SCIENCE 22 October 1976

Volume 194, No. 4263

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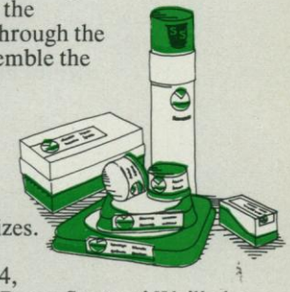

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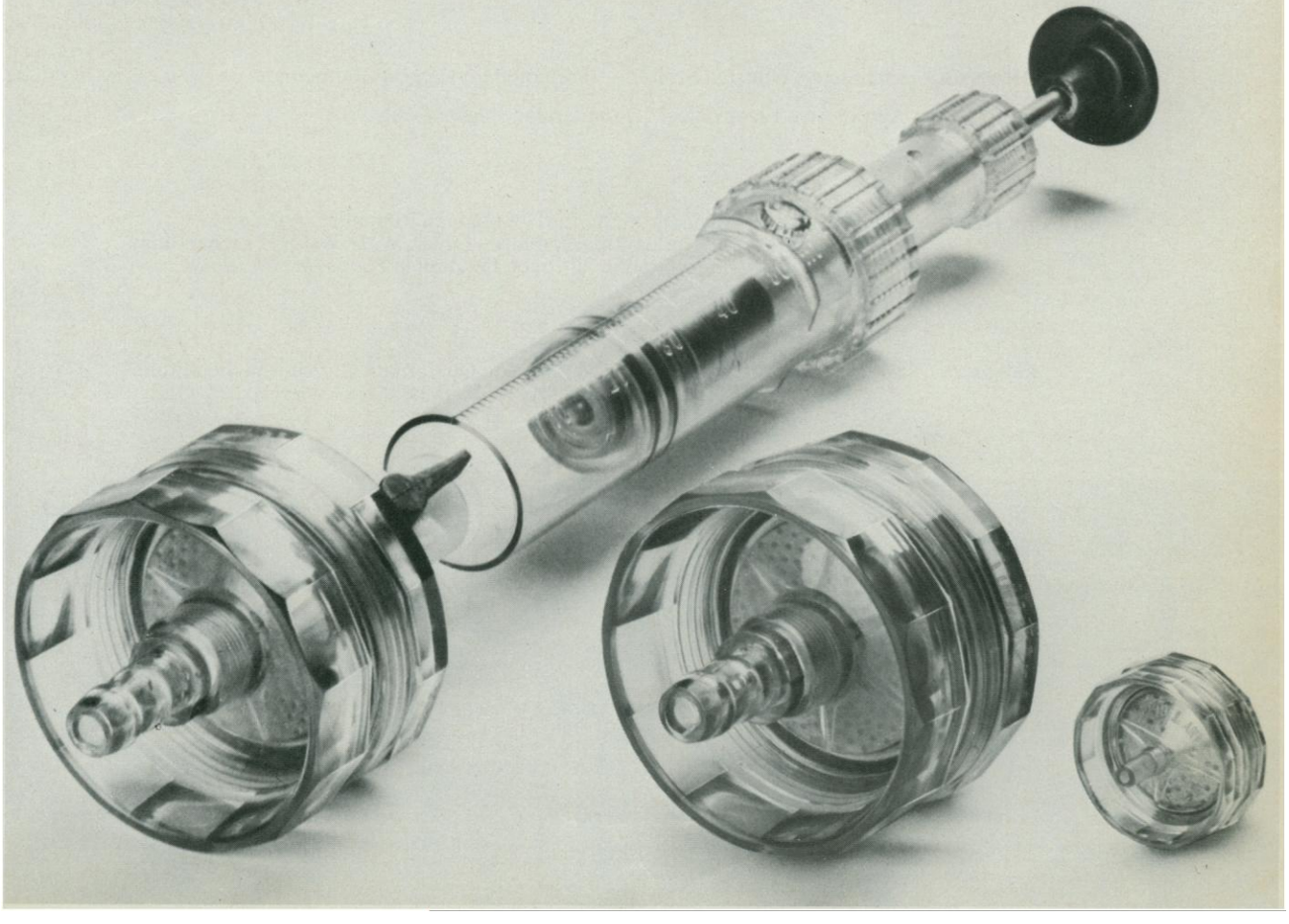

