SCIENCE

18 February 1977

Volume 195, No. 4279

AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

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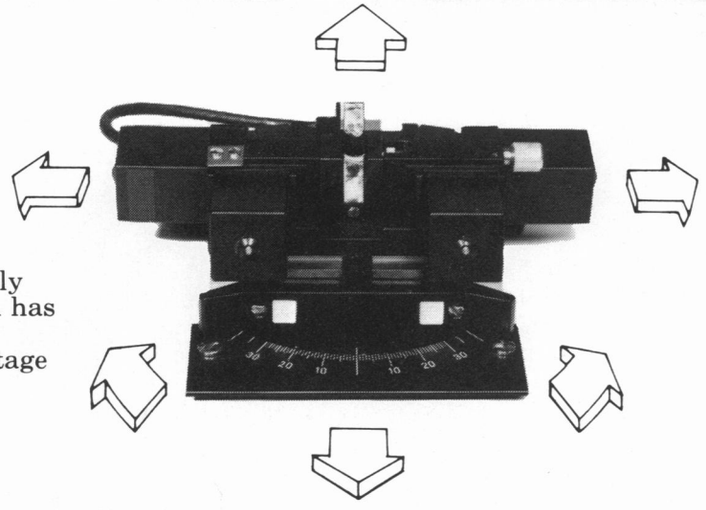

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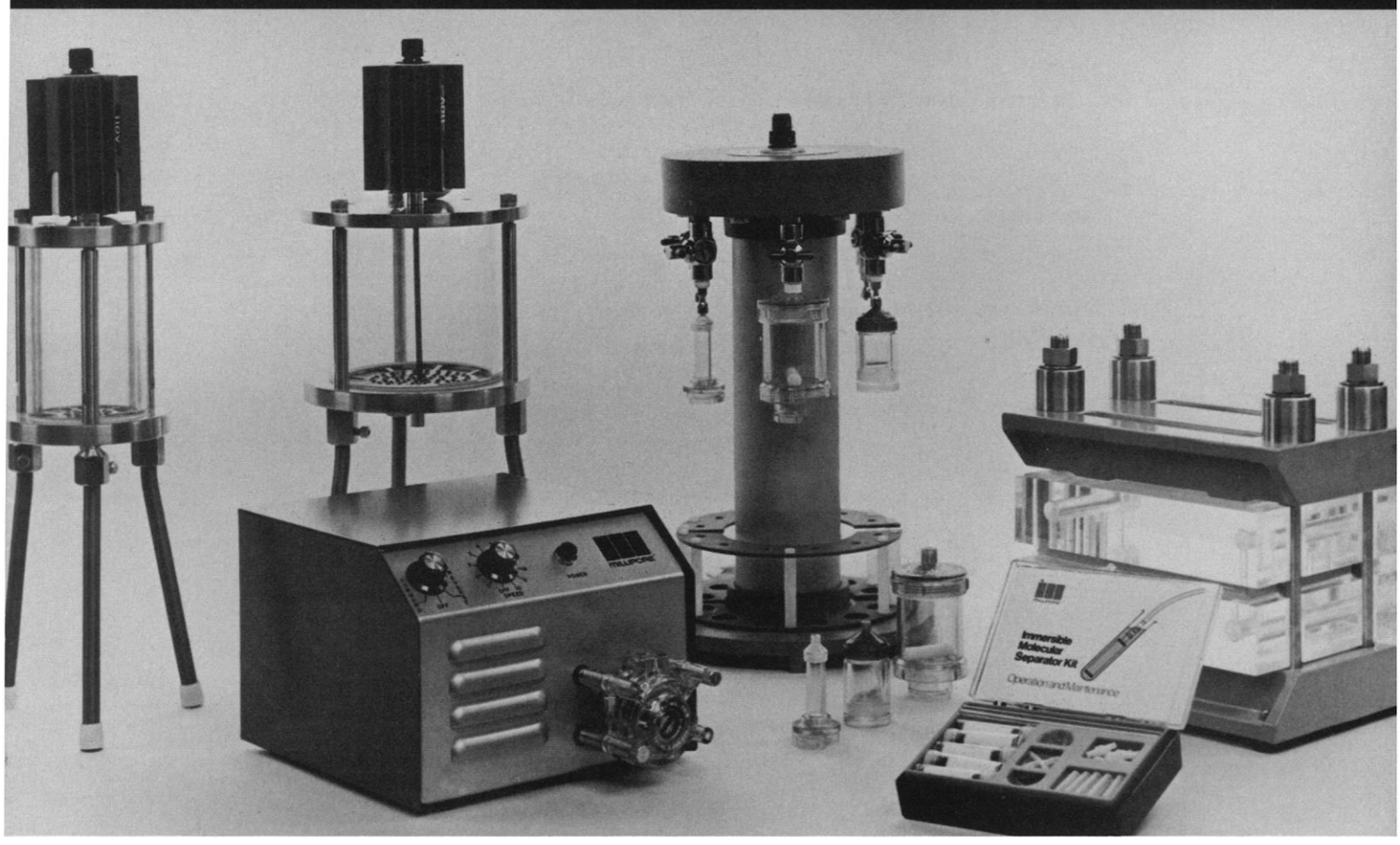

