

SCIENCE

16 September 1966

Vol. 153, No. 3742

AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE



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COVER

Beetle of the genus *Eleodes* assuming the headstand with which it characteristically responds to disturbance. The insect repels predators with a secretion containing guinone; the guinone is sprayed from the tip of its abdomen (actual body length, 2.5 cm). See page 1341. [T. Eisner, R. Alsop, R. Silberglied, Cornell University]

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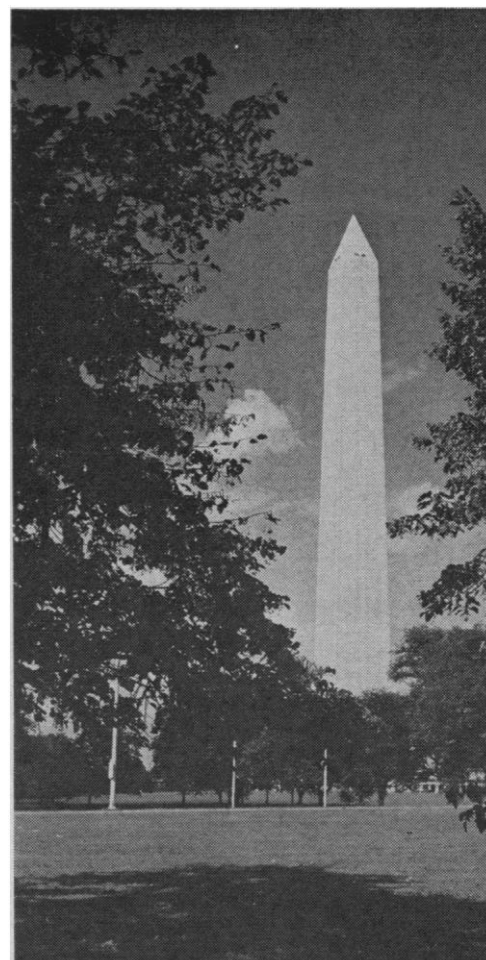
