of truth. We now live in a society that is so complicated it cannot exist without almost total mobilization of brain power. And the modern university is much more than the custodian of the accumulated wisdom of the past, transmitting to each successive generation what is then judged to be the best that man has conceived and performed. It is not only the primary wellspring of new knowledge, it is also the primary stimulator of change. It is for these reasons that demands for service have converged on the university from all sides: federal, state and city governments, industry, the professions, and voluntary organizations.

The university has developed considerable strength to resist attempts by outsiders to twist its arm, even in response to the popular will. The Joe McCarthy era is not very far in the past. At that time the Senator had almost succeeded in bewitching the country with his fantasies about domestic Communists and he had the Congress and most of the federal agencies pretty much cowed. But the best of our universities stood up to him.

So much for power plays against independence from the outside. What about power plays from inside the campus walls? For the first time, violence is being used by members of the university community to influence decisions and to bring about rapid change. Even if we assume that all this change has been both constructive and overdue, what about the tactics being used to bring it about? Are the needs for change so great and so immediate as to justify the glorification of force over reason on our campuses? Is it merely upsetting to defenders of the status quo? Or is it threatening to break down the barriers that have been built so carefully over so long a period to protect the university's independence? Once you invite the state onto the campus to quell disorder, will it stay to quell dissent? This is not an idle question, as anyone knows who has been reading the speeches and legislative proposals of congressmen and governors.

It is abundantly clear that the university is being pushed into the vortex of our sociological morass with unrelenting demands for its participation in changing the basics of our society. We now realize that no academic institution can ignore the question of relevance, nor can it resist the responsibility to take part in the resolution of difficulties which affect the welfare of the community and of our society. The question is how it can serve its primary function—teaching and scholarship—when new commitments to society create a totally new world for academe.

One thing above all else must remain strong on our campuses if the universities are to serve society beneficially. This is the freedom to speak one's mind and the freedom to participate in responsible dissent. This is the basis of the long, hard battle for tenure fought for by university professors which allows them to behave as scholars and critics without fear for their jobs.

But the best protection for the university—and thus for all of us—is the openness and pluralism of society as a whole. If we continue to relish the fresh air of new opinions—no matter how hard they are to take; if we refuse to become submissive to authority, just because it is authority; if we continue to listen to reason, sweet or sour, instead of becoming consumed by the righteousness of our own feelings; and above all, if the university is willing to fight for its independence and we are ready to fight alongside it, I believe all will be well.

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NEWS AND COMMENT

Ernest J. Sternglass: Controversial Prophet of Doom

Ernest J. Sternglass, professor of radiation physics at the University of Pittsburgh, has a startling and alarming theory. He believes that low doses of fallout from nuclear weapons tests may have caused more than 400,000 infant deaths and more than 2,000,000 fetal deaths in the United States since the early 1950's. Few reputable scientists believe Sternglass has the evidence to support his contention. But that hasn't stopped Sternglass from making an unusual public impact. Indeed, for a man who is so widely regarded as wrong, Sternglass has achieved surprising exposure on the nation's airwaves and in the mass media.

Thwarted in his efforts to win scientific recognition for his theories, Sternglass has increasingly chosen to take his case directly to the public. He has injected himself into presidential politics and the recent ABM debate; he has appeared on such influential television programs as the Huntley-Brinkley Report, the Today Show, the CBS Morning News, and Martin Agronsky's Washington; and he has authored an article entitled "The death of all children" for *Esquire*, a mass circulation magazine that published his piece in record time without bothering to check whether the theory was regarded as scientifically sound.

Despite his efforts to influence public policy, Sternglass seems to have had no measurable impact on either the 1968 presidential election or the recent ABM vote. But there are some intriguing hints that his disputed theories may have played a part in the behind-the-scenes maneuvering that led to the 1963 atmospheric test ban treaty. And Sternglass has a way of popping up in all sorts of state and local issues. He appeared as an "expert" witness in a recent court suit that sought, unsuc-

cessfully, to prevent an underground nuclear shot in Colorado. And he was a vociferous critic of a proposed underground blast in Pennsylvania that was ultimately abandoned.

To say that Sternglass has become controversial is understating the case. The Atomic Energy Commission (AEC), which has been cast in the role of an unwitting murderer of innocent babies, tends to get apoplectic at the mention of Sternglass' name. "You can't believe how many things he's said about so many things that are so wrong," says William R. Bibb, an AEC scientist who has spent full time for the past half year checking out Sternglass' assertions. The AEC has tried to discourage TV programs from airing Sternglass' views and has frantically rushed speakers into action to rebut Sternglass' contentions.