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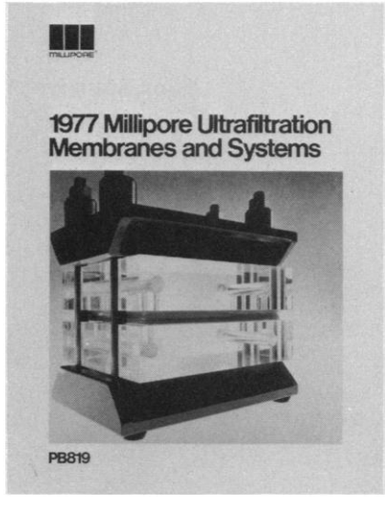

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Volume 195, No. 4279

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COVER

Iguanas emerging from their nest hole in a communal nesting site on Slothia islet off Barro Colorado Island, Canal Zone, Panama. Hatchling iguanas engage in considerable social behavior and move about in small groups. Animals from different holes often synchronize nest emergence, displays, and movements. See page 689. [J. A. Carter, University of Oklahoma, Norman]

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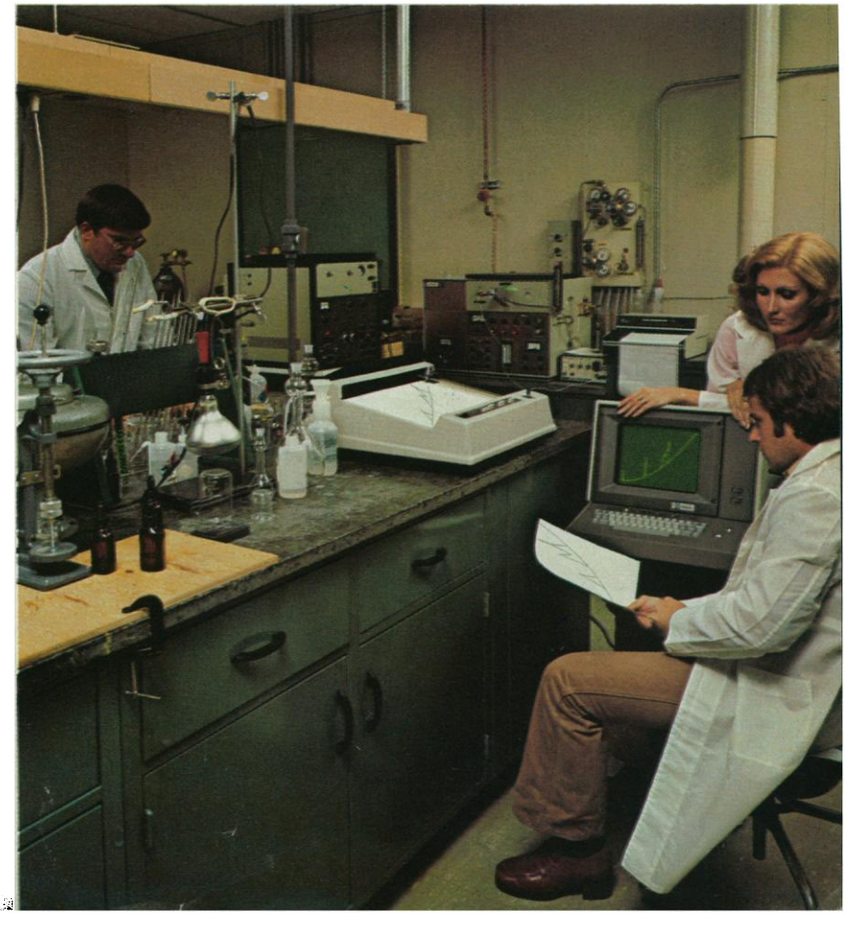

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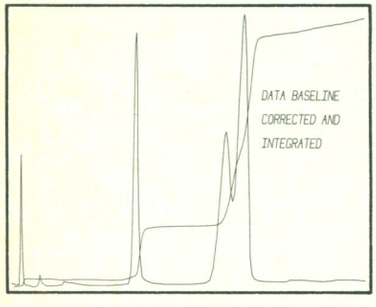

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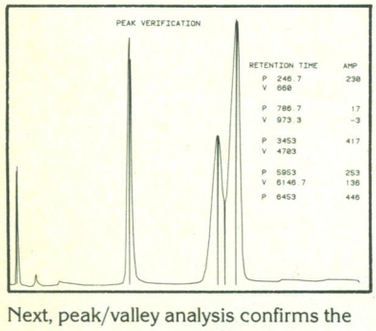