22 October 1976

Volume 194, No. 4263

SCIENCE

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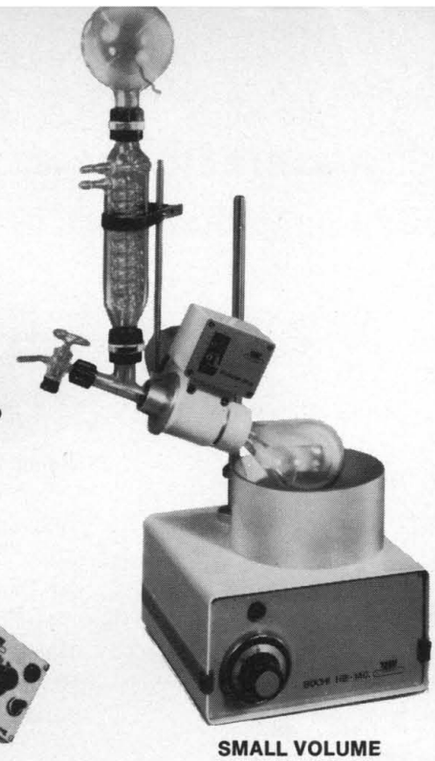

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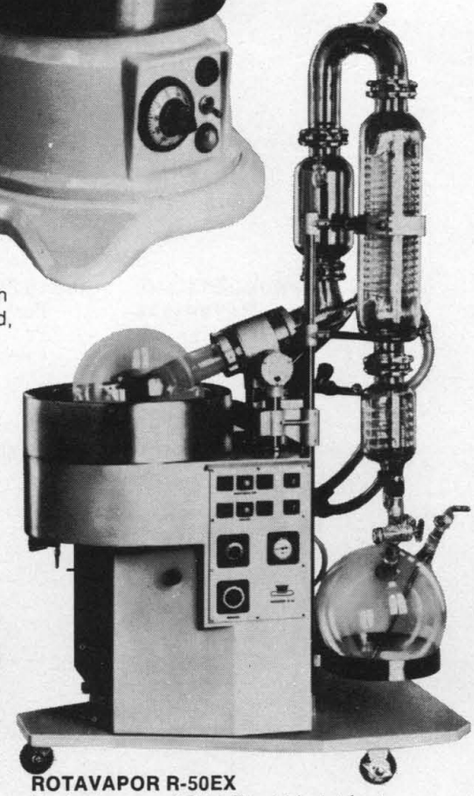

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try. Although far from perfect, the comprehensive, long-term program of the Department of the Interior has been invaluable and unique in providing for the significant advances made in coal science and process technology that are now being tested on a pilot-plant scale.

The fundamental problem is that coal technology has not changed very much since the 1940's. The point not brought out in Hammond's article (which does not really discuss research) is the need for significant improvements in coal conversion processes requiring innovative, exploratory, applied research. The attitude prevails today even in the technical community that, if a great number of large enough pilot and demonstration plants are built and tested, the nation's coal-energy dilemma can be solved. I believe the construction and operation of present and planned plants are well justified by the benefits derived from knowing the operability and costs of these plants, each of which incorporates improvements, essentially of an engineering nature, over the technology of the 1940's.

But these measures will not be enough. In particular, it is already known that the investment cost of coal conversion technologies is too high. This high cost arises because present processes require too high pressure, too low throughput, too many process steps, and too high a hydrogen requirement.

Examples of promising new technologies are now in the research stage in government, industry, and university laboratories supported by ERDA. They include flash hydropyrolysis of coal, catalytic gasification, conversion of carbon monoxide plus hydrogen to aromatic gasoline, reductive alkylation, new molten salt catalysts for liquefaction, and others. Also, recent advances in understanding coal structure by a combination of analytic techniques, notably carbon-13 nuclear magnetic resonance, are providing new concepts leading to innovative research.

Such research projects are thought to be important because they provide the basis for significantly improved "third generation" synthetic fuel processes. But also of great importance is the need to understand and recognize the status of coal research so that a balanced coal program can be planned. An important segment of this program is an adequate and sustained research effort.

