated by the government are literally outweighed by the dangers of chemical carginogens in the "natural" food we eat every day.

How then can we expect the American people to realize that not all man-made chemicals are dangerous, and, indeed, that most are actually "the grease for the gears of the modern technological society?" Furthermore, how can we expect them to appreciate the progress engendered by the democratic capitalistic experience in which scientific innovation plays such an important role?

One bitter fruit of our ignorance—and resulting fear—is the current attack on biotechnology, especially genetic engineering. As a result, the biotechnology industry, which has grown rapidly in the last few years and exhibits great promise, is on the brink of stalling. A stampede of rules and regulations could keep us held back in the laboratory, when we should be out in the marketplace. The good news is that countless laboratory and field tests are proving that biotechnology can work. In 1986, the widely publicized "Frostban" experiment in California demonstrated how engineered bacteria can safely be sprayed on strawberry plants to help them resist frost. In the long run, successful products like Frostban can help us avoid millions of dollars in damage for all kinds of crops.

Innovation Stalled

But if that seems like a reason to celebrate, the biotechnology industry isn't doing cartwheels. The company that makes Frostban, Advanced General Sciences (AGS), was so battered by a long and arduous regulatory struggle with the federal and state governments over testing that it had to merge with another company just to stay afloat. In January of 1988, the *New York Times* reported that other companies interested in developing genetically-engineered agricultural products are standing on the sidelines. Fewer than ten companies are now active in that field —and even if some are moving forward with field tests, they are all waiting for clearer signals from the regulatory agencies. The future, quite simply, looks uncertain.

Few laymen have the necessary knowledge to grasp biotechnology's potential, so it is no wonder that the critics of genetic engineering have been spectacularly successful in creating a sense of fear. Fear usually emerges from ignorance, and this is nowhere more clear than in biotechnology. Public anxiety over perceived environmental risks is outweighing sound scientific analysis and, when mirrored in public policy, is a serious obstacle to scientific innovation and the necessity to rapidly commercialize scientific advances.

At first the biotechnology community was self-regulating. The Asilomar Conference of 1975 established guidelines for recombinant DNA research in laboratories receiving federal funding. Since 1974, the Recombinant DNA Advisory Committee (RAC) of the National Institutes of Health (NIH) has relaxed the guidelines twice,

because scientists have been able to safely manage the risks associated with DNA research.

Prior to the 1980s, NIH took the position that no federal agency had the authority to regulate private biotechnology research, so the federal government was not involved in any further regulatory activity. The biotechnology industry began to grow, largely in the laboratory, and it complied voluntarily with RAC guidelines. During this time, proponents of regulation tried to convince Congress to make compliance mandatory, but their attempts were unsuccessful.

Thus, in the early part of this decade, many ambitious entrepreneurs entered the biotechnology field. Over two-thirds of all biotechnology firms have been in business for less than 10 years. These entrepreneurs can revolutionize the way we live: by working to find treatments for diabetes, cancer, and AIDS; by improving food production with stronger animals and hardier, disease-resistant plants; and by creating microbial organisms to control insects and toxic wastes.

They exhibit a refreshing "can-do" attitude. So it is not surprising that they

want to take their products out of the realm of the laboratory and into the real world. They desire to create useful commercial products and to make profits, but also to meet global challenges of hunger, disease, and waste disposal.

In the last few years, when the biotechnology industry was prepared to test its new products in the field, it faced a national uproar over whether genetically engineered organisms should be "released" into the environment. In the mid-to-late 1980s, it is understandable that the focus of legislative and regulatory attention had to shift: Guidelines for mere laboratory research—which were not appropriate any longer—had to be replaced. But this shift was dramatically affected by critics who dominated the public debate, casting a cloak of suspicion over all biotechnology innovation.

