SCIENCE

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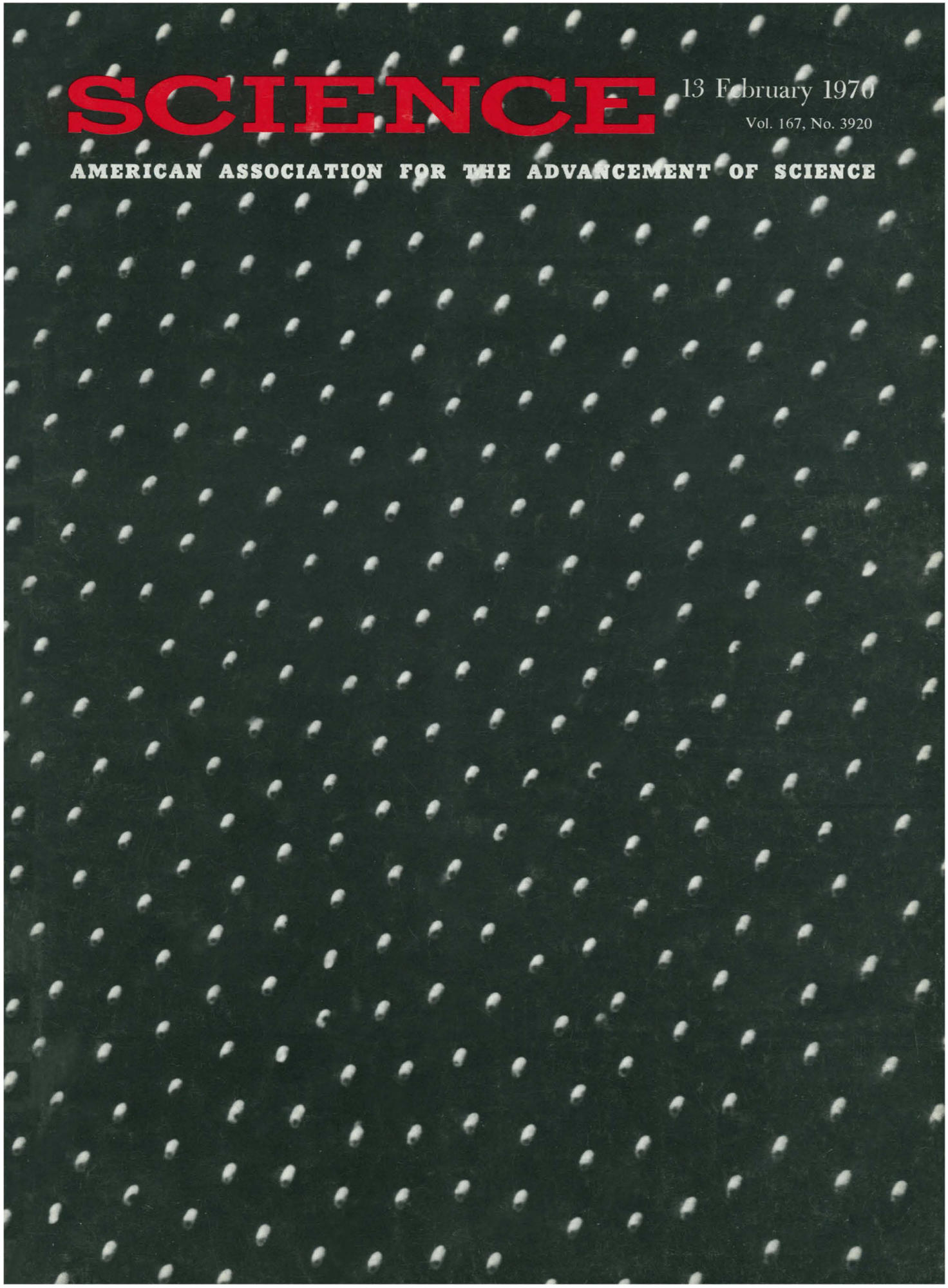
AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE



Water, Water Everywhere...

. . . nor any drop to drink?".

It has not reached that stage, yet. But there is growing concern over the pollution of drinking water in the closely populated areas of the world, and, far more serious, the pollution of the oceans and the sea-food which forms the diet of many millions of people.

