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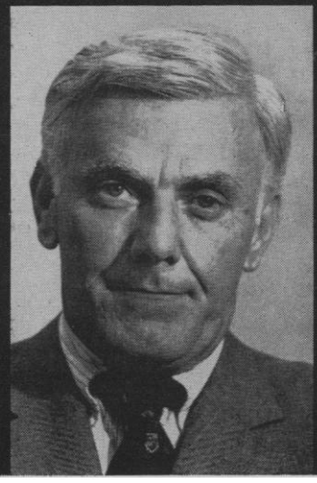

12. Are there new uses for this product?
13. Are the data obsolete?
14. Is there a more economical synthesis for this compound?
15. Does this compound have significant biological activity?
16. Does the development program have a marketing payoff?
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COVER

Immature male of the Central American otter (*Lutra annectens*) against which a freshwater crab (*Potamocarsinus richmondi*) exhibited attack autotomy as a defensive mechanism. See page 300. [Michael Robinson and Barbara Robinson, Smithsonian Tropical Research Institute]

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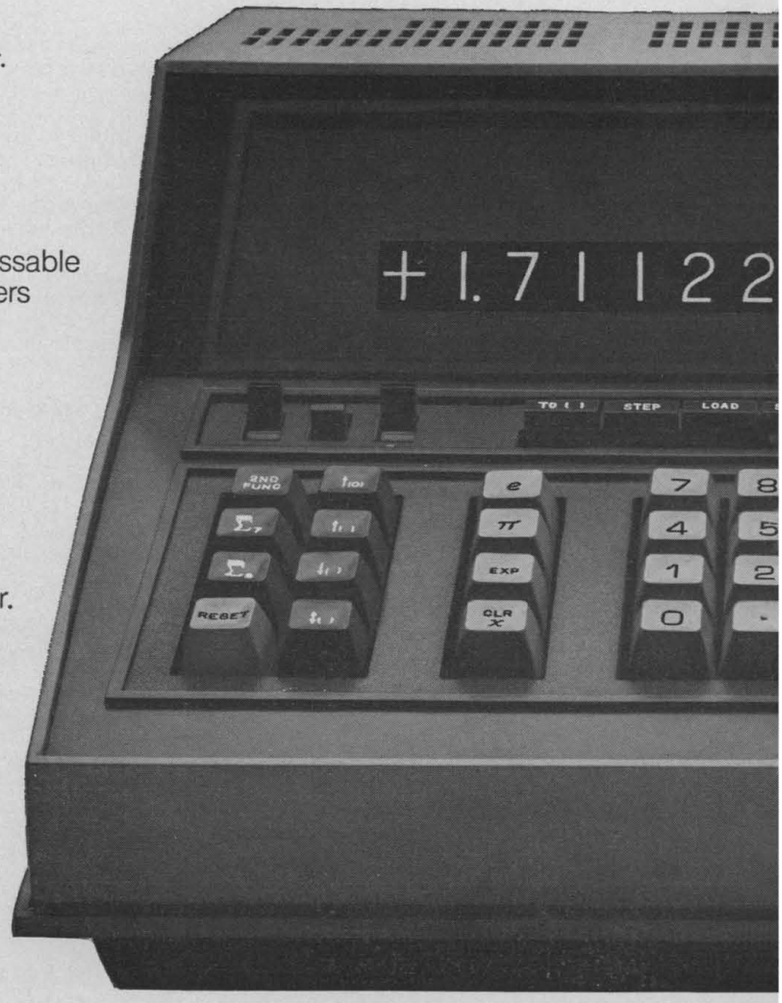

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2) and 3) may be expected to increase.

The National Research Council should have collected the foregoing data before stating, "The evidence does not support the notion that widespread unemployment or malutilization of training and talents exists among recent doctoral graduates."

JAMES M. KALLIS
3639 East 2nd Street,
Long Beach, California 90803

Despite the oversupply of applicants for certain jobs in science (Editorial, 15 May, p. 781), biomathematics is one field in which demand still well exceeds the supply.

Since 1963, the biomathematics program at North Carolina State University has finished 29 postdoctoral students and granted 12 Ph.D. and 11 Master's degrees. These trainees, with one exception, had no difficulty in finding challenging, high-paying positions. Most had several opportunities from which to choose. Currently there are 6 postdoctorals and 19 predoctorals in residence. Of the 2 postdoctorals and 4 predoctorals who will complete their training within the next few months, only one has had less than two job offers; one had five. All have accepted positions at salaries that are well above average.

Many of the openings are related to ecological and other aspects of environmental science, but there is also notable demand in the pharmaceutical industry. Inquiries have been received from a variety of biological, medical, biostatistical, and biometrical as well as biomathematical groups at several universities. Capability in mathematical modeling is a prime job requisite. . . .