Various investigators who have looked at Sternglass' work have also attacked him in unusually harsh language. Arthur R. Tamplin, of the Lawrence Radiation Laboratory, has distributed a critique which describes Sternglass as "obsessed" with his data. And the director of New Zealand's National Radiation Laboratory has accused Sternglass of making a "false and irresponsible statement" with respect to the impact of fallout on infant mortality in Australia and New Zealand.

Sternglass, who sees himself as the bearer of information that may save the human race from extinction, just shrugs off the criticism. "I'm stimulated by controversy," he said in the course of an 8-hour interview with *Science*. "Some of my best ideas come when I get mad enough to look into something. Scientists are too afraid of exposing themselves to public calumny and scrutiny." As Sternglass views it, most of his critics have links with the AEC, the nuclear industry, and other "powerful forces" that are trying to discredit him. "I told my wife, if I get run over by a car, don't believe it," he says, only half in jest.

The stakes in the battle between Sternglass and the nuclear-industrial-military-scientific complex are enormous. If Sternglass is right, then nuclear war becomes even more unthinkable than it already is, the antiballistic missile becomes a threat to human life, the peaceful use of nuclear explosives to dig canals or harbors would probably have to be abandoned, and nuclear reactors would have to be built so as to contain all radiation—a precaution which would add considerably to the cost of reactors and thus damage their competitive position versus other energy sources.

Ernest J. Sternglass

Scientific groups and organizations which have looked into Sternglass' data have generally found it unconvincing. Two journals—*Science* and *Nature*—have recently rejected papers in which Sternglass set forth the evidence supporting his views. Two government agencies—the AEC and the Department of Health, Education, and Welfare—have assigned specialists to check out aspects of Sternglass' theory and have concluded that the evidence doesn't hold up under close scrutiny. And even the Federation of American Scientists (FAS)—an organization that is particularly devoted to reducing nuclear hazards—has shied away from supporting Sternglass. At Sternglass' instigation, the FAS early this year appointed a committee—headed by John Edsall, the noted Harvard biologist—to review the data Sternglass had accumulated. According to Cameron Satterthwaite, who was then chairman of the FAS, the committee concluded that the FAS "couldn't possibly defend Sternglass because there were so many questions unanswered in his paper."

Few scientists seem willing to say publicly—or even privately, for that matter—that Sternglass has made a persuasive case. The most they will say is that he should be listened to. Thus Freeman J. Dyson, a physicist at the Institute for Advanced Study, in Princeton, N.J., has written: "The evidence is not sufficient to prove that Sternglass is right. The essential point is that Sternglass may be right. . . . we have no justification for dismissing Sternglass's numbers as fantastic."

Sternglass has also received encouragement from Karl Z. Morgan, director of the health physics division at the AEC's Oak Ridge National Laboratory, who is currently president of the International Radiation Protection Association. Though Morgan is inclined to "doubt very seriously" that Sternglass is right, he nevertheless calls Sternglass' data "highly suggestive" and says it "demands an answer." Similarly, Rene Dubos, noted pathologist at Rockefeller University, while dubious about Sternglass' theory, told *Science* it would be "a social crime" not to investigate fully whether fallout has helped cause infant mortality rates to worsen.

Sternglass has long had the reputation of being an extremely bright and original thinker—though one with rather "far out" ideas. He worked for Westinghouse Research Laboratories in Pittsburgh from 1952 to 1967 and is remembered by William E. Shoupp, vice-president for research at Westinghouse, as a "very brilliant and creative guy." Sternglass won his doctorate in engineering physics at Cornell in 1952 and, by his own admission, had "trouble" at Cornell because of his "outspoken ideas" on elementary particles. He has worked on elementary particles under such eminent physicists as Robert Hofstadter, Philip Morrison, and Louis de Broglie, and has published papers suggesting that all particles may eventually be describable in terms of electrons and positrons in relativistic motion. Sternglass says his particle theory "contradicts everything in quantum electronic physics" and adds that he has been able to get his papers published in reputable journals only through the intervention of eminent scientists. "I have to find Nobel Prize winners willing to stick their necks out to get anything published," he says. "I always find a new way of looking at things, so I'm not surprised when people say I'm not right."