One of the most serious effects of ocean pollution is the ruin and destruction of plankton — the food on which most of the creatures of the sea depend.

As part of the search for greater knowledge of the life processes of plankton, a renowned marine biologist has successfully measured their metabolic activity. This investigation called for an instrument with incredible sensitivity — the LKB FLOW MICROCALORIMETER. In fact, the LKB Flow Microcalorimeter sensitivity was such that successful measurements were made not only of concentrated solutions of plankton, but even of such diffuse solutions as normal sea-water.

A special feature of both the LKB Flow and Batch Microcalorimeters is the ease with which they can be set up and operated. Even the newcomer to calorimetry will find them easy to use, after only a very brief training session.

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Hurry up and get well

Sir Luke Fildes' famous painting notwithstanding, a newer, cold-hearted tide of informed opinion about doctoring has begun to run. To the neglect of bedside demeanor, recognition is accorded such capabilities as resolving 30 distinct proteins in a couple of μl of serum.

Such an ability serves the public weal through science or the clinic, preventive or therapeutic. As for science, beating a drum most of the past decade for protein resolution by acrylamide-gel electrophoresis has also well served the EASTMAN Organic Chemicals business. The clinic has not yet been served so well. A procedure that takes 6 technician-hours to run costs too much. High cost, low volume. Low volume limits buildup of statistics by which to interpret a protein spectrum clinically. If computers are to help practice medicine as well as issue bills, then the doctor needs to consult the computer in terms the computer can understand.

1-Anilino-8-naphthalenesulfonic Acid Magnesium Salt
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This new EASTMAN Organic Chemical, of all things, may help. It replaces the 2-3-hour, protein-denaturing staining and destaining step with a 2-5-minute delineation of the major zones by fluorescence. Only on the outer surface does our little lantern molecule covalently bond itself; the volume of the zone remains untouched. "Live" protein so pure and so easily isolated has obvious investigative value. Clinically, the speedup hastens the day when an acrylamide-gel protein pattern becomes as routine as weighing the patient.

Working procedure was published only last month among the circle interested in—of all things—Neurospora. Copy available from W. T. Fisher, Eastman Kodak Company, Rochester, N. Y. 14650.

Mangrove

Here's an instance where real-estate law and botany interlace in a mass as easy to penetrate as a mangrove shore.

Though shore property deeds run to the low-water line in northeastern Maine, it's the mean high-water line in South Florida. Where the Florida shore is not yet man-made, some of it is mangrove-made. With aerial roots and with vigorous germination while the fruit still hangs on the tree, mangrove has built this niche.

What with the very small elevation gradient, the human land-developers argue about where they own. We have been helping the state authorities grapple for a fair resolution.

KODAK EKTACHROME Infrared AERO Film extends color vision into the near-infrared. There it finds in plant tissues spread out beneath the aerial camera as subtle a play of colors—arbitrary though they be—as ever distinguished a Red Delicious apple from a Macintosh for a shopper who can't name a single plant pigment.

Gerald Norman of the Florida Department of Agriculture hopes a sharp split has occurred in mangrove speciation at the high-water line. Perhaps salinity makes the difference, perhaps time and distance out of water. He further hopes to show a reliable difference in infrared color. After all, in orange trees even differences in variety within a single species stand out this way from aloft. Perhaps "false color" can locate the high-water line honestly.

Mr. Norman's address is P.O. Box 1269, Gainesville, Fla. 32601, in case you'd like to keep in touch with his progress.

Room to work

A small minority of students take physics.

A small minority of physics students thrill to the unit on optics.

Little or none of the unit on optics deals seriously with lens aberrations.

Therefore, when a moderately well-informed person hears of lens aberrations, he thinks of defects in manufacture. Unwittingly imbued with Greek notions of perfection, he reasons that perfect spherical surfaces on perfectly homogeneous media should form perfect images.

There really is no reason why they should, and they don't. The bigger the aperture and angular field, the more they fail.

Though image perfection may remain forever unattainable even with perfect spheres and media, ever nearer approaches are made. One strategy employs numerous successive spherical surfaces separating numerous media of different refractive index. Each is calculated to undo some of the others' image errors.