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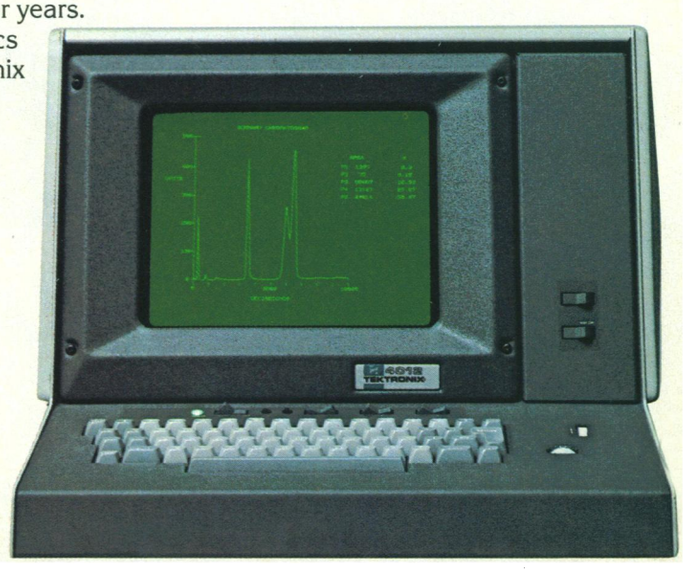

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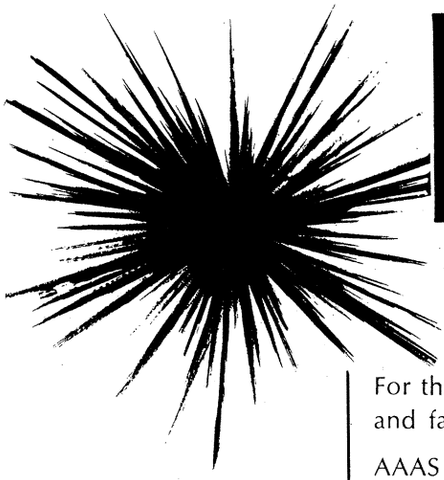

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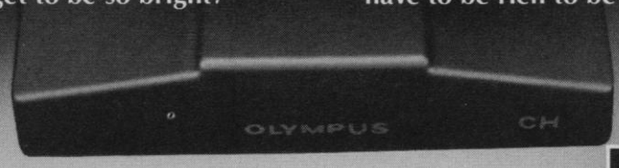

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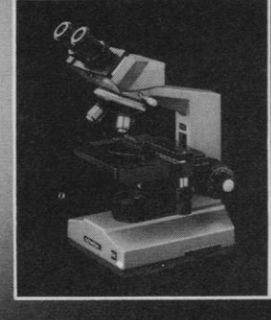

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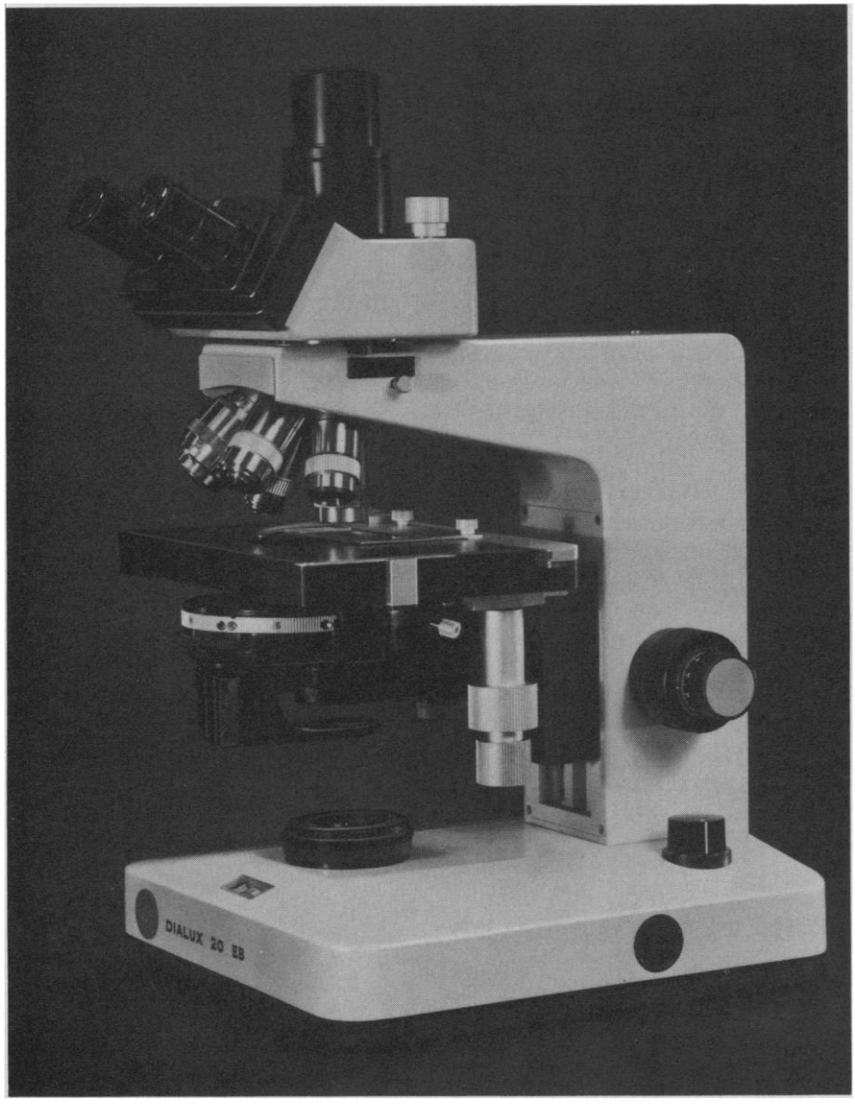

