

photographs. There now exist more than 3500 hours of tested materials in more than 100 subject areas. There is also a wide range of tools available for managing courses oriented to PLATO. Communications facilities include public forums, electronic mail, and on-line consulting. The system can be connected to laboratory equipment for on-line data collection and analysis.

There already exist three PLATO systems (3). It is expected that additional systems will be set up on a regional basis, with electronic intersystem connections to assure a high level of communication, including nationwide access to curriculum materials.

References and Notes

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2. People who have been involved in the development of the "hardware" associated with the PLATO system include D. Bitzer, J. Stifle, F. Ebeling, M. Johnson, R. Johnson, F. Propst, D. Skaperdas, G. Slottow, and P. Tucker. A number of people have contributed to the development of the PLATO "software." Full-time people have included P. Tenczar, D. Andersen, R. Blomme, J. Carstedt, R. Chabay, C. Fugitt, D. Lee, R. Rader, M. Secrest, B. Sherwood, D. Shirer, and M. Walker. They have been assisted by W. Golden, J. Parry, D. Brown, B. Fortner, D. Frankel, S. Freyder, S. Gooch, D. Kopf, K. Mast, P. Mast, M. Midden, L. North, L. Steinberg, L. White, and D. Woolley.
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20. The computer used is a Control Data Corporation Cyber 73 with 2 million words of extended core storage.
21. The microwave distribution system costs about \$2.50 per month per terminal.
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24. Many people have made significant contributions to the development of the PLATO system described here. None of the work would have been possible without the interest and help of D. L. Bitzer, director of the Computer-Based Education Research Laboratory at the University of Illinois, the National Science Foundation, the Advanced Research Projects Agency, and the Control Data Corporation.

NEWS AND COMMENT

Sulfur Pollution: Charges That EPA Distorted the Data Are Examined

The charges were very serious—they impugned the professional integrity of a fast-rising government health official and the validity of a government antipollution program.

On 29 February the Los Angeles *Times* published a story asserting that a former research administrator at the Environmental Protection Agency (EPA) deliberately distorted research reports "in an effort to prove that pollution from sulfur-bearing fuels had an adverse effect on human health."

The investigative article, written by reporter W. B. Rood, pointed the finger at John F. Finklea, currently director of the National Institute for Occupational Safety and Health but previously the head of EPA's Human Studies Laboratory in North Carolina. In his former capacity Finklea was a key figure in managing the

EPA program known as CHES (Community Health and Environmental Surveillance System), a series of epidemiological studies in communities around the country aimed at determining the health effects of exposure to relatively low levels of pollutants. The program was designed to evaluate whether existing air quality standards are adequate, to obtain data for new standards that might be needed, and to document any health benefits that might result from controlling air pollution.

In the spring and summer of 1972, Finklea was in charge of preparing the early drafts of a monograph analyzing data from the first year of the CHES program, 1970–71. That monograph, which was eventually published in 1974, purported to find that sulfur pollutants (notably sulfur dioxide and suspended sul-

fates) were associated with a variety of adverse health effects, including aggravation of asthma and heart and lung disease in the elderly.

The L.A. *Times* reported that "extensive interviews" with government and nongovernment scientists and others had disclosed that, in preparing this monograph,

Dr. John F. Finklea rewrote the work of agency scientists, often deleting what the researchers felt were important qualifiers on experimental results;

Finklea deleted material from the reports that did not show a connection between sulfur pollution and adverse health effects;

Finklea screened statistical analyses to downplay evidence tending to weaken or contradict the case against pollution; and

Finklea overrode agency scientists' objections to publishing estimates of the health impact of pollution which were either statistically dubious or unsupportable.

The article viewed the consequences as serious. "Relying heavily on the disputed CHES studies," it said, "EPA has called for controls on sulfur pollution that would cost power companies and ultimately American consumers billions of dollars."

The evidence to support these charges consisted largely of quotes from individ-

uals—some named, some not—who were critical of the CHES findings, Finklea, or both. Most of the critics who were identified by name aimed their barbs at the CHES monograph. Only one of them implicated Finklea, and he did so by saying that he had heard others blame Finklea. The remaining attacks on Finklea came from anonymous sources. The article cited not a single specific example of material that Finklea had supposedly distorted or deleted.

Almost immediately the article became a political factor. Representatives of the coal industry, the electric utilities, and other purveyors of sulfur pollutants began clamoring for a moratorium on new clean air legislation until the charges could be examined. Faced with mounting pressure on the eve of congressional consideration of amendments to the Clean Air Act, two House committees—the subcommittee on environment and health, chaired by Representative Paul G. Rogers (D-Fla.), and the subcommittee on the environment and the atmosphere, chaired by Representative George E. Brown, Jr. (D-Calif.)—held a joint hearing on 9 April to receive testimony on the charges and their implications. It was a marathon session involving more than 20 witnesses, including some who were expected to be friendly to Finklea and some who were deemed hostile. But by the end of the day, Finklea, a hard-driving type who seems to have made a few enemies on his way up the executive ladder, had been showered with flattering testimonials to his integrity and competence while several witnesses threw darts at the *L.A. Times*.