Jeremy Rifkin is biotechnology's most outspoken critic. He was quoted in the *Washington Post* in early 1988 as saying that genetic engineering is "so powerful and so inherently wrongheaded that 'in the mere act of using it, we have the potential to do irreparable psychological, environmental, moral and social harm to ourselves and the world.' "

It hardly mattered amidst such widely-believed but unwarranted charges that the scientific community has overwhelmingly decided that biotechnology is safe. The National Academy of Sciences published a report in 1988 on the possible environmental risks associated with the deliberate release of genetically engineered organisms, concluding that there "is no evidence that unique hazards exist in either the use of recombinant DNA techniques or in the movement of genes between unrelated organisms." Some significant field tests have shown that microorganisms aren't posing *any* hazards. But no one has stepped forward to tell this to the American people. News, especially good news that isn't sensational, just doesn't make the front page, so biotechnology's opponents continue to file lawsuits and grab publicity.

Regulatory Agency Overlap

Fortunately, the study group which President Reagan established in 1984 to review biotechnology regulation opted for a balanced approach. It decided to create "a coordinated and sensible review process." This process, it was hoped, would "minimize the uncertainties and inefficiencies that can stifle innovation and impair the competitiveness of U.S. [biotechnology] industry," while simultaneously weighing risks. The result was a document called the "Coordinated Framework for Regulation of Biotechnology." Whether it is genuinely coordinated, however, remains to be seen.

The "Framework" states quite correctly that existing regulations are adequate, but in its preamble, it lists five separate federal agencies which have statutory authority over all biotechnology research and development: the National Institutes of Health (NIH); the United States Department of Agriculture (USDA); the Environmental Protection Agency (EPA); the Food and Drug Administration (FDA); and the Occupational Health and Safety Administration (OSHA). There is considerable overlap of authority between these watchdog agencies, and to make matters worse, the preamble leaves crucial definitions like "release into the environment" up to subsequent determination.

> "The scientific community has overwhelmingly decided that biotechnology is safe."

Immediate problems have resulted since regulators have begun to apply laws to microorganisms designed to regulate plants, pesticides and foods. Companies desiring to comply with regulations are unsure of how to do so, or they receive conflicting information from the government. And the result is too often a loud hue and cry in the media. We can return to the example of the AGS product, Frostban, whose concept was simple: Researchers started with two bacteria called *pseudomonas*, which have literally been with us since the beginning of time. They altered one single gene, leaving the microorganism unable to form ice at low temperatures.

Moonsuiting the Biotechnology Industry

AGS's first rooftop test of Frostban complied with NIH guidelines for a deliberate release. Those were the first such guidelines available. But because the company hadn't obtained the EPA's approval, the EPA fined the company and delayed further testing. The EPA finally approved outdoor tests. Local regulators thereupon jumped into the act and required testers to wear moonsuits—yes, moonsuits like astronauts wear, complete with helmet, gloves, and breathing pack—and required them to erect a fence around the test site!

According to a reporter's account of the second Frostban test, a dozen people swarmed over a strawberry patch the size of two tennis courts, distributing hundreds of petri dishes and setting up equipment on steel towers. (The drama mounted when a vandal trespassed upon the plot and uprooted some of the strawberry plants. An environmental protester stood before television cameras and praised this act.) Then, an AGS scientist dressed in a moonsuit took up a garden sprayer; simultaneously, the EPA official present at the site signaled for some 60-odd vacuum pumps to begin to suck up air samples. And the intrepid scientist, probably bewildered by all the attention, began to spray.

I can't imagine a scene more carefully crafted to frighten the biotechnology industry into abandoning its plans to test new products. Nor is this experience unique. The statutes themselves create ample opportunities for confusion. Let us assume that a company desires to genetically engineer a plant that will resist diseases. Well, under the Federal Insecticide, Fungicide and Rodenticide Act (FIFRA), the EPA regulates pesticides. Under the Federal Plant Pest Act (FPPA), the USDA regulates plant pests. So both agencies would have jurisdiction to review the application. The company would face at least two standards of review and chances are other agencies would also claim jurisdiction.