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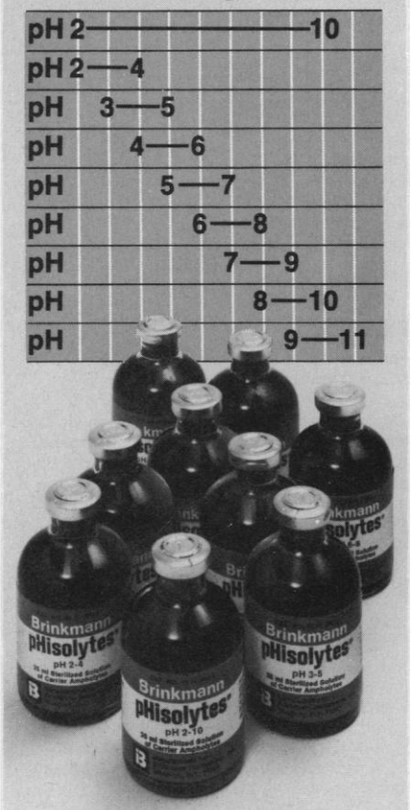

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LETTERS

Nuclear Moratorium: Projected Effects

Reporters who read Alvin Weinberg's studies carelessly or with preconceived notions do so at great peril to accuracy and fairness. We saw this demonstrated several years ago, when the press became enthralled with Weinberg's "Faustian bargain" warning on nuclear energy development but neglected to note, for the most part, that Faust was redeemed; that Weinberg felt the bargain was worth striking.

Now Allen L. Hammond asserts (News and Comment, 14 Jan., p. 156) that Weinberg says the country "could afford to give up nuclear power for 30 years with only modest economic and environmental consequences." My knowledge of Weinberg's study (*1*) is based on a close reading of a summary volume and hearing him describe the findings at our energy conference in Washington, D.C., on 11 January. Nowhere have I seen or heard Weinberg describe the consequences of a 30-year nuclear moratorium as either acceptable or modest; these are Hammond's judgments.

Hammond does violence not only to Weinberg's conclusions but also to his assumptions. For example, Weinberg specifies that all nuclear plants that come on line by 1985 are permitted to stay in operation, but Hammond conveniently does not mention the fact that this builds a considerable hedge against economic dislocation into the early stages of the theoretical moratorium; by 1985, nuclear power will already be generating more than 20 percent of the nation's electricity. Just as conveniently, Hammond does not mention Weinberg's clearly stated doubts that the coal industry can pick up the slack at the turn of the century, given a 30-year pause in nuclear energy development.

Weinberg calculates that his nuclear moratorium would impose a $300-billion to $400-billion economic penalty over the course of 30 years; this may be "modest" to Hammond, but I doubt that economists would agree. Weinberg's prediction of a 1 percent annual reduction in the gross national product as a result of a moratorium may not impress Hammond, but it would be a powerful depressant to the nearly 1 million American workers whose jobs are estimated to be jeopardized by every 1 percent shortfall in the GNP. Weinberg's estimate that, with a nuclear moratorium, we must double the acreage disturbed in order to triple or quadruple coal production may strike

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Specific topics this year will include the impact of the "transition" on R&D decisions, future trends in R&D budgeting, and problems of criteria for federal budget decisions. For information and reservations, please write to

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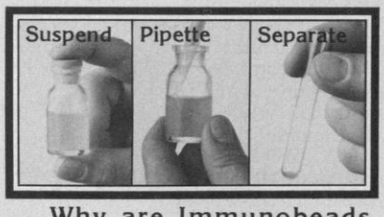

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Hammond as a modest environmental penalty, but I wonder if many environmentalists would share his perception. Most disturbing, however, is the fact that Hammond reports on only half of Weinberg's study, perhaps because the conclusions of the other half demolish Hammond's thesis and trample on another shibboleth, solar energy.