Sternglass first became concerned about fallout during the great national debate over fallout shelters in the late 1950's. The Pittsburgh chapter of the Federation of American Scientists (FAS) decided to conduct a study of the effect of a nuclear attack on Pittsburgh and Sternglass was chosen to assess the effects of low-level nuclear radiation. "I got very concerned," he recalls of that original study. "I had thought about building a shelter myself but I realized that it was no use. I couldn't dig deep enough and stock in enough food to keep myself and my kids alive."

In 1962 Sternglass became even more troubled. He was then chairman of the Pittsburgh FAS and another great national debate was shaping up—this one over the need for a nuclear test ban treaty. Sternglass came across two articles in 1962 that influenced him greatly. One article noted that there had occasionally been unusually heavy fallout in certain localities, such as the Albany-Troy area in New York in 1953. The other confirmed that diagnostic x-rays given to pregnant women seemed to be associated with increased cancer in the children. Sternglass put the two ideas together and concluded that fallout—like the x-rays—might also damage unborn children. "I said to myself: 'By God, this really means we must worry about fallout'," Sternglass recalls. " 'By God, we had better get a test ban.' " Sternglass put his ideas down on paper and ultimately, after an initial rejection, got the paper published in the 7 June 1963 issue of *Science*.

The paper in *Science* was controversial at the time, and it remains controversial, but Sternglass believes it played a role in the government deliberations that led to the atmospheric test ban treaty that was signed in 1963. Early that year, even before the paper was accepted by *Science*, Sternglass sent a draft copy of it to Arthur M. Schlesinger, Jr., then a special assistant to the late President Kennedy. Sternglass is under the impression that Schlesinger passed the paper on to Jerome B. Wiesner, Kennedy's science adviser, and that Wiesner, after checking it out with a prominent Nobel laureate, then showed it to the President and used it as another argument demonstrating the need for a test ban. The only evidence Sternglass can produce to document his impression of events is an inconclusive, but nevertheless intriguing, letter from the assistant librarian at the British Ministry of Health, dated September 1963. The letter asks for a copy of Sternglass' paper and says: "Our attention has been drawn to your report on the effects of the last round of Russian and American nuclear tests, which I understand was presented to the President of the United States on 10th June."

Schlesinger told *Science* he doesn't recall anything about the Sternglass paper. Wiesner told *Science* he "vaguely" remembers getting the paper but he doesn't recall showing it to the President. Wiesner says the fact that he remembers the paper indicates it was a "non-trivial input" into the test ban deliberations, but he says it was certainly "not a major factor at that time."

After Sternglass' report appeared in *Science*, numerous arguments were raised to dispute its conclusions, including one argument which Sternglass found "devastating." The New York State Department of Health published a table of leukemia cases in children in the Albany-Troy-Schenectady area along with a statistician's note saying the 1953 fallout did not seem to be connected with the leukemia incidence in children born in 1953. Sternglass, who had been assuming that the fallout radiation would do its damage to children while they were *in utero*, was temporarily stumped. But several years later he noticed a paper suggesting that x-rays cause genetic damage and he "suddenly realized that my suspicions were right about Albany-Troy." He concluded that fallout—like the x-rays—might cause genetic damage and that this would affect children who had not even been conceived at the time of the fallout. Sternglass wrote to the New York State Health Department asking for more data on Albany-Troy and got back what he regards as a "vicious letter" refusing to supply him with any more data. But he says the problem "kept nagging me—I felt there was some fantastic thing that needed to be brought out." At the June 1968 meeting of the Health Physics Society in Denver, Sternglass presented a new paper arguing that fallout radiation had caused a doubling of leukemia in Albany-Troy over an 8-year period, partly as a result of genetic damage. He submitted his paper to *Science* but it was criticized sharply by the reviewers and ultimately rejected.

Since the middle of last year, Sternglass has been trying to buttress his theory with new evidence. His motivation, at least in part, is frankly political. Last October, Sternglass began to get "worried about the election." He noted that Richard Nixon's scientific advisers included Edward Teller, Willard Libby, and others whom he regards as advocates of nuclear testing. He also noted that General Curtis Lemay, vice presidential candidate on the American Independent Party ticket, made a speech in Pittsburgh asserting—as Sternglass recalls it—that the only ill effects of nuclear testing were "a few hot crabs at Bikini." Says Sternglass: "I realized the battle was only beginning. I had to find

House Threatens Unrestful Colleges

The House of Representatives has aimed an angry jab at colleges and universities in which there have been student disturbances about military presence on the campus.