Experience with the current regulatory system suggests that it is time for reform. Regulatory uncertainty is quite simply eroding America's lead in biotechnology. Other nations are moving more aggressively into commercial products and processes. We need to streamline the cumbersome bureaucratic tangle that arose under the so-called "Coordinated Framework," in order to bring more certainty to the process, and, above all, to allow American biotechnology companies to confront global competition head-on.

New companies, new jobs, and indeed whole new technologies and new industries are within our grasp. Great goals of human endeavor are at stake. We must create a climate where biotechnology can help us reach them.

Hillsdale's Biology: For a Small School, Nobody Else Comes Close in Research

The Center for Constructive Alternatives seminar, "Biotechnology: New Cures and New Dilemmas" informed Hillsdale students of recent advances being made in the field of biotechnology. But not all such discoveries necessarily come from large labs at huge universities. Crammed into their hall in the Strosacker science building, Hillsdale's biology students and faculty don't believe that breakthrough research should be left for the big guys. At Hillsdale, breakthrough research is "where it's at."

"For a college of our size and number of faculty, no school in the nation approaches us in terms of the amount of research our students do," said Ted Platt, associate professor of biology.

Platt's main research interest lies in studying birth defects. For the past six years, he and his students have been exploring the effects of various chemicals on the unborn.

Hillsdale's research is limited to the effects of chemicals on mice, but Platt believes that anything that will react in a mouse will react the same way in a human.

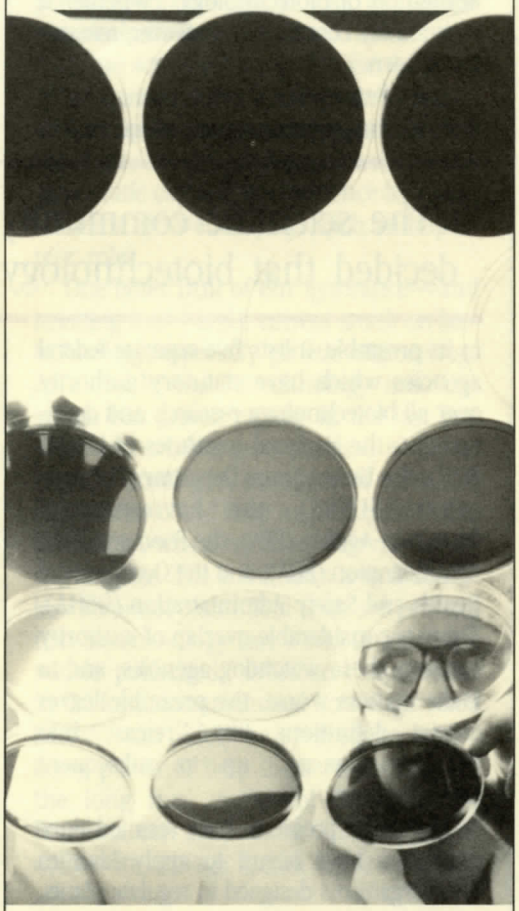
"So far," he said, "everything that will hurt a human baby can be given in mouse equivalents and cause the same damage in the mouse." Platt says that the reverse is also true. He says that if they can correct the mouse then they can get the same correction magnified by the size of the person. His students, he says, publish at "mouse level" and let others take the research from mice to humans.

Platt sees this type of research as especially helpful for hospital hotline services, doctors, and for pregnant women.

"The usual recourse in a case where an expectant mother has been exposed to dangerous chemicals was abortion," Platt said. "But I wanted to come up with ways to save the child, and that's what's really thrilling for the students. They realize that they're working with a mouse, but they're thinking about saving a human being."

"The field of teratology has primarily been concerned with 'what hurts kids,' not 'what can we do about it?' I think Hillsdale College is turning that around. We're now saying, 'This hurts kids - okay, can we fix it?' More people are now trying to do something about birth defects and our students are contributing," he added.