As I read Weinberg—and without for a moment conceding that I endorse his assumptions or conclusions—he is saying that, rather than risk the dislocations of a nuclear moratorium, we should take advantage of a projected leveling off in energy demand to devise "technological fixes" to make nuclear power fully acceptable. One "technological fix" that Weinberg discounts is development of solar energy into a large-scale supplier of central-station electricity.

I think the News and Comment section of *Science* should impose upon itself a more rigorous definition of what is news and what is comment, and properly segregate the two.

CARL WALSKE

Atomic Industrial Forum, Inc., Washington, D.C. 20014

References

1. *Economic and Environmental Implications of a U.S. Nuclear Moratorium* (Institute for Energy Analysis, Oak Ridge Associated Universities, Oak Ridge, Tenn., 1976).

Although Hammond's article on the study by the Institute for Energy Analysis *Economic and Environmental Implications of a U.S. Nuclear Moratorium* is generally accurate, he fails to make two points clear.

1) The moratorium we studied allowed nuclear plants already in operation by 1985 to continue until 2010. From Hammond's article one might infer that our study concluded that we could give up nuclear power entirely for 30 years with little effect; this we did not say, nor do we believe.

2) This nuclear moratorium would require, we estimate, 1.5 to 2.6 billion tons of coal per year to be mined by 2000, and 2.6 to 4.8 billion tons by 2010. Although other studies suggest that this much coal can be mined, the problems associated with achieving these goals were not examined independently in this study. Thus rather than concluding, as Hammond does, that "a nuclear moratorium would not exert undue pressure on energy supplies," we consider this to be one of the most uncertain implications of energy growth after the year 2000.

We were careful in the study not to recommend for or against a moratorium, but I personally consider the moratorium

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to be imprudent and unwise, primarily because of the pressure it would place on our supply of coal.

ALVIN M. WEINBERG
Institute for Energy Analysis,
Oak Ridge Associated Universities,
Oak Ridge, Tennessee 37830

I regret that my article inadvertently failed to make clear that the hypothetical moratorium in question would apply only to the construction of *additional* nuclear power plants.—A.L.H.

Oil Spills: Risks and Relevance

Philip H. Abelson's editorial "Oil spills" (14 Jan., p. 137) quite properly calls attention to problems raised by the use of such terms as "disaster" and "ecological catastrophe" to describe the sinking of the tanker *Argo Merchant* off Nantucket Island. His editorial also demonstrates the inadequacy of our procedures for disseminating findings such as those in the National Academy of Sciences' report *Petroleum in the Maritime Environment* (*1*).

However, the editorial is seriously misleading in its bland conclusion that "Incidents of this kind should be avoided and the perpetrators should be forced to pay for any demonstrable damage." First, our government has long since decided that there cannot be adequate compensation for many insults to the environment, and the regulation of potentially harmful behavior has been given a higher priority than compensating mechanisms. Second, even if there is no damage from this oil spill, even if there has never been serious damage from previous oil spills, the *Argo Merchant* incident raises in a dramatic way some major issues of science-related public policy that are of increasing interest to *Science*'s readers. For an editorial in *Science* to focus on distortions in the press and on the difficulty of establishing "demonstrable damage" strikes me as an unfortunate lost opportunity.

All uses of high technology involve risk, and the oil spill from the *Argo Merchant* raises the question of how much of a risk we are willing to take to obtain petroleum. Rather than risking the consequences of badly maintained and badly navigated oil tankers in coastal waters, we could substantially reduce these risks by properly enforcing existing regulations.

Why aren't these regulations enforced? What are the necessary risks of transporting oil? Who is to determine what are the relevant scientific "facts," and who is to judge the relevance of these facts for the national welfare? There are no easy answers to these questions—nor to most questions of technology management. But they can never be answered unless they are asked.

It seems to be true that this oil spillage did not lead to an ecological disaster, but it nevertheless did reveal the near-disastrous inability of our institutions to make and enforce public policy on scientific-technological issues. This is the true relevance of the sinking of the *Argo Merchant*.

DAVID L. SILLS
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1. Ocean Affairs Board, *Petroleum in the Maritime Environment* (National Academy of Sciences, Washington, D.C., 1975).

In his editorial on oil spills, Abelson concludes that ecological catastrophe from oil spills is only talk and has no basis in fact. This seems to be true only when one bases these conclusions on the kind of data arising from studies following emergencies from accidental spills. Loss of seabirds, seals, and fishes are the subjects mostly reported, while the largest biomasses of the oceans, the nannoplankters, have been ignored.