Congressional staffers say they had some difficulty finding witnesses to criticize Finklea's handling of CHES, since few critics have surfaced publicly. The scientist who seemed most critical in quotes attributed by the *L.A. Times*—Harvard's George B. Hutchinson—declined to appear, according to staffers.

Among those who did appear, the most critical by far was Robert W. Buechley, an epidemiologist at the University of New Mexico's Cancer Research and Treatment Center who served at EPA during the time the CHES monograph was prepared. Buechley, who was not interviewed for the *L.A. Times* article, nevertheless echoed its charges. He claimed that "promises were made" by CHES leaders "that specific scientific findings would be forthcoming to incriminate those pollutants for which regulations were being written . . . ill-done studies were then written up as if they did, in

fact, incriminate the desired pollutant." But Buechley acknowledged that he did not work on CHES himself, he merely worked alongside the CHES scientists and heard their gripes. When pressed, he said he could not document his charges and was unwilling to be more specific about the alleged wrongdoing.

Another witness who had seemed critical when quoted in the *L.A. Times*—Ian P. T. Higgins, professor of epidemiology at the University of Michigan—took a more equivocal position in testimony. On the one hand, he asserted again that CHES data "have sometimes been overinterpreted" in the sense that "insufficient weight has been given to inconsistencies in the findings." This poses the danger, he said, "that conclusions might be drawn that significant effects on health are produced by lower levels of pollution than are justified by the evidence"; thus "unnecessary, costly attempts at further reduction in pollution might be instituted." That seemed to support the paper's allegations. But Higgins also praised the CHES program, said he had never intended to impugn Finklea, and claimed the *L.A. Times* "distorted" his position.

Another seeming critic in the *L.A. Times* article, Benjamin G. Ferris, Jr., of Harvard's School of Public Health, who had coauthored (with Higgins) a 1973 paper critical of a draft of the CHES monograph, resolutely emphasized the valuable aspects of the CHES program in his testimony.

Greenfield Switches Sides

Similarly, Stanley M. Greenfield, former assistant administrator for research and development at EPA, who now heads a consulting firm that is analyzing the sulfur issue under contract with the Electric Power Research Institute, an arm of the electric utility industry, handled the issue with kid gloves. Greenfield said he had "a professional or technical disagreement" with the CHES monograph, but no reason to believe that Finklea had distorted the data or analyses (though he acknowledged that he didn't really know for certain). Greenfield was forced to explain to skeptical congressmen how it was that, when he wore his EPA hat, he endorsed the CHES report and praised it lavishly, yet now that he's carrying the spear for the utilities, he's finding fault with CHES. Part of his answer was that he has been examining the raw data from subsequent years of CHES and believes it contradicts some of the initial findings. When pressed, he said he has seen nothing in the data that would un-

dercut the current federal standard for sulfur dioxide, but he expressed doubts that sulfates are as hazardous as the CHES monograph indicated. (The federal government has not yet promulgated a sulfate standard but several states have.) For the most part, Greenfield was unwilling to get very specific about his differences with CHES pending completion of an analysis by his new firm of the raw data from several years of CHES. That, he explained, might take a year or two.

While the attack on Finklea largely failed to materialize, a battalion of witnesses from EPA—ranging from agency director Russell Train down to the foot soldiers who had worked on the CHES report—marched into the fray to defend both Finklea and the program against what one called "public character assassination" in a "sensational article." The thrust of their combined testimony was that:

- Finklea did indeed revise, or require the original authors to revise, some of the papers that went into the monograph. This was partly to establish uniformity in data presentation and partly because some of the first drafts contained incomplete analyses.

- In the process, there were instances where Finklea left out qualifying statements, but this does not appear to have been systematic and there is no evidence he sought to distort the data.

- Some of the original authors were unhappy at the time with Finklea's editorial changes, and their unhappiness was exacerbated by pressure to meet short deadlines as Finklea lashed his troops to complete the project. (The *L.A. Times* described "lasting scars" on scientists whose marriages were broken, whose careers were threatened, or who became "psychotic" under the pressure.)

- The complaints of the original authors, and much of the criticism by other scientists cited in the *L.A. Times* article as well, were directed at a *draft* of the monograph prepared by Finklea. Subsequently Finklea was promoted to another post in EPA, the draft was widely circulated for review and criticism, and it was revised by Finklea's successors before final publication. The reviewers' comments were no more critical than is normal for such an exercise, which is meant to elicit criticism. Most participants believe the final document is a valuable piece of work whose overall merit far outweighs any disagreement they may have over specific details of interpretation.