Their contributions are rapidly becoming noticed in scientific circles. Hillsdale biology students travel nationwide to deliver papers at meetings of scientific organizations, such as Sigma Zeta and Beta Beta Beta, scientific and biological honoraries. In 1987-88, Hillsdale's chapter of BBB beat out the likes of Purdue, Loyola and the University of Michigan to receive the Lloyd M.



Berthof Award as the best BBB chapter in the country and recently, at the 92nd annual meeting of the Michigan Academy of Science and Letters meeting held in Saginaw, students Tandy Champion, Sarah Ellenberger and Marc Richards all presented papers.

Hillsdale's Biology Department does not limit itself to birth defects research, nor does it limit itself to bench work. Ongoing research includes studies on the effects of flouride on teeth, calcium absorption in older women, isolating genes and DNA and other topics.

The Department also uses computer simulated experiments. Dr. Sam Townsend, professor of biology and science division chairman, explained that computer simulations make it possible for the Biology Department to provide students with experience equivalent to working with the most sophisticated laboratory apparatus, without having to buy the equipment.

To help ready students for delivering research papers—and as part of graduation requirements—the faculty of the Biology Department gets together with junior and senior biology majors each Tuesday and Thursday to hold their own "conventions" in which students deliver the findings of their research. Students and faculty are selected to make presentations by lot. Each draws a marble, and those holding red marbles deliver their papers.

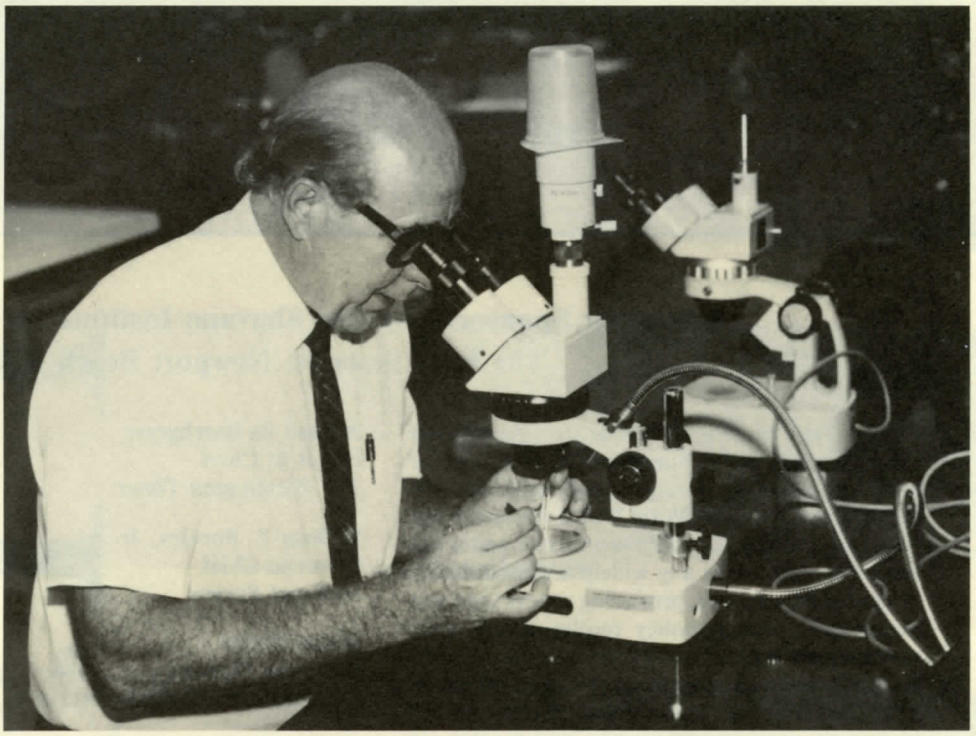
"You would see a very slight difference between some of the papers presented by our students and those presented by members of national scientific associations," Townsend said. "As a matter of fact, I hear papers presented by our seniors at those Tuesday and Thursday sessions that are superior to papers presented at national meetings."

Townsend said that these mini-conventions prepare students to go out and speak on a larger scale and work as real biologists.