H. L. LUCAS, JR.
School of Physical Sciences and Applied Mathematics, North Carolina State University, Raleigh 27607

Consensus and the Collective "We"

Scientists are being systematically urged to ask their professional societies to take a stand against the war in Indo-China. I wish to point out that the avoidance of such stands is a matter of principle, not just tradition.

If a society to which I belong takes stands on nonscientific issues, it will sooner or later espouse one that is abhorrent to me, forcing me to condone it or resign. Eventually the society will

be reduced to a small, politically single-minded group. This group will then have succeeded, intentionally or not, in suppressing all political thought except its own.

ROBERT HOOKE
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Computers in Printing and Indexing

Salton's excellent article "Automatic text analysis" (17 Apr., p. 335) stresses the technical feasibility of using computers to index and classify documents and indicates that computers do as good a job as manual indexers (which does not inspire confidence in the present systems used for manual indexing). However, there is no reference to the economic feasibility of automatic indexing and no mention of current or eventual cost.

Also omitted was a discussion of scale-up problems and lengthy computer runs to be expected when expanding from a small trial system with a limited number of terms and synonyms to the relatively huge thesauri needed to cover broader fields [13,535 main terms in the NASA Thesaurus; 17,810 main terms in the 1967 DOD Thesaurus of Engineering and Scientific Terms (TEST or LEX Thesaurus); 7590 main terms in the National Library of Medicine Thesaurus of Medical Subject Headings (MESH), and so forth]. It may be that consideration of these factors would have some bearing on Salton's qualified conclusion that ". . . there are no obvious technical reasons why manual document analysis methods should not be replaced by automatic ones."

JOHN H. SCHNEIDER
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Washington, D.C. 20008

. . . The significance of this work will become more evident as more text is on computer base. The British publication *Physics Abstracts* is now composed by photocomposition, and in this country both the American Chemical Society and American Institute of Physics plan to photocompose their journals. The availability of these on computer base amenable for searching offers rich fields for further automatic indexing studies. . . .

JAMES D. CAPE
608 West Vanderbilt Drive,
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17 July 1970, Volume 169, Number 3942 **SCIENCE**

Methyl Mercury

During this century, in the United States, about 75 million kilograms of mercury have been consumed; little information is available on its final disposition or on the concentration of the element at specific points in the environment. Recently, it has become clear that compounds of mercury present a substantial hazard. Of particular significance is methyl mercury, a highly toxic substance that causes neurological damage, produces chromosomal aberrations, and has teratogenic effects. It is mainly in this form that mercury is found in food fishes. Recent studies have elucidated some of the steps in the accumulation.*

Industrial wastes containing inorganic mercury or phenyl mercury find their way into bottom muds of lakes. There they are converted by anaerobes into CH_3Hg^+ or $(CH_3)_2Hg$. The latter compound is volatile, and it escapes into the water column from the sediment. Though quite stable in alkaline solutions, $(CH_3)_2Hg$ is converted to CH_3Hg^+ at low *p*H. This ion is soluble in water, and it is concentrated by living things, usually appearing in the body lipids. In part, the concentration may come by way of the food chain, but apparently fishes may also accumulate the toxic ion directly. The concentration factor from water to pike is of the order of 3000 or more.