G. ALEX MILLS

Division of Fossil Energy Research, Energy Research and Development Administration, Washington, D.C. 20545

In reference to Hammond's Research News articles of 20 and 27 August (p. 750) on coal research and coal gasification, respectively. I wish to make the following points.

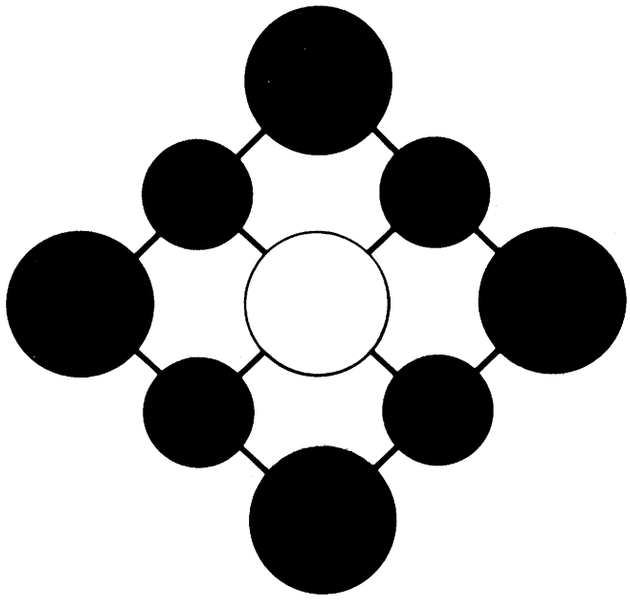
1) Blaming the Interior Department's Office of Coal Research (OCR) for lack of progress in the current coal research program of the Energy Research and Development Administration (ERDA) is completely unjustified and contrary to fact. OCR was a most efficient and dynamic agency. Working on a very small budget, it rekindled coal research in the United States that had lain dormant since the end of World War II. OCR was much less encumbered by the bureaucracy and red tape that is unavoidable in such gigantic undertakings as ERDA. It is unfair to make repeated statements that the OCR program was not technically sound. Indeed, in all the major areas of coal research now administered by ERDA, the concepts were developed by OCR.

2) Hammond concludes that ERDA's aura of failure was underscored by the fact that none of the four gasification processes for which pilot plants had been built were among the two chosen for design of the demonstration plant, implying some basic technical inadequacy in the four ERDA processes.

The facts were, however, that at the time of ERDA's Request for Proposals for the high-Btu gas demonstration plant, the Bi-Gas and Synthane pilot plants had not begun operation. The Carbon Dioxide Acceptor process was not adaptable to caking bituminous coal, as required in the Request for Proposals. The Ken-Tex Corporation bid, which involved the HYGAS process, was not selected because of unacceptable cost-sharing arrangements. The HYGAS process itself, however, was given a high technical rating, second only to that of the Conoco process, by the ERDA Source Evaluation Board.

The fact that an evolving technology may support several demonstration plants for different processes at different times is historic in chemical and petroleum processing industries. No aura of failure or deficiency should be ascribed to the ERDA-sponsored processes because they were not selected at this time for the reasons given above. Further development on a pilot-plant scale is necessary for continued process improvements, even after demonstration and commercial plants have been built and operated.

3) Hammond attributes the delay in starting a synthetic fuels industry to the



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Edited by
Philip H. Abelson
and Allen L. Hammond

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fact that coal-based fuels are not competitive with imported oil, implying that price competition alone is the correct criterion for choosing between the two options. However, it is the cost of synthetic fuels that sets the price of the imported oil. The declining supply of domestic oil and gas already makes coal-based synthetic fuels competitive with alternative energy supplies. But if we tie the future of synthetic fuels to imported oil, there will not be a synthetic fuels industry for many years, until foreign oil resources are depleted. In the meantime, we will continue to be subject to the uncertain price fluctuations established by the oil exporters and suffer the increasing impact of a negative trade balance. Only by establishing a going synthetic fuels industry in the United States will we be able to establish a stable measure of energy costs and a stable basis for international energy trade. The ability to achieve energy independence by using our indigenous resources is a corollary benefit.

In summary, perhaps a very cold winter *will* panic the nation into realizing the urgency of the energy shortage and the need to develop the synthetic fuels industry. But what we really need is an unwavering mandate from Congress to establish this industry by eliminating unnecessary institutional barriers. We also need the firm resolve of the Administration to implement this mandate.