During World War II, German submarines sank many oil tankers along the coastal waters off North Carolina. The ensuing oil spills, which I studied, resulted in much environmental degradation. Some of the most productive areas of eelgrass and clams have not yet recovered. The principal perturbation was not injury from toxins of the oil itself, but from apparently unsuspected high concentrations of some lipid-soluble metals derived from the tolerant concentrations in the ocean. Toxic levels of these metals were concentrated in the oil in the euphotic zone and were released as the hydrocarbons were degraded. In choppy waters the oil is not confined to a thin film of petroleum, but forms an emulsion to considerable depths. My comparisons of the nannoplankton upcurrent to downcurrent from oil rigs off Galveston, Texas, in 1975, and off Louisiana in the summer of 1976, indicate acute toxic effects to the nannoplankton in downstream sectors as well as lower species diversity and, therefore, lower water quality. However, increases in populations of fishes tend to occur around the rigs, which are associated with food organisms that foul these rigs.

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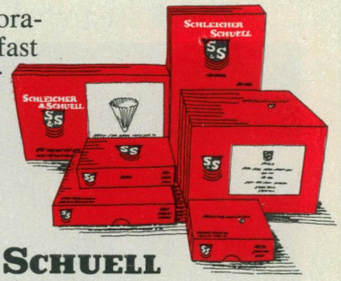

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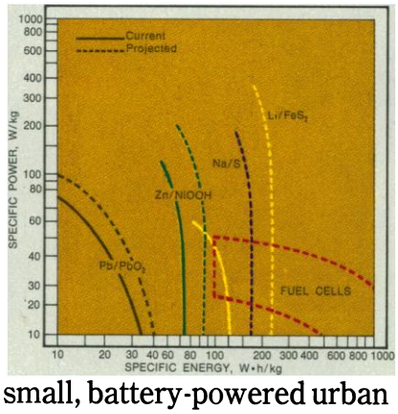

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The Overhead Headache

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Indirect costs are *not* set arbitrarily by university administrators. They are *not* a profit to the institution. Rather, they represent recompense for real expenses which cannot be allocated uniquely to individual projects, but which are attributable as a whole to research supported by external grants. Indirect costs are scrutinized in minute detail by large staffs of federal audit agencies. Consequently, every university must maintain its own large staff of accountants to keep appropriate books. For the university the question is not one of profit, it is one of minimizing loss. Administration, faculty, and program officers alike should be working together to obtain adequate funding for the true costs of research, and thereby to maintain the financial viability and integrity of our universities.

The current indirect cost recovery system is subject to misunderstanding and abuse. In asking that indirect costs be waived, the faculty becomes arrayed against the administration, creating unnecessary strains and distrust. Program officers sometimes make invidious comparisions between institutions based on the varying negotiated indirect cost rates. The choice of research projects to support may even be made not on the quality of the proposed research, but on the basis of which project will buy more research because it carries a lower indirect cost rate. Federal auditors can and do pry into every aspect of a university's affairs, including such sensitive areas as faculty teaching loads and consulting activities. Such prying may be a precursor to further harmful controls.

The intimate connection between graduate education and research has been demonstrated in the United States to be an outstanding success. That connection needs preservation. Adequate funds should be provided to cover the true costs, not only of education, but also of research. Indirect cost reimbursement is intended to cover the true costs of research. However, the dangers implicit in the present indirect cost process, the antagonisms, and the misunderstandings are too great to be tolerated any longer. A new way is needed to accomplish the same goals.

A simple solution to the indirect cost problem exists. We should, in my opinion, return as soon as possible to a fixed indirect cost allowance, proportionate to carefully defined allowable direct costs of research and collected uniformly from all granting agencies at a rate uniform for all universities. The savings in auditing costs and in the simplified accounting that would result from uniform collection procedures would permit a rate lower than that in general use. A rate of perhaps 30 to 35 percent of total direct costs might currently be reasonable. An appropriate figure might be set by Congress based on a recommendation from an expert commission.

Such a uniform rate would alleviate much of the overhead headache. In addition, it would constitute a first step toward a badly needed genuinely enlightened program for support of our research universities. It is high time that we embark on a more ambitious program of planning for the future to ensure that our research universities can fulfill their optimum role as a national resource in American society.—HARRISON SHULL, *Quantum Chemistry Group, University of Uppsala, S-751 20 Uppsala, Sweden*

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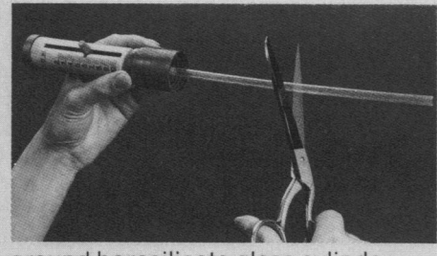

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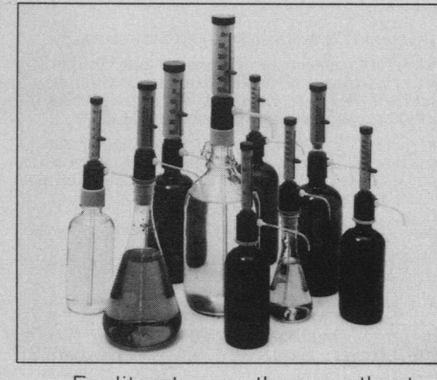