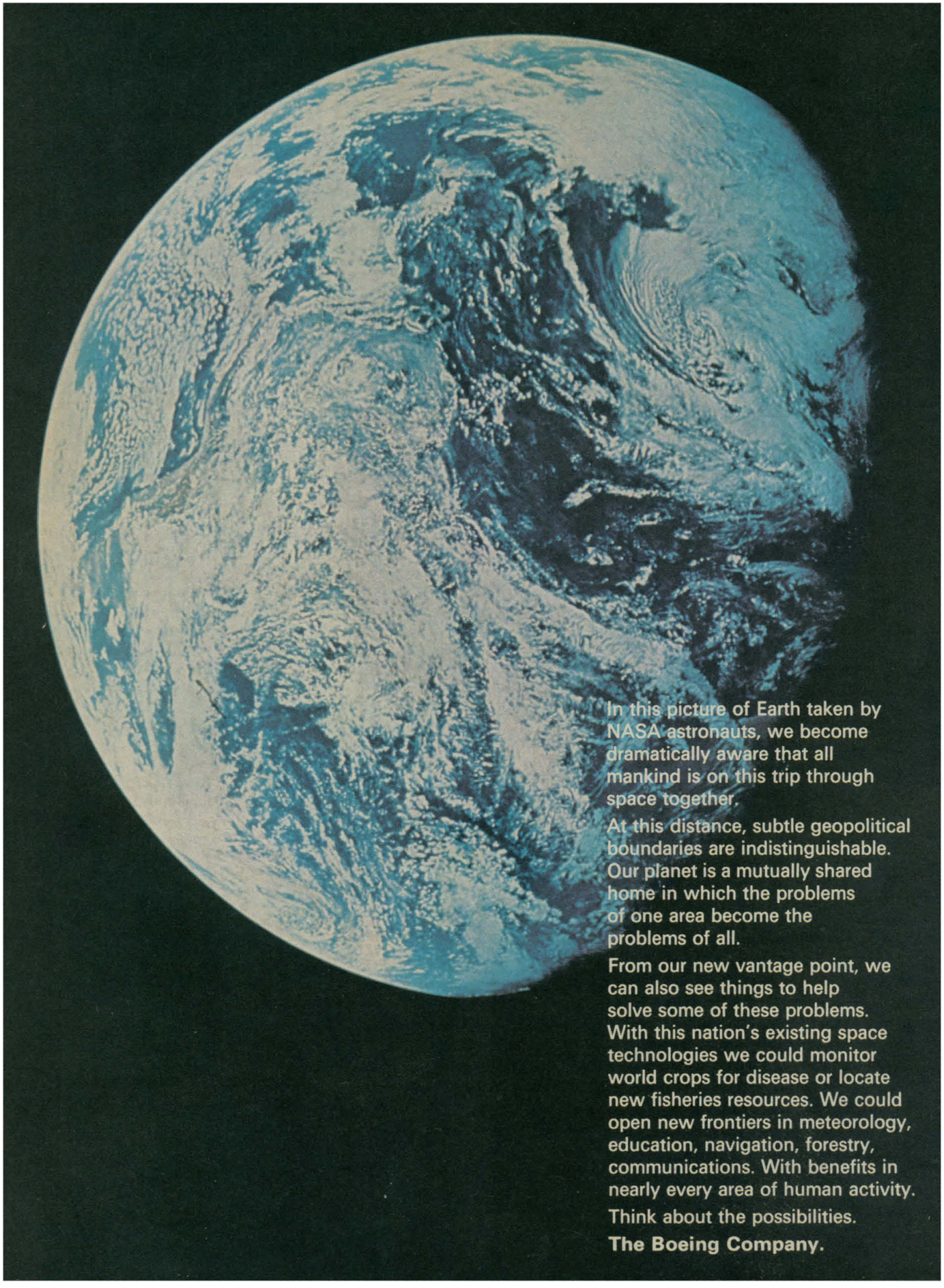
Substantial mercury pollution in the Great Lakes became apparent in March of this year. Mercury concentrations as high as 5 parts per million were reported in some pickerel shipped from Canada. Typical concentrations in fish taken from Lake Erie were 1 part per million or less. Further investigations have confirmed the existence of a major environmental problem traceable to the dumping of large amounts of mercury-containing liquid wastes. This discovery comes as a surprise to most scientists and apparently to federal authorities. However, there was ample reason for looking for such a phenomenon. Episodes in Sweden† and Japan had pointed to dangers arising when large quantities of mercury are discharged into the environment. In Sweden the use of methyl mercury in a seed dressing had led to a drastic decrease in wild bird populations. Near Minamata, Japan, between 1953 and 1960, 111 persons were reported to have been killed or to have suffered serious neurological damage as a result of eating fish and shellfish caught in mercury-contaminated areas. Among the 111 were 19 congenitally defective babies born of mothers who had eaten the fish and shellfish. Later, at Niigata, Japan, 26 cases of methyl mercury poisoning were noted. The affected persons and their families ate fish with a frequency of 0.5 time to 3 times a day; the fish contained mercury at concentrations of about 5 to 20 parts per million.

Physiological and cytological studies have revealed some of the behavior of methyl mercury. It tends to be associated with red blood cells and nervous tissue, and it easily passes the placental barrier, becoming moderately concentrated in the fetus. It can cause chromosomal disorders. Fruit flies consuming food containing methyl mercury at a concentration of 0.25 part per million had offspring carrying one extra chromosome.

It seems unlikely that anything approaching the Japanese observations will be seen in the region of the Great Lakes. There the concentrations of methyl mercury in fish are lower and fish are a less important part of the diet. Nevertheless, we have a substantial and long-enduring problem; even if fresh pollution were stopped, it would be many years before natural processes could cleanse the lakes.

This episode has not led to demonstrable tragedy, but it should remind us how much we risk when we convert our rivers to sewers and our lakes to cesspools.—PHILIP H. ABELSON

* S. Jensen and A. Jernelöv, "Biological methylation of mercury in aquatic organisms," *Nature* **223**, 753 (1969). † Report of an International Committee, "Maximum allowable concentrations of mercury compounds," *Arch. Environ. Health* **19**, 891 (1969).



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