B. S. LEE

Institute of Gas Technology,
3424 South State Street,
IIT Center,
Chicago, Illinois 60616

Hammond's articles on coal gasification provide a good overview of current gasification work. In light of the high ranking of slagging gasification, some additional comments may be appropriate.

The Grand Forks Energy Research Center (GFERC) of the Energy Research and Development Administration has recently reactivated pilot plant studies in a slagging fixed-bed gasifier. This gasifier was designed and operated from 1958 to 1965 under the Bureau of Mines, and results of that test program have been documented (*1*). The GFERC gasifier operates at coal feed rates approaching 1 ton per hour and is the only pilot plant of its type in the United States. The research emphasis in current studies includes characterization of effluents to develop methods for reducing environmental effects and water usage, comparison of gasification potentials of western and other coals, and studies of hearth refractory and slag removal problems. Shakedown tests are in process, and successful operation has been achieved in several tests completed with lignite fuel.

Slagging gasification offers two important advantages when compared with the more conventional Lurgi process. First, the slagging gasifier consumes only about 20 percent of the steam required by a dry-ash unit. Second, the gas production capacity is about four times as great in the slagging gasifier as in a conventional Lurgi of comparable size.

HAROLD H. SCHOBERT

Grand Forks Energy Research Center,
Energy Research and Development Administration, Box 8213,
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1. G. H. Gronhovd, A. E. Harak, W. R. Kube, W. H. Oppelt, *U.S. Bur. Mines Rep. Invest. 6085* (1962); G. H. Gronhovd, A. E. Harak, M. M. Fegley, D. E. Severson, *U.S. Bur. Mines Rep. Invest. 7408* (1970).

Mills' comments on the need for greatly improved coal processes and for research to bring them about are well taken. But these "third generation" processes may be irrelevant if the current round of engineering development does not produce some successes. Neither congressional support nor industrial willingness to put up part of the R & D money is likely to survive major failures in demonstration plants. The Office of Coal Research did keep the subject alive during the 1960's; but it was never intended to and, on the evidence, did not make much progress toward commercial technologies. Unfortunately, the OCR legacy still dominates the ERDA program, although the quality of work going on is much improved and there are signs of a new emphasis on technologies that can be commercially successful.

Congress, however, is obviously not yet convinced of the need to build commercial synthetic fuel plants and subsidize their operation. It recently refused again to pass such legislation, despite rising imports of oil and gas. There are many arguments for building—or committing now to build when the technology is ready—at least a few synthetic fuel plants, perhaps the most important being that these facilities would help to resolve technical, environmental, and institutional uncertainties. But advocates of such a course might do better to admit that snythetic fuels are not yet competitive with imports and will require subsidy in one form or another and instead focus their arguments on the national need, which is to have proven alternative sources of gaseous and liquid fuels well in hand.—A.L.H.

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22 October 1976, Volume 194, Number 4263 **SCIENCE**

Species Preservation

In 1973 Congress passed the Endangered Species Act to ensure that the well-being of endangered species will not be jeopardized by the activities of federal agencies or departments. The recent publication of an official list of threatened and endangered plant and species* represents a first step toward attaining this goal. To prevent harm through habitat destruction, further federal effort is being made to designate habitat requirements of endangered species. In the private sector, industry is preparing environmental impact statements (EIS's) to assess, among other things, whether proposed projects represent threats to endangered species.

There are compelling justifications for preventing needless extirpation of species†. We have a common evolutionary heritage with other organisms, and find inspiration and beauty in many of them; thus, in some sense we are impoverished by the elimination of other species. More pragmatically, species are genetic and chemical resources that are useful in plant breeding, pest control, and biomedical research. Clearly, loss of species reduces this resource base.

Present efforts in the public and private sectors are a welcome beginning, but may be insufficient to guarantee long-term preservation. They are essentially negative in their concern not with preservation, but with preventing decimation of species. Further, in the case of plants and many inconspicuous animals, few of the field personnel working on EIS's have the training and experience required to recognize these species in the field.