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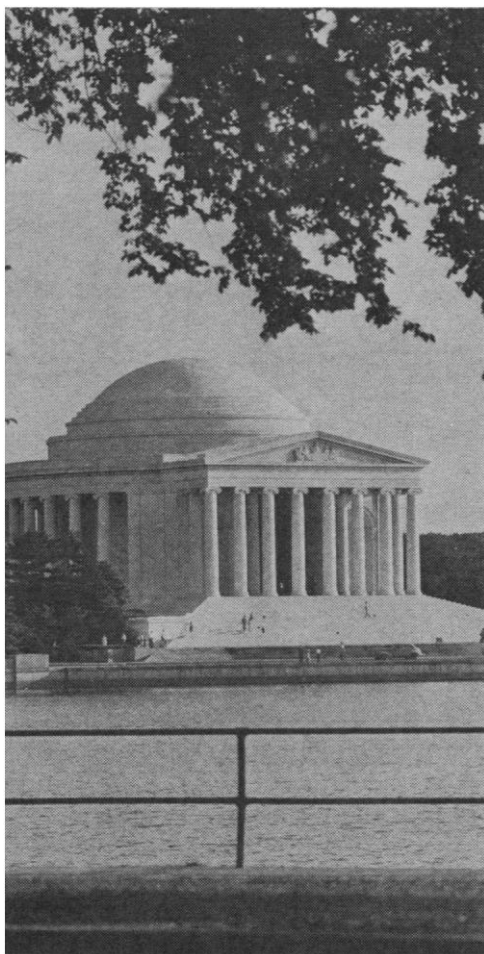
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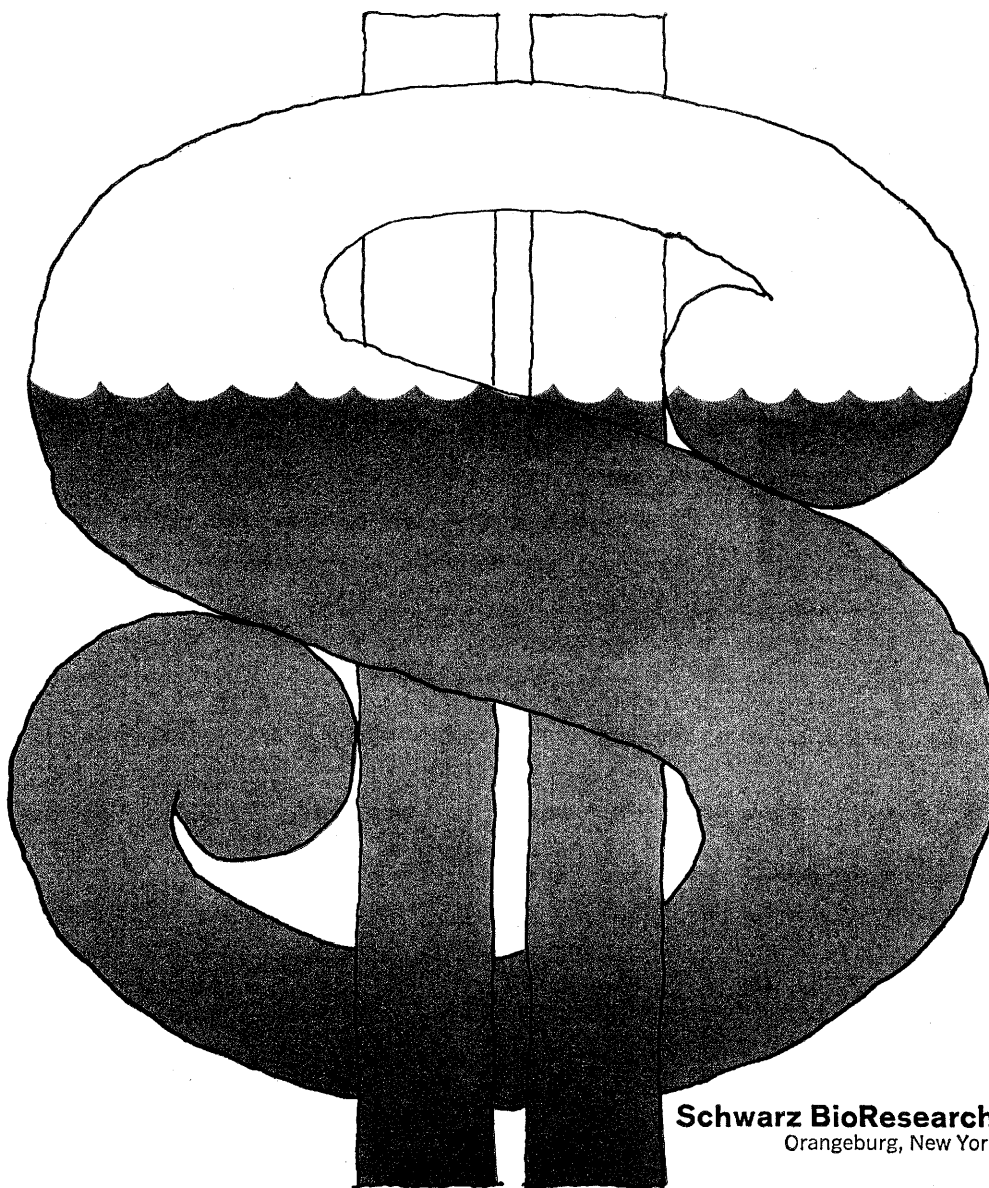
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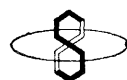
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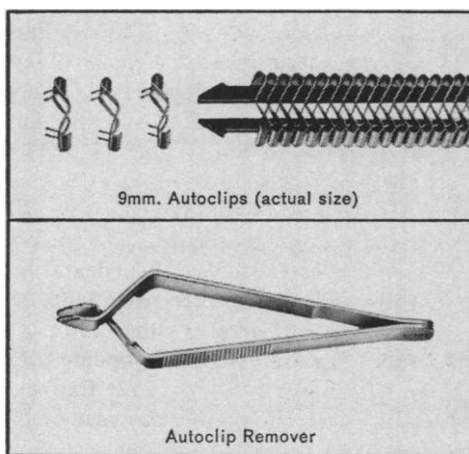
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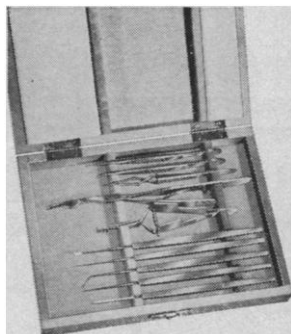
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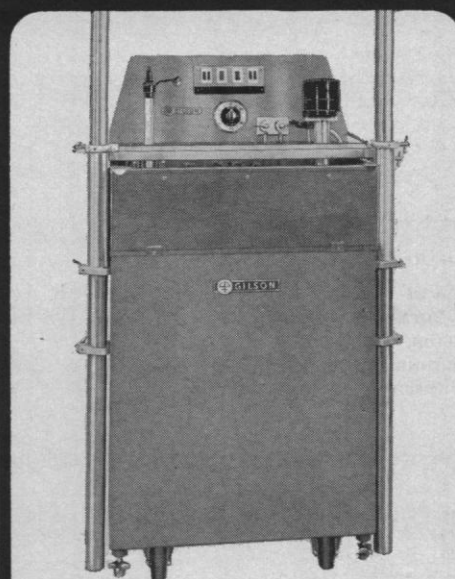
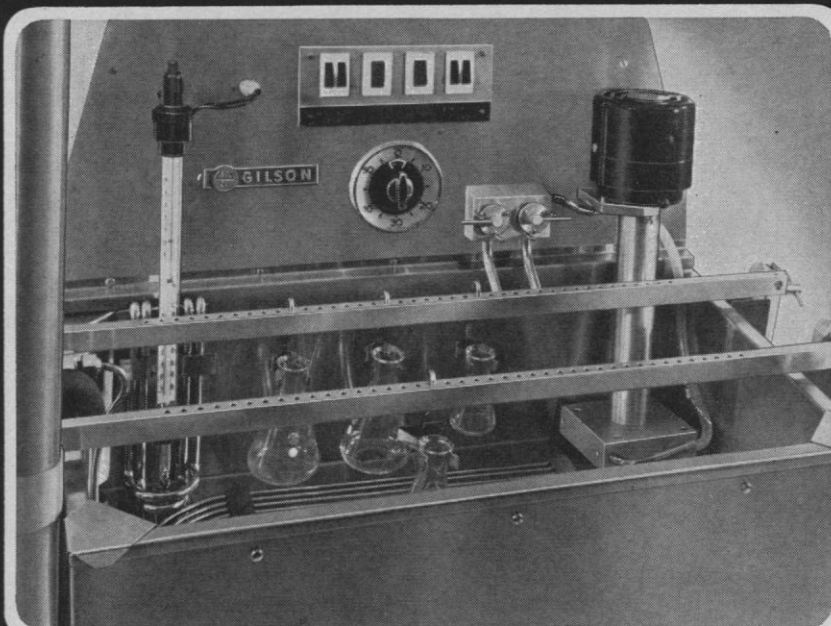
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Commitment to Science