In another strategy, sphericity is abandoned. Aspheric lenses now serve usefully in many applications. They, too, all miss perfection in geometrical image formation.

A third way of bending the rays is now receiving consideration: make the index vary on a gradient. Planetary atmospheres bend light that way. How to produce such media in a factory is one question. How to fight aberrations with them is another question, a mathematical question. Mathematical weapons for the fight have been fabricated by the mathematician Erich W. Marchand of the Kodak Research Laboratories. His paper "Ray Tracing in Gradient-Index Media" in the January issue of the *Journal of the Optical Society of America* broadcasts them for use. In acclaiming his achievement, let us point out that the uncrowded fields of scholarly endeavor offer satisfactions comparable in their way with those of an uncrowded physical environment.

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COVER

Composite of uranium oxide and tungsten. The bright tungsten fibers are exposed because a thin layer of the oxide matrix was selectively etched away. The sample was not coated with a conductive layer and the emissive mode was used at a viewing angle of 0 degree. The composite was unidirectionally solidified in a modified floating zone process (× about 2300). See page 979. [R. J. Gerdes and A. T. Chapman, Georgia Institute of Technology; G. W. Clark, Oak Ridge National Laboratory]

Whatever range you're weighing in, Sartorius top-loaders are best to weigh it on.

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The Need for Basic Research

Basic science is attacked today from two major fronts. One attack stems from a mounting opinion, widely held and shared by some members of Congress and government, that the search for deeper insight into natural phenomena is an expensive luxury which should be supported only if it promises immediate payoff in terms of practical applications for industry, for medicine, or for national defense. The other attack comes from a significant part of the younger generation; they distrust science as being the source of industrial innovations leading to further deterioration of our environment, to further destructive applications in weaponry, and to further developments in our society toward Orwell's world of 1984. At best, they say, pure science is a waste of resources which would be better devoted to some immediate, socially useful purposes.

Caught between these two wedges, basic science is threatened, and its activities may be reduced further. Lack of material support and public disinterest and distrust not only endanger basic science now, they also jeopardize its future by increasing demoralization among working scientists and sharply reducing the influx of young people into science. The character of our higher education in science is to be blamed, too, because it too strongly emphasizes narrow specialization instead of broader training for more general scientific approaches. In consequence of these trends, the number of scientists adept at pure research is already small, and basic science is in process of shrinking toward insignificance in this country. This ominous trend must be combated.

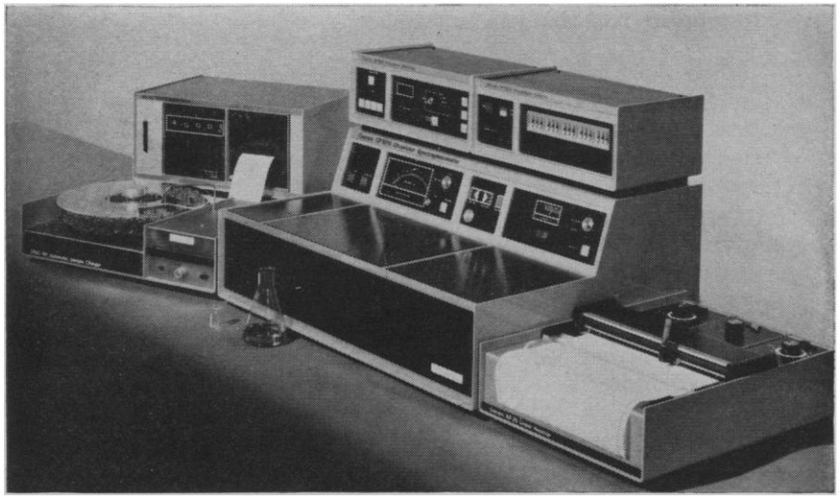
We live in critical times. The growing speed of technological change, and the growing expansion of technology over the globe, have created vast social and technical problems which must be attacked if we are to avoid major catastrophes. This attack must take the form of painstaking investigation of the effects of industrialization and thorough study of the interrelation of many factors which determine our environment. To proceed effectively will involve more basic science, not less. To quote Polanyi*:

> The scientific method was devised precisely for the purpose of elucidating the nature of things under more carefully controlled conditions and by more rigorous criteria than are present in situations created by practical problems. These conditions and criteria can be discovered only by taking a purely scientific interest in the matter, which again can exist only in minds educated in the appreciation of scientific value.