A longer-term, more positive approach seems essential. The only sensible basis for protection of endangered species is preservation of sufficient suitable habitat. If such habitats were carefully chosen on a regional basis, they could, in addition to harboring endangered species, represent prime examples of natural communities. The search for endangered species and analysis of their habitat requirements would have to be carried out by trained field taxonomists and ecologists. It might be best to begin by systematically screening public lands. Such habitats as might be found could be set aside to be managed, if necessary, specifically for preservation of endangered species.

Such an extensive search and study effort would take many years of fieldwork, and it would be costly. Yet, only through such efforts can we know which species really need special attention for their preservation. In addition, this approach could reduce the cost of EIS's in several ways. Substantial sums of money are now being spent to determine whether endangered species reside on sites proposed for construction. The approach outlined here could eliminate the need for this aspect of EIS's, which could have the additional benefit of allowing EIS writers to focus directly on the more complex aspects of assessing potential impact. Further savings should result from an improved efficiency of locating sites acceptable for new construction. Once the locations of preserved habitats have been made public, it could be determined at the outset whether a particular site is unacceptable in terms of risk to endangered species, instead of discovering this after an impact assessment study is completed. Finally, preserved natural habitats would provide a standard for judging the quality of habitats to be destroyed or significantly altered by a particular project.

In the long run, it would seem prudent to approach the problem of species preservation as part of the broader problem of regional habitat preservation.—P. A. HARCOMBE, *Department of Biology, Rice University, Houston, Texas 77001*; and P. L. MARKS, *Ecology and Systematics, Cornell University, Ithaca, New York 14853*

*"Threatened or endangered fauna or flora," *Federal Register*, vol. 40, No. 127, part V, July 1975. †N. Myers, "An expanded approach to the problem of disappearing species," *Science*, vol. 193 (1976), page 198.

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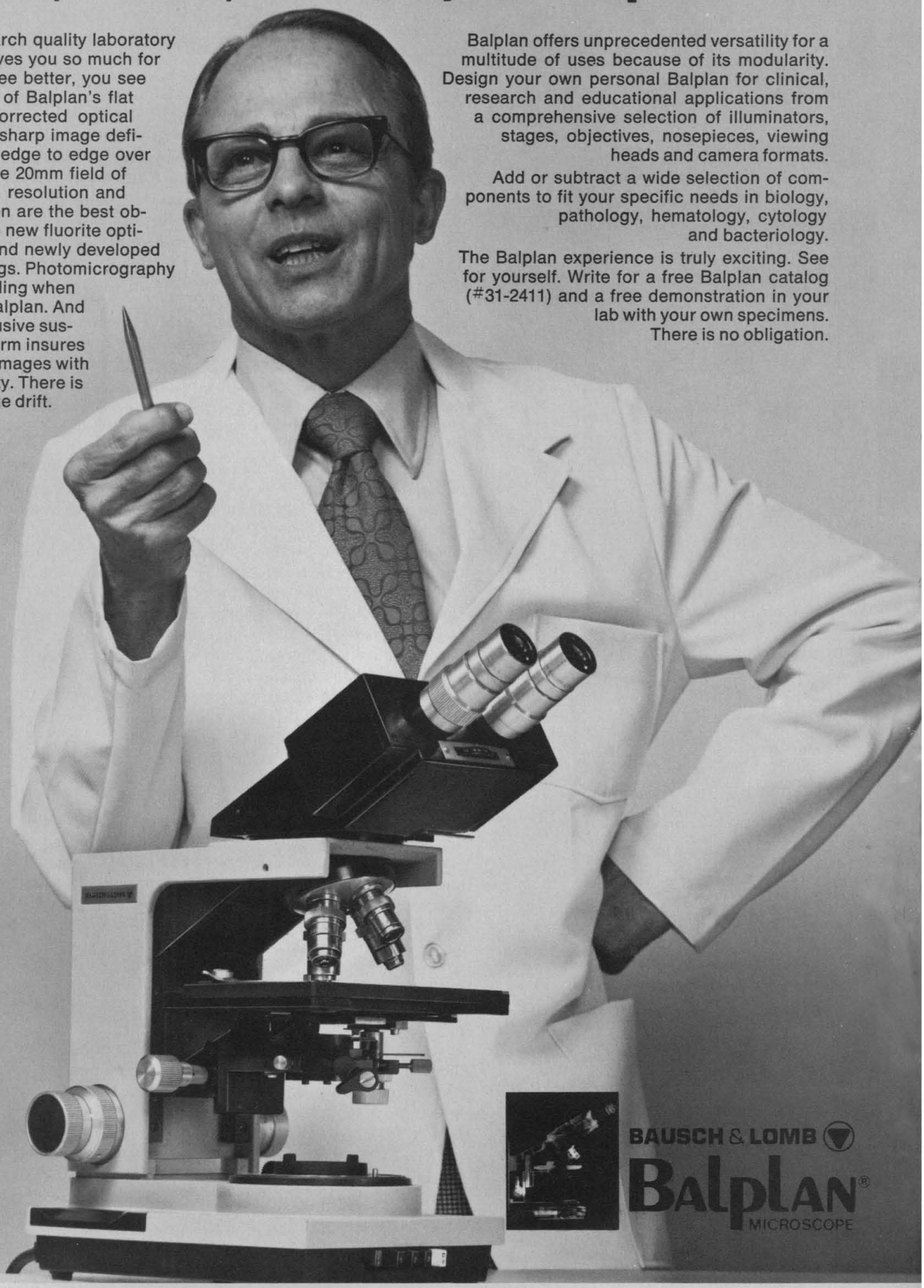