A section of the House military procurement authorization bill, which passed the House by an overwhelming vote on 3 October, would hold up all Department of Defense research contracts or grants to a university or a university employee until 60 days after the filing of a report with Congress. The report, which presumably would be filed by the Defense Department, would state, among other things, "the record of the school, college, or university with regard to cooperation on military matters such as the Reserve Officer Training Corps and military recruiting on campus."

There is nothing in the bill indicating what Congress might do if it were dissatisfied with one of these reports, and it is not clear what Congress *could* do. The Senate version of the military authorization bill did not include this provision, and a House-Senate conference committee was to decide whether the provision would become law.

Both the Defense Department and the White House Office of Science and Technology opposed the reporting provision. One OST official, Hubert Heffner, suggested that the provision, ironically, might encourage the kind of protest Congress seeks to punish. If a student wishes to get the university out of military research, Heffner said, "all he has to do is be nasty to ROTC and the implication is that defense funds to the university will be cut off."—JOEL R. KRAMER

Joel R. Kramer, a recent Harvard graduate, has joined Science *as a news intern.*

more evidence that nuclear testing produces long-range biological effects."

In what he describes as a "desperate" frame of mind, Sternglass went to the public library to try to answer the criticisms made of his theory by the *Science* reviewers. He got out a book of vital statistics covering New York State and, while going down a column containing fetal death rates, he noticed that they seemed to be declining from 1935 to 1950, then started to level off. "My God," he says. "Within a matter of a few hours I had seen the fantastic story. The fetal deaths leveled off and went up again after the nuclear tests. I said, 'My, God. What have I found?' I didn't need a single piece of classified information or anything from the New York State Health Department. It was all there in the vital statistics."

Sternglass fired off another paper to *Science* setting forth his new evidence. It, too, was rejected. He also called a special meeting of the Pittsburgh FAS to discuss his findings and to generate some press coverage. In addition, he mailed a batch of material to Wiesner, who was advising Hubert Humphrey in the campaign, and to former Democratic Senator Joseph Clark, along with a suggestion that the Democrats might want to use the material in their campaign. "People say Sternglass is politically motivated," he says. "Of course I am. I was desperate. I was sitting on what I regarded as the most fantastic knowledge with the most horrendous effect on the future of mankind." The Democrats, however, were afraid to use Sternglass' material.

Spreading the Message

Undaunted, Sternglass has continued to seek outlets for his views. In April, the *Bulletin of the Atomic Scientists*, a journal of political opinion, published one of his articles after getting sharp "pro" and "con" opinions from a number of scientific advisers concerning the article's merit. "We felt the issue was sufficiently important so that his views ought to be called to the attention of the scientific community," says Richard S. Lewis, the *Bulletin's* managing editor. In May, Sternglass gave an invited paper at an AEC-sponsored symposium in Hanford, Washington—"right in the lion's den," as he describes it. In June–July he gave another paper to the Health Physics Society, had a letter published in the New York *Times*, made the front page of the London *Observer*, wrote pieces for the *New Scientist*, a British magazine, and for *Medical Tribune*, a newspaper for doctors, and appeared on Canadian TV. In August, he was featured in broadcasts in Australia and New Zealand.

Meanwhile, *Esquire* magazine had spotted Sternglass' letter to the *Times* and asked him to expand it into an article. Harold Hayes, *Esquire*'s editor, says the manuscript was edited in a single hectic weekend and printed in less than 3 weeks—"the fastest this magazine has ever turned around." *Esquire* took out full-page ads to advertise the article, promoted television appearances for Sternglass, and distributed advance copies to all senators before the ABM vote. The article asserted that fallout from a large-scale ABM firing could "cause the extinction of the human race." However, the Sternglass theory seems to have played no important role in the ABM debate, partly because the pro-ABM scientists, like the Democrats the previous fall, were afraid to touch it. Hayes said *Esquire* checked informally on Sternglass' professional reputation but made no effort to get outside scientific opinion on the merits of the article. "The fact that he is an accredited scientist seemed to us to qualify him to draw conclusions," Hayes said.