- The document does not slant its interpretations by using only "worst case" or

“least case” analyses; rather, it employs a “best judgment” approach. Although some reviewers complained that the draft emphasized results indicating an adverse health effect, other participants believe there are factors in the CHESS approach which could cause *underestimation* of health effects.

•Even if one assumes the worst about CHESS, that does not call into question EPA’s regulatory program for sulfur oxides, which is based on a broad array of studies and analyses. The national ambient air quality standards for sulfur dioxide were set before the CHESS studies even began, and the emission standards for power plants are based on the ambient standards, not on CHESS. CHESS has indeed been cited to support EPA’s case for controls on power plants converting from oil or gas to coal, and to buttress EPA’s opposition to the use of dispersion techniques to control pollution—but it is only one among many supporting

studies.

CHESS is only one. In some cases, CHESS was not even a factor in establishing federal standards.

By the end of the long day, Finklea had emerged with his reputation largely restored. Even those congressmen who asked the most hostile questions stressed that they were not questioning his integrity. But the avalanche of support for Finklea proved disquieting to some. Witness Buechley claimed that some EPA scientists who had been critical of CHESS in conversations with him [and presumably with journalist Rood as well] sang a different tune when called upon to testify. Rood, who attended the hearing, declined to comment afterward but gave no indication he does not stand behind his original piece.

Some congressmen said that, in exonerating Finklea, they did not intend to endorse EPA’s sulfur oxides program. They noted that the CHESS monograph

had been prepared in a great rush while the agency was facing a legal challenge to one of its sulfur dioxide standards—not necessarily the best environment for objective analysis. Moreover, the allegations of distortion had been largely investigated by the agency itself. Representative Barry M. Goldwater, Jr. (R-Calif.) has requested additional investigations, and he said at the hearing that Congress should examine whether EPA’s research function should be separated from the regulatory process. But chairman Rogers, probably the most influential House member in air pollution matters, indicated that such further scrutiny will not necessarily weaken the antipollution fight. In a day that was largely devoted to examining charges that sulfur oxides regulations have been made too stringent, Rogers managed to extract some testimony which indicated to him, at least, that the standards may not be strict enough.—PHILIP M. BOFFEY

Universities and the Law: Legislation, Regulation, Litigation

Administrators in higher education have reason to feel that the era of confrontation has been succeeded by an era of litigation. The spirit of the 1960’s generated a spate of legislation aimed at increasing equality and strengthening the rights of individuals, and now universities must contend with what happens when causes become court cases.

The spectrum of legal and quasi-legal problems facing colleges and universities is very broad. Cases arising from affirmative action and nondiscrimination programs mandated by civil rights legislation have attracted the most attention, but a bigger case load is probably produced by more traditional labor relations conflicts growing out of collective bargaining agreements. In the case of faculty, recession and retrenchment in higher education has, not surprisingly, led to increasing litigation over layoffs and questions of tenure or promotion. And student rights are still very much in the process of being legally redefined.

The complications colleges and universities encounter in complying with multiplying federal regulations (*Science*, 31

October 1975) provide another dimension of legal involvement. And the institutions must still deal with perennial legal problems posed by taxes, property transactions, patents and copyrights, contracts of all kinds, bequests, and the often touchy relations with local and state governments.

University legal staffs are bigger and legal costs are up—in some places alarmingly so. But what is more difficult to assess and doubtless even more important is that changes in legal relationships between the institution and faculty, students, and staff have been accompanied by significant changes in attitudes and atmosphere on the campus.

These changes have come very rapidly. In the 1950’s, the doctrine of *in loco parentis* governed relations between academic institutions and students. The authority of the institution was generally unquestioned, and its actions were assumed to be benign. College attendance was regarded as a privilege, not a right. As for faculty, the McCarthyism of the early 1950’s had shaken confidence in the doctrine of academic freedom, but

the expansion of higher education made promotion and tenure more readily accessible and had increased faculty mobility, thereby minimizing friction. Non-faculty staff were low-paid, ununionized, and, for the most part, legally invisible. The courts in general showed a reluctance to intrude in matters they regarded as the university’s business.

A legal milestone generally regarded as marking the start of a major shift in attitudes was the case of *Dixon v. Alabama State Board of Education* in 1961. Some students arrested in a sit-in aimed at integrating public facilities were dismissed from college as a result. They brought suit for reinstatement in federal court on 14th Amendment grounds and the court ruled in their favor, saying that they had been denied the “rudiments of due process.” The court held that the students were entitled to a formal hearing with all that implies in the way of right to legal counsel and adherence to the rules of evidence.

The Magna Carta for those who felt oppressed by universities, however, was the Civil Rights Act of 1964 as amended in 1972. The law, under various titles, prohibits discrimination on the basis of race, color, national origin, and sex and covers both students and employees of public and private institutions.

A lot of the legislation affecting colleges and universities was enacted with business and industry in mind—for example, the Occupational Safety and Health Act and the Equal Pay Act. In re-