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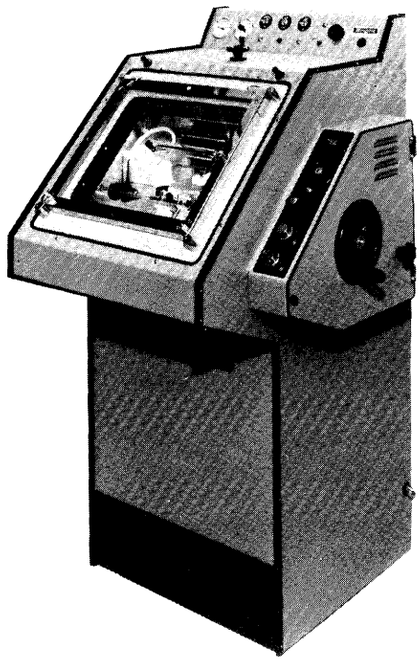

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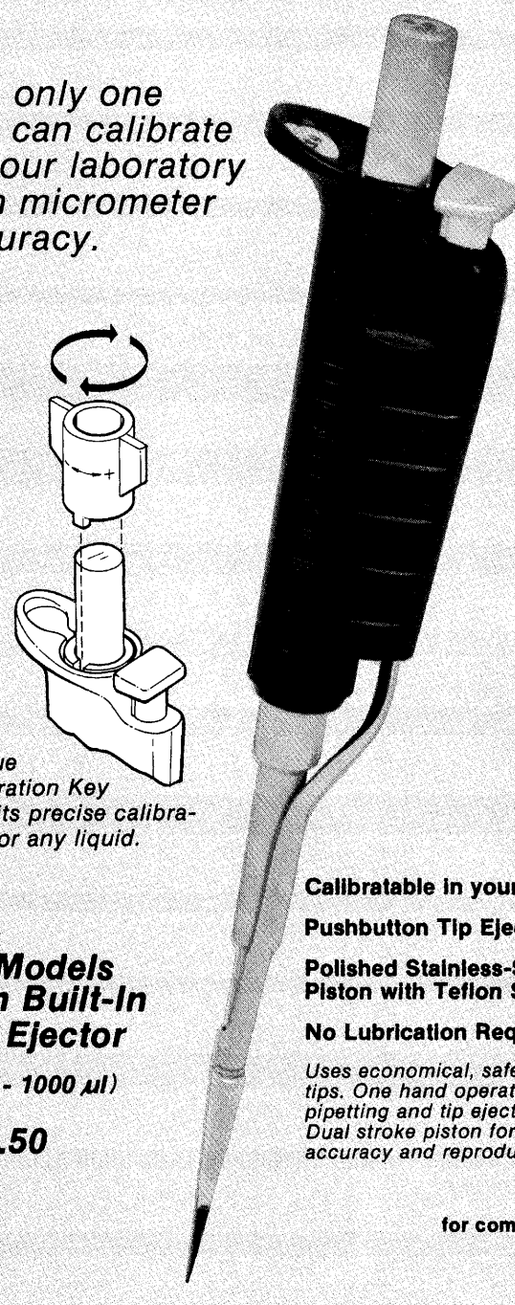