"A person can major in biology in a lot of places and never have 'been on stage,' never do what biologists do, which is to research and deliver their findings," he said. "When they deliver their papers to us, we tease, we criticize, but we're home, we're all good friends."

Townsend explained that the Biology Department tries to create a relationship between the students and their teachers that is based on mutual respect. "Our relationship with students

is different, even compared with other small colleges," he said. "Here, it's the way things used to be in the '50s at all small colleges. A lot of small colleges have adopted a big university model that is publish or perish for their faculty. That is not to say that we are not successfully doing research, because we do a great deal of it, but it is student/faculty research. We have younger and older biologists in the Department, we do not have students we're going to dictate to."



Hillsdale Professor Ted Platt at work in his lab in Strosacker Science Center.

Center for Constructive Alternatives Seminar "Biotechnology: New Cures and New Dilemmas"

At the Center for Constructive Alternatives seminar, "Biotechnology: New Cures and New Dilemmas" held on the Hillsdale campus in March 1988, Dr. Thomas Althuis, director of science policy affairs for pharmaceutical manufacturer, Pfizer, Inc., noted that although the term biotechnology is recent, the age-old practices of fermentation and cross-breeding are examples of biotechnological modification. Dr. Gwen G. Krivi, a science fellow in the department of biological sciences at Monsanto, discussed animal and plant agriculture and speculated on future improvements in both areas.

Dr. J. Gregory Zeikus, president of the Michigan Biotechnology Institute, spoke on the utilization of renewable resources. He focused particularly on new methods of transforming low value agricultural products like corn into high value goods like biodegradable plastic. Iowa State University professor Dr. Donald S. Robertson touched on the problem of malnutrition in the Third World and how biotechnology is helping to overcome it. His own research and others' may soon end one of the world's leading causes of death: Vitamin A deficiency.

Dr. Russell Blaylock, a neurosurgeon from North Carolina, described what he called the anti-technology stance of the New Left which equates scientific innovation with "greedy capitalism" and warned that this would prevent the development of badly needed technologies. Dr. Reed E. Pyeritz, who directs the Johns Hopkins Medical Genetics Clinic, explained how genetic screening can be used to detect and even prevent birth defects and disease. Dr. V. Elving Anderson, associate director of Dight Laboratories and a professor of genetics at the University of Minnesota emphasized the need for us to consider the moral and ethical questions which arise from genetic engineering. Biotechnology can be a wonderful tool to "improve our ability to behave responsibly toward God and our fellows" if used with this end in mind, he concluded.

On the final day of the CCA seminar, a panel discussion included Joan Thierstein, assistant patent counsel for Parke-Davis and Hillsdale faculty members: Robert Blackstock, associate professor of law; and Donald Heckenlively, Ted Platt, and Francis Steiner, members of the Biology Department.

THE FUTURE OF
U.S.-SOVIET RELATIONS
May 24-25, 1989

A Seminar Sponsored by The Shavano Institute for National Leadership
The Four Seasons, Newport Beach, California

That there exists a worldwide struggle between democracy and communism was once a central tenet of American foreign policy and military defense. But this post-World War II consensus has been under attack for over twenty years and it has not been replaced by any widely accepted theory or concerted response, producing a weakened and inconsistent foreign policy resolve which compromises our leaders' ability to act in the national interest. One moment we speak of the Soviet Union as an "evil empire" and the next discuss cultural exchanges, arms control treaties, and the "moral equivalence" of the two superpowers. Ironically — perhaps tragically — we are sincere in each case.

The realities of geopolitics demand that we come to the negotiating table, but we must do so with a clear idea of who we are dealing with and how we ought to respond. Can we reach verifiable arms control agreements? Is "glasnost" genuine? Are our systems irreconcilable? Do we retain enough of the old values — the old "Cold War mentality" — to discern between our friends and our enemies? If so, can we recover the political and moral will to respond to each without the ambivalence which has characterized our recent rhetoric and actions?

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