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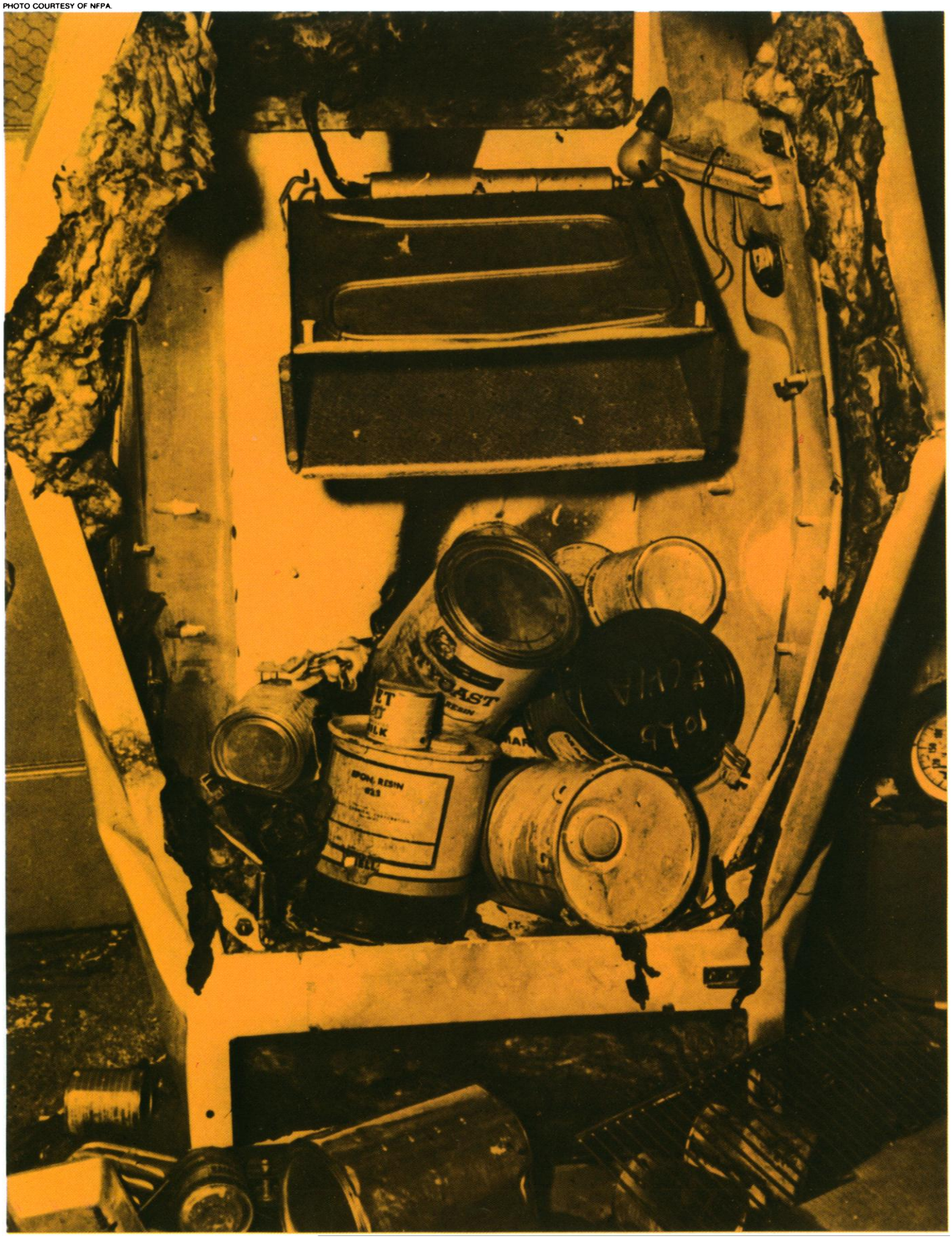

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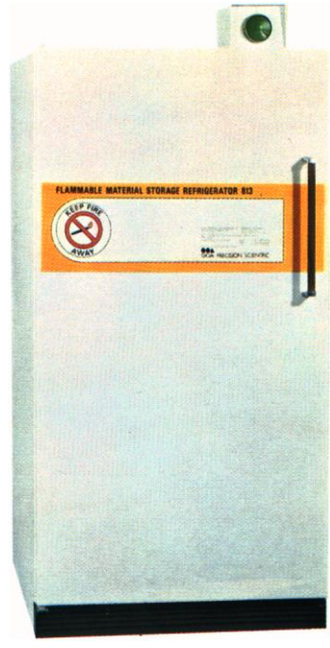