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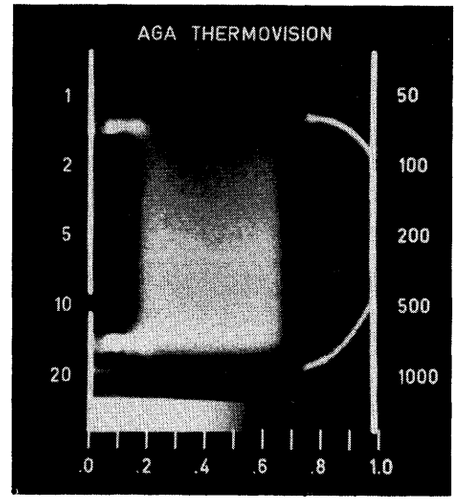

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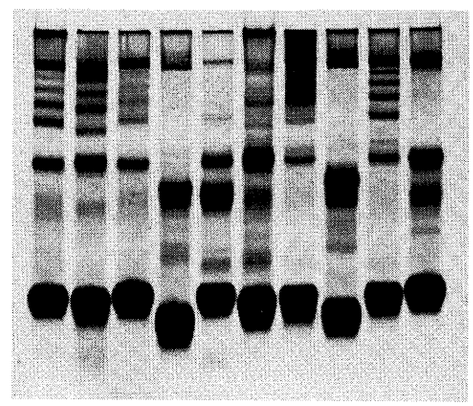

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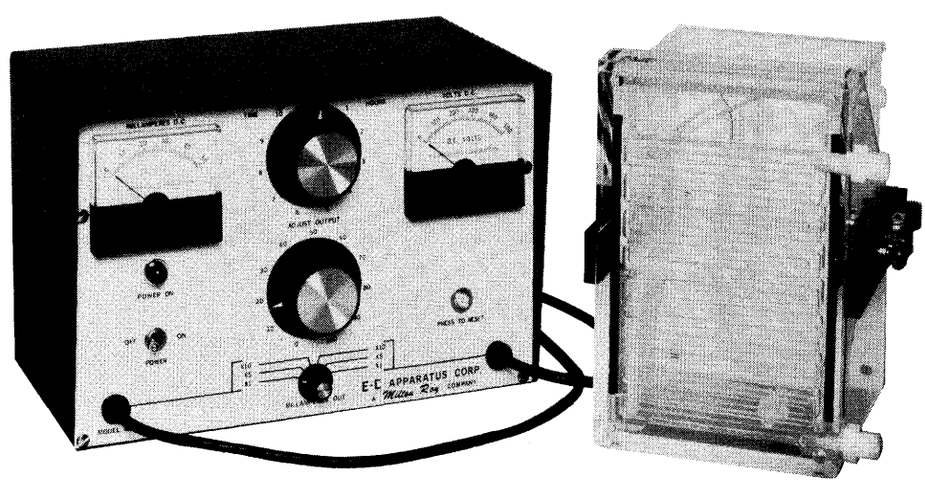

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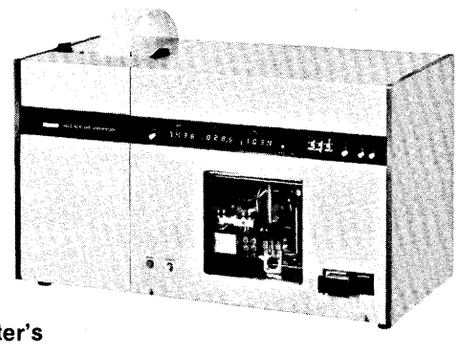