The careful analysis of the problems and the necessary measures for solving them will require more, not less, of the spirit engendered in pure research. We will need more, not fewer, people trained in pure research, in the unbiased search of causes and effects. The scientists who are involved in fundamental research have always proved to be the best reservoir of manpower for tasks requiring objectivity, innovative ideas, and imaginative approaches. We must not let the source of this reservoir dry up. We cannot afford to do what we did during World War II—to stop basic research for the duration, which for us was only 4 years. The present environmental trouble could well extend over many decades, during which time we must continue to train new generations of devoted young scientists. We need a continuous vigorous pursuit of basic research in this time of crisis, for its intrinsic values as well as for its role as a source of brainpower for the tasks which we will face in the future.—VICTOR F. WEISSKOPF, *Department of Physics, Massachusetts Institute of Technology*

* M. Polanyi, *Personal Knowledge* (Chicago Univ. Press, Chicago, 1958), p. 182.

3 ways to go into analysis.



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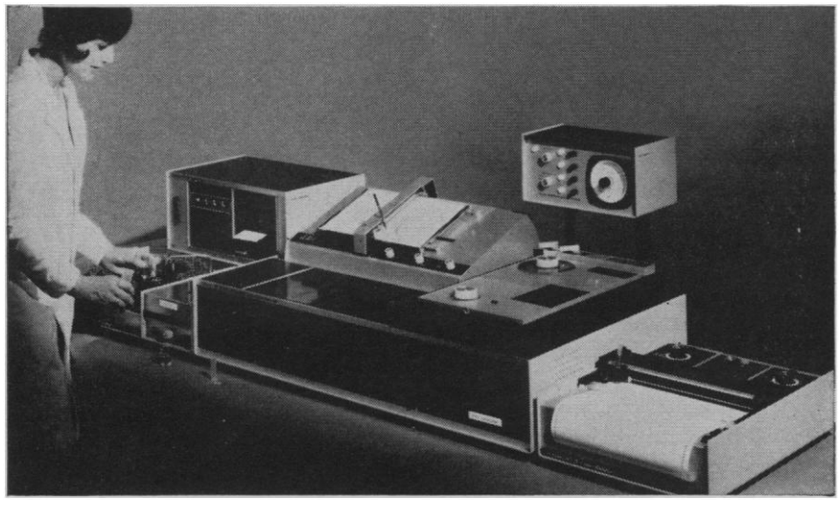

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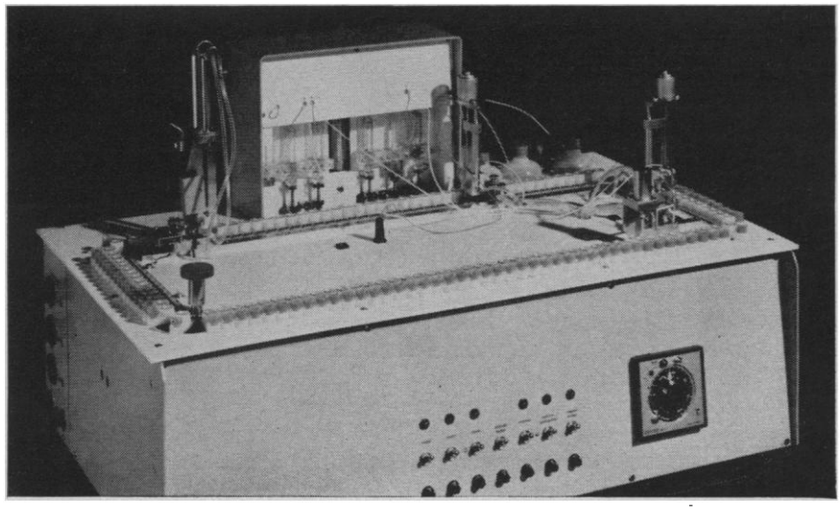

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in cancer cells and the degree of differentiation of this organ-specific isozyme whose pattern changes irreversibly in the course of development. The activity of the marker enzyme does not change in regenerating liver or after various hormonal treatments. H. Inoue (University of Wisconsin Medical School, Madison) observed two forms of the enzyme serine dehydratase in liver and hepatomas. The two forms appear to be regulated by different environmental mechanisms. Serine dehydratase in the rat occurs only in the liver. These studies again emphasize that the mammalian cell must have considerably greater flexibility in the regulation of enzyme synthesis than the bacterial cell. This may in part be due to the complex structure of the mammalian cell with spatial separation of the synthesis of different forms or to even more subtle distinctions in the regulation of the synthesis of such closely related isozymes.