Sternglass does not claim to have a complete explanation for how fallout can cause infant and fetal deaths, but in his recent scientific papers, popular articles, and television appearances, he has given a rough sketch of how the harm may be done. He suggests that strontium-90 from the fallout contaminates milk, food, and other environmental materials, then is ingested, and goes to the reproductive cells of a man or woman where it is somehow incorporated into the genetic material, causing chromosomal damage. As a result, babies conceived a year or more later tend to be underweight and less able to resist infection, so they fall easy prey to such "normal" diseases as pneumonia and influenza. "That's the tragic thing," Sternglass explains. "That's why it wasn't noticed formerly, because all that happens is that radiation tends to cause underweight babies." Sternglass says the bulk of the children killed by fallout "did not die of bone cancer; they did not die of leukemia. They died, apparently, of all the normal conditions."

Sternglass cites two principal types of evidence in support of his theory. First, he produces statistical data purporting to show that changes in fetal and infant death rates for the United States as a whole, and for various states and localities, as well as leukemia rates in Albany-Troy, show a close correlation with the time of nuclear weapons tests in the atmosphere. Second, he cites laboratory and epidemiological studies which indicate, he says, that the statistical correlations he has found reflect a causal relationship. On both counts, Sternglass has been subjected to sharp criticism.

Core of Argument

The core of Sternglass' argument can be seen in his discussion of the infant mortality rate for the United States as a whole. Sternglass notes that the rate declined steadily from 1935 to 1950, but then leveled off for a number of years, more or less coincident with the 1951 commencement of atmospheric tests in Nevada. The rate only resumed its previous decline, Sternglass says, after the enactment of the atmospheric test ban treaty in 1963. Sternglass suggests that the infant mortality rate "ought" to have declined at its 1935–1950 pace for the entire period. He suggests that the *excess* of infant mortality over what the mortality *should* have been if the 1935–1950 decline persisted can be attributed wholly or substantially to fallout from the weapons tests. That's how he gets his 400,000-plus figure.

Most critics seem willing to grant that the infant mortality rate in the United States did indeed worsen after the weapons tests, but they say Sternglass has no reason to assume that the 1935–1950 rate would continue indefinitely. Tamplin, of the Lawrence Radiation Laboratory, for example, attributes the relatively "good rate" of 1935 to 1950 as due to the introduction of antibiotics and improvements in the socioeconomic conditions of the poor. He also claims that fetal death rates in England —which presumably should also have been affected by fallout—don't show the same trend.

One of Sternglass' most provocative bits of evidence is a map purporting to show that there was "excess" infant mortality in a band of Southern states that he describes as "downwind" of the first "Trinity" nuclear test at Alamagordo, New Mexico, in 1945. Sternglass contends that the fallout drifted eastward from New Mexico and that by 1950 there was substantial excess infant mortality in those Southern states over which it had drifted. He calculates the excess mortality by comparing 1950

figures with the trend for a base period of 1940–1945. But Edythalena Tompkins and Morton L. Brown, of HEW's Bureau of Radiological Health, have recalculated the rates and have discovered that 1950 is the only year that gives Sternglass his result. If 1947, 1948, 1949, or 1951 are used, a different pattern of states with "excess" deaths emerges. Similarly, if the base period is changed to 1935–1945 to coincide more nearly with the base period Sternglass uses in other discussions, then there seems to be no effect. To top it off, the AEC contends that the fallout cloud from Alamagordo did not even go eastward. On this point, Sternglass appears on shaky ground. His authority for saying that the cloud went eastward is a popular book written by a *Time* magazine correspondent, but a perusal of that book reveals that it has parts of the cloud drifting in several different directions—none of them eastward.

Sternglass' efforts to prove a causal link between fallout and infant mortality has run into even sharper criticism than his statistical analyses. In his *Esquire* article, Sternglass announced that "the causation problem now appears to be solved." He cited Swedish experiments in which mice injected with what Sternglass described as "small amounts" of strontium-90 experienced genetic damage. But shortly afterward Karl Gustav Lüning, the leader of the Swedish experiments, publicly disputed Sternglass' interpretation of his data. "The effects are very small," he said, "and the doses given the mice were at least 1000 times stronger than a human can obtain after a nuclear test." On another occasion, Sternglass cited studies by the British epidemiologist, Alice Stewart, as suggesting a causal relationship, only to have Dr. Stewart turn around and write an article disputing his theory.

How could Sternglass achieve such wide exposure for his views when so many scientists believe he is wrong? Part of the answer probably lies in the fact that Sternglass makes good press copy—he has a startling theory that relates to important public issues. Another explanation is that Sternglass is in tune with a number of deep public moods—the revulsion against the military, the desire to end contamination of the environment, and the tendency to disbelieve the rosy reports emanating from government agencies.