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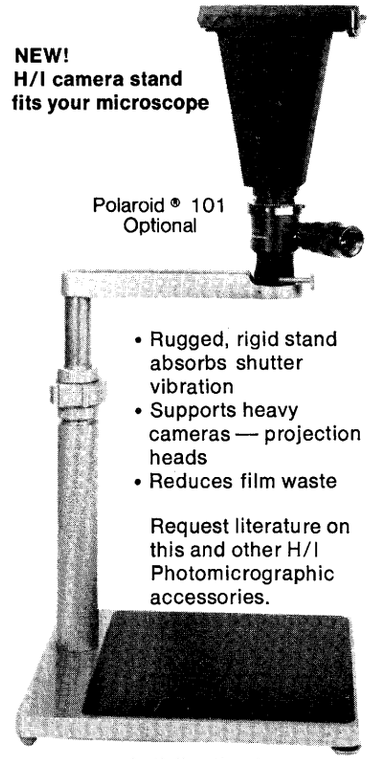

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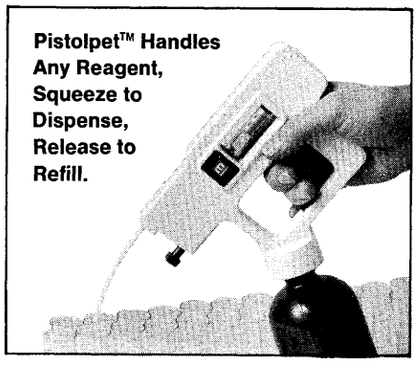

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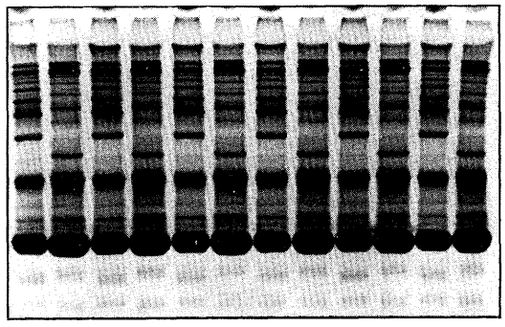

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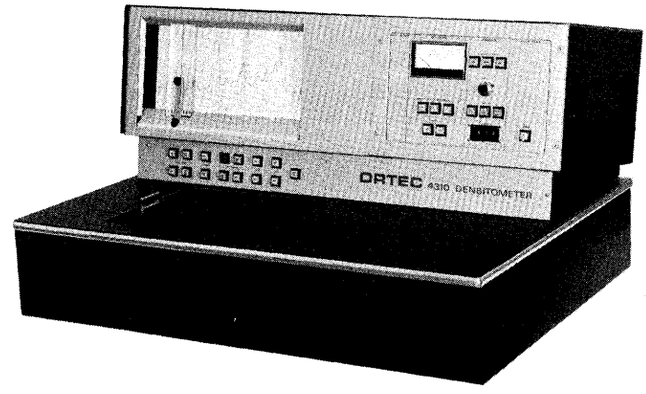

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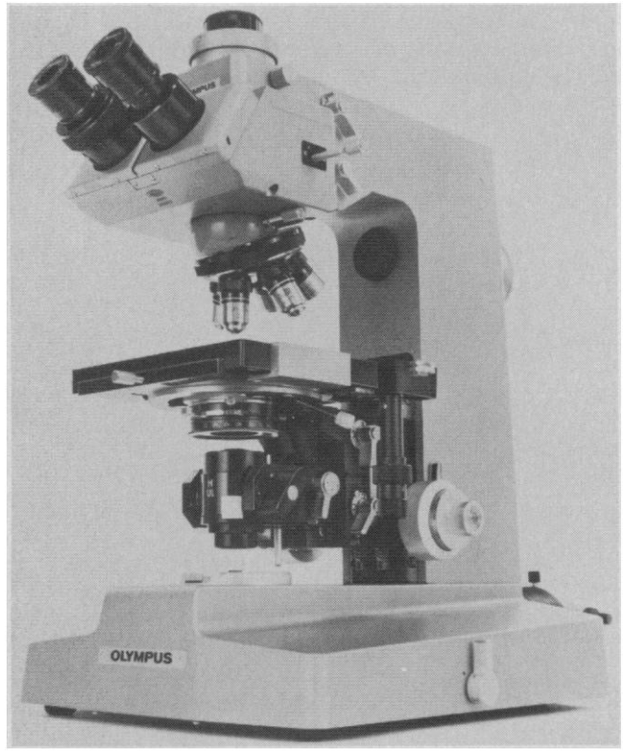

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