In a session on Control Mechanisms in Tumors, V. R. Potter (University of Wisconsin Medical School, Madison) described the induction of an enzyme in Morris hepatoma 9618-A that was thought to be noninducible. Tyrosine transaminase in hepatoma 9618-A is very low in activity on standard diets and is unaffected by a 60 percent protein diet or by hydrocortisone injections, either of which induces high amounts of activity in normal liver. Thus it might have been assumed to be "uninducible" or "deleted." Potter reported that such interpretations were now untenable and that the lack of an enzyme or the failure to induce an enzyme under conditions that result in enzyme induction in differentiated tissues of adults no longer suffices to define the state of the genome in a neoplasm. The experiment in which the enzyme was induced in the hepatoma was the culmination of numerous trials using inductive procedures designed on the assumption that the hepatoma cells resemble fetal cells more closely than they resemble adult liver cells. G. Galli (University of Milan, Milan, Italy) investigated the latest stages of cholesterol biosynthesis in rat liver, in growing and adult central nervous systems, and in experimental and spontaneous brain tumors. The incorporation of a specific precursor (mevalonic acid) in the individual sterols, particularly in brain and brain tumors, was established, and a biosynthetic sequence was described. A new precursor of cholesterol, 4,4-dimethyl-5α-cholesta-8,14 dien-3 β-ol, was identified, and its formation and role were discussed. G. A. LePage (University of Texas, Houston) discussed two examples in which the tumors had suffered partial deletion of catabolic enzymes or changes in enzyme-substrate specificity. In one case, the alpha-enomer of a fraudulent nucleoside was inert in mouse bone marrow but was phosphorylated to the active nucleotide form in some neoplastic tissues. Neoplastic tissues that phosphorylated the nucleoside, alpha-2′-deoxythioguanosine, were responsive to treatment with this nucleoside. In a second case the analogs of adenosine, arabinosyladenine, and xylosyladenine were carcinostatic in some neoplasms. Evidence was obtained for variation in the relative rates of deamination of ribosyladenine, arabinosyladenine, and xylosyladenine from one species to another and from one tumor to another within a species.

GEORGE WEBER
Pharmacology Department, Indiana University School of Medicine, Indianapolis 46202

Notes

1. The full text of the papers, edited by the chairman of the conference, George Weber, will be published in the spring of 1970 as volume 8 of *Advances in Enzyme Regulation* (Pergamon, New York and Oxford, in press).
2. The conference was sponsored by the Indiana University School of Medicine, Burroughs-Wellcome and Co., Hoffman-LaRoche, Eli Lilly and Co., and the Squibb Institute for Medical Research.

Courses

Summer Institute on Surtsey, 15 June–1 July. An interdisciplinary course to study the geological, geochemical, geophysical, biological, and ecological implications of the new volcanic island, Surtsey, and selected areas of Iceland. Is intended for university teachers and research workers. Financial support is available for 14 participants. *Deadline for receipt of applications*: 1 March. (Prof. James W. Skehan, S.J., Department of Geology and Geophysics, Boston College, Chestnut Hill, Mass. 02167)

Field Ion and Field Emission Microscopy, Gainesville, Fla., 23–27 March. Among the subjects to be covered are geometry of surfaces and computer techniques, electronic structure of surfaces, field electron emission, field ionization and image formation, field evaporation, grain boundaries and interfaces, metallurgical applications, and atomic order. Travel and subsistence allowances and/or tuition waivers have been made available by the National Science Foundation. (Dr. J. J. Hren, Department of Metallurgical and Materials Engineering, University of Florida, Gainesville 32601)