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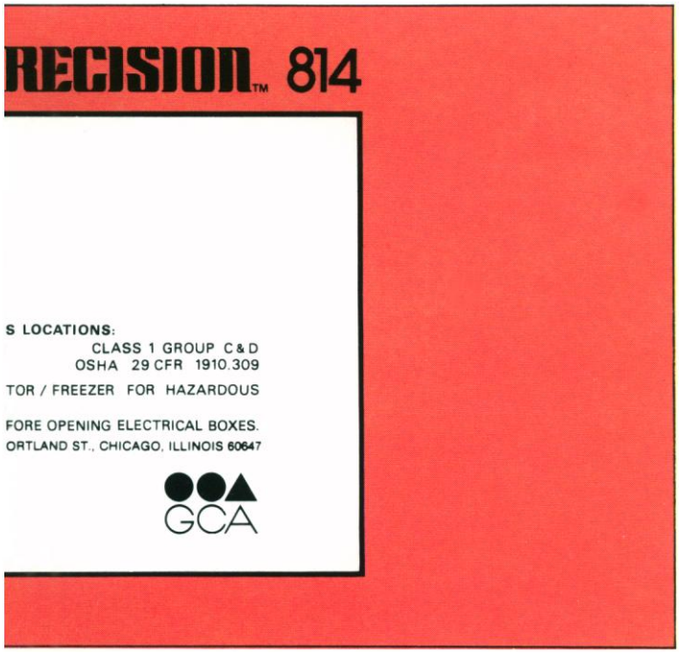

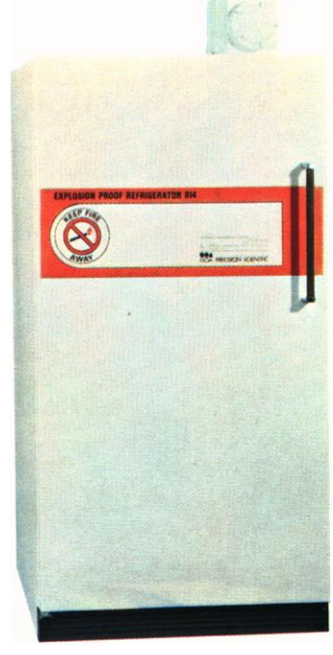

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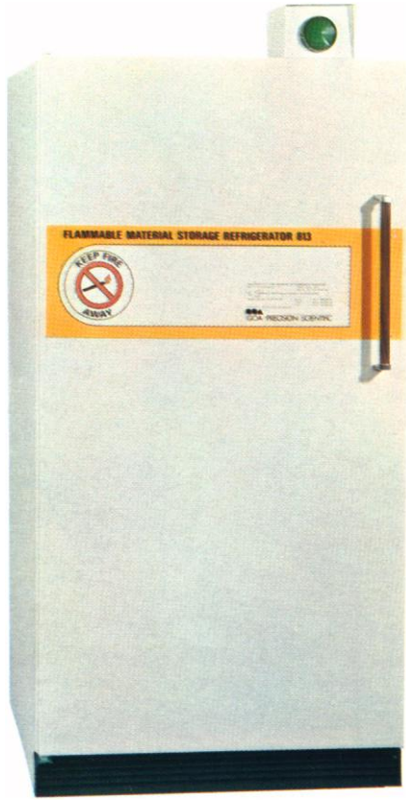

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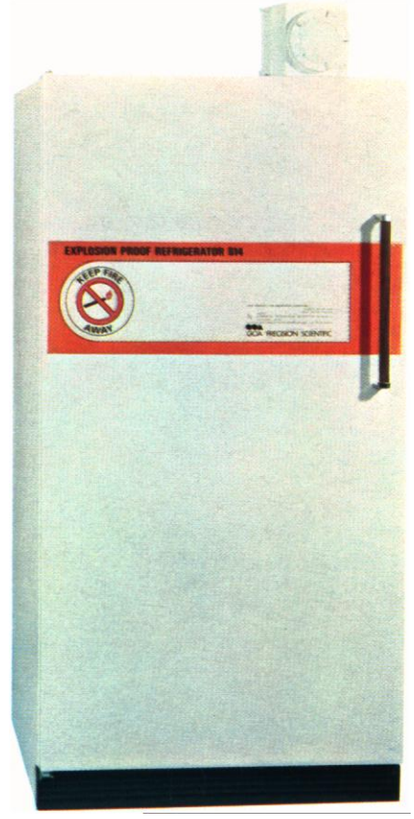

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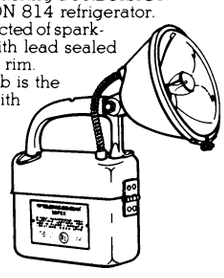

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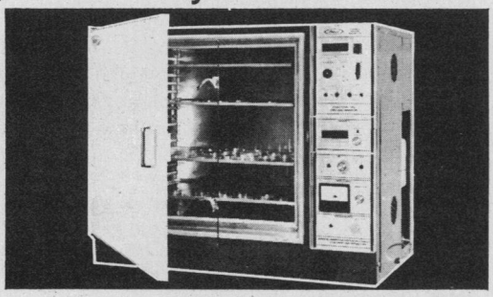

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