A third explanation blames the scientific community for not denouncing Sternglass earlier. "They won't come

NEWS IN BRIEF

• **COLUMBIA SUIT TO REVOKE Ph.D. DEGREE:** Columbia filed a lawsuit—the first of its kind in the university's history—to revoke a doctoral degree in economics after a Canadian economist complained that his work had been plagiarized. Following more than a year of academic investigation by Columbia scholars, the university charged in the New York State Supreme Court that Constantine Thanos, former deputy governor of the Bank of Greece, plagiarized his thesis from the work of J. A. Galbraith, a professor of economics at McGill University in Montreal. The investigative panel, headed by Columbia economist Harold Barger, concluded that Thanos' degree, granted in 1962, was awarded on the basis of a thesis that bears more than a coincidental similarity to Galbraith's work, completed several years earlier.

• **HERBICIDE DISPOSAL EXPERIMENT:** A controversial experiment in the natural open-air destruction of a persistent herbicide (2,4-D) has been approved by local Oregon officials who had initially blocked the federally sponsored attempt by Oregon State University (OSU) to test a new poison disposal method until the safety of the project could be assured. The project, headed by Robert L. Goulding of OSU's Environmental Health Sciences Center and funded by a $68,000 grant from HEW, will measure the effectiveness of the poison disposal method on a 5600-acre tract of private land near Alkali Lake, about 340 miles southeast of Portland. Large quantities of previously undisposable liquid will be spread in small plots on the land and scientists will observe whether the combined effects of sunlight, air, and microorganisms in the soil will degrade the agricultural poison. The herbicide manufacturing plant that produced the toxic liquid is reported to have more than 500,000 gallons of toxic materials stored at the Alkali Lake site awaiting disposal.

• **SOVIET, EAST EUROPE EXCHANGES:** U.S. scientists interested in current scientific research activities in the Soviet Union or Eastern Europe are invited to apply to the National Academy of Sciences (NAS) for Soviet Eastern European exchange program grants. Under existing agreements, NAS, in cooperation with the Soviet Academy and the academies of sciences in Czechoslovakia, Poland, Romania, and Yugoslavia, will offer 1- to 12-month visits during the 1970–71 academic year. Applications should be filed before 24 November with the Office of the Foreign Secretary (USSR/EE), NAS, 2101 Constitution Avenue, NW, Washington, D.C.

• **CASE HISTORY OF THE VIETNAM DEFOLIANT CONTROVERSY:** A study of the military use of defoliant chemicals in the Vietnam war and the attitudes of U.S. scientists concerning its use has been published by the House Science and Astronautics Committee. The study, which was prepared at the request of Representative Emilio Q. Daddario (D–Conn.), is a historical record of a 3-year ongoing debate over the use of weed-killing chemicals as a warfare weapon. The report centers upon the process by which the American Association for the Advancement of Science undertook to assess the ecological effects of the military use of chemical defoliants and herbicides in Vietnam. The report was prepared by the Science Policy Division of the Legislative Reference Service in the Library of Congress and may be obtained from the House Science and Astronautics Committee, 2321 Rayburn House Office Building, Washington, D.C. 20515.

• **SCIENCE-FOREIGN AFFAIRS STUDY:** A House foreign affairs subcommittee, chaired by Representative Clement J. Zablocki (D–Wis.) is conducting an 18-month study of the operations of government in dealing with international issues and problems of a scientific nature. One of the main purposes of the study is to determine how U.S. foreign policy can be improved to keep in stride with international technological and scientific innovations; the study will focus in particular on the way in which the State Department uses diplomacy to solve international scientific problems. The study is being conducted by the Legislative Reference Service of the Library of Congress at the request of the House Foreign Affairs Subcommittee on National Security Policy and Scientific Developments. The first phase of the report, which includes an annotated bibliography of published materials on the topic, is expected to be completed by the end of the year.

out publicly and say this guy's wrong," complains Bibb, the AEC's Sternglass-watcher. "People don't want to get involved." A few prominent scientists, in fact, have privately encouraged Sternglass to plunge ahead with his work. One Nobel laureate, who was prominent in the development of the atomic bomb, told Sternglass in a letter last February that he found the evidence "very impressive," particularly the map showing excess mortality "downwind" of the Trinity site. The letter raised several questions about Sternglass' theory but said: "In view of the enormous statistical significance of the results you plot on your map of the United States, it is difficult to question your findings." Sternglass, not surprisingly, interprets this as an endorsement of his findings. But that same Nobel laureate told *Science* he thinks it is "highly probable" that Sternglass is wrong. He said he was simply encouraging Sternglass to publish his theory because "I'm very much against people speaking the party line—I encourage people who view things a little differently from anyone else."

The Sternglass case has raised the perplexing question of whether it is "good" or "bad" to have a scientist yelling "fire" when there may not be any fire at all. On the negative side, some critics contend that Sternglass, by alarming the public without reason, has made it more difficult to reach rational decisions on such important issues as the ABM and nuclear power. Others contend that, if Sternglass is ultimately shown to be a fool, the public's confidence in the scientific method will be diminished. And if Sternglass has actually made selective use of the data to support a preconceived theory—as some critics allege—that, of course, cannot be defended.

On balance, however, the country probably has more to gain than lose by letting Sternglass have his day in court. If Sternglass is right, he has performed an incalculable public service. But even if he is wrong—and the weight of informed opinion seems to think he is—he has nevertheless served a useful function by forcing others to look into the question. Nobelist Joshua Lederberg, in a newspaper column attacking Sternglass' analytical methods, acknowledged that Sternglass' "expose" had called attention to "a surprising lack of experimental work directed specifically at the genetic effects of Sr-90." And, much to the AEC's consternation, Tamplin, in preparing a detailed point-by-point rebuttal of Sternglass, has come up with an estimate of his own, namely that, in 1963, fallout could have accounted for more than 8000 fetal deaths. That's a pretty sizeable number, and while Tamplin's estimate is disputed on a number of grounds, it nevertheless raises the interesting possibility that Sternglass may be wrong in all his details but still be right in his general fear that low doses of radiation are more pernicious than previously believed.

Satterthwaite, past chairman of the FAS, believes Sternglass has raised enough questions to justify a "careful study" of the whole matter by the government. Such a study might well show that Sternglass is totally wrong. But in a world where government bureaucracies have a tendency to become complacent, it doesn't hurt to have deeply concerned citizens raise the question of safety—again, and again, and again.

—PHILIP M. BOFFEY

Pollution Control: Sweden Sets Up an Ambitious New Program

Stockholm. Larger than California, but with a population of only 8 million, Sweden is far from being plagued by the pollution problems that afflict most industrialized nations. But the Swedes have not remained altogether unscathed, nor are they unmindful of the environmental ruin now found in places that once could follow the maxim that "the answer to pollution is dilution." As a consequence, Sweden has undertaken an ambitious and relatively expensive effort to clean up whatever mess now exists and to prevent further ones from developing. Not surprisingly, Sweden was the first nation to impose a total ban on the use of DDT, aldrin, dieldrin, and other chlorinated hydrocarbons, effective the beginning of next year. As one official explained, "It wasn't very difficult to do. Very little if any of these are manufactured here, and besides, we made the farmers realize that they are the first to suffer from exposure."

In many respects, the Swedish approach to the problem is similar to the approach in other countries: research, the establishment of standards, and the provision of matching government grants to help industry and local communities buy antipollution equipment. But the Swedish effort also contains several special elements that are intriguing when viewed against the so-far doleful U.S. experience in dealing with pollution. First of all, though fairly strict legislation is on the books—as is the case in the United States—the Swedish government, recognizing the link between law enforcement and public opinion, has undertaken a sizable adult education program aimed at creating in each community a corps of well-informed citizens who can organize public hearings and confront industrial and civic officials on what they are doing about pollution. Over the past year, under the auspices of the Ministry of Education, some 250,000 persons received at least a few evenings' instruction on the technical and legal aspects of pollution. From this number, about 10,000 accepted the offer of an additional 2 weeks' instruction, and, from this second group, about 1000 throughout the country were picked to conduct public inquiries and, in general, agitate in behalf of pollution control. The program is just getting out of the classroom stage, and its effectiveness remains to be demonstrated. But one of the country's most diligent antipollution crusaders, a young physician and researcher, Hans Palmstierna, who is secretary of the government's central coordinating board in the pollution field, is quite optimistic. "With the new laws that we have, and the public getting more and more aroused," he said, "we have every reason to make progress." And he added, "It's down to the level now where peo-