In an essay entitled "Science, Scientists, and Politics,"* the historian Lynn White, Jr., has pointed out that public attitudes toward science have always been closely related to the basic religious, social, and esthetic values of a culture. Thus science flourished in Greece and for four centuries in Islam, but was ignored in Rome and deliberately abandoned in Islam when the focus of Islamic culture changed in the 12th century.

In its earlier years, the European scientific tradition was strongly supported by the congruence of scientific attitudes and the Protestant ethos—the similarity of their cosmic views, the Christian belief in good works, and the use of science to increase man's understanding of the works of the Creator. Now, as White explains, "the motive force of natural theology has long been spent, and it does not seem to have been replaced with any other idea of equal power."

What has developed is a strong commitment to the practical values of science. Within available means, the United States and many other countries are willing to support research that gives promise of useful application. In fact, the announced policy of the present U.S. administration is to place even greater emphasis than in recent years on research designed to achieve useful objectives. The recent vote of the House of Representatives denying funds for continuation of the Mohole Project is relevant. The controversy that has surrounded this project almost from its beginning makes it easy to sympathize with congressional feelings of irritation and to understand the intrusion of political arguments into the debate. Nevertheless, the vote should be interpreted not only as a rejection of a particular, and meritorious, research program but also as a sign of a serious flaw in the American commitment to science. That commitment is so largely to the practical values of science that other values tend to be forgotten. Contributions of the Mohole Project to the improvement of drilling techniques have not been much stressed, and geophysical studies of the earth's crust and the Mohorovičić discontinuity have neither medical nor military appeal. Given our emphasis on practical results, such projects become easy targets when the going gets a little rough.

The expectation of practical results is a thoroughly sound reason for supporting research; scientists and government officials both talk of "investment in research." But this is not society's only justification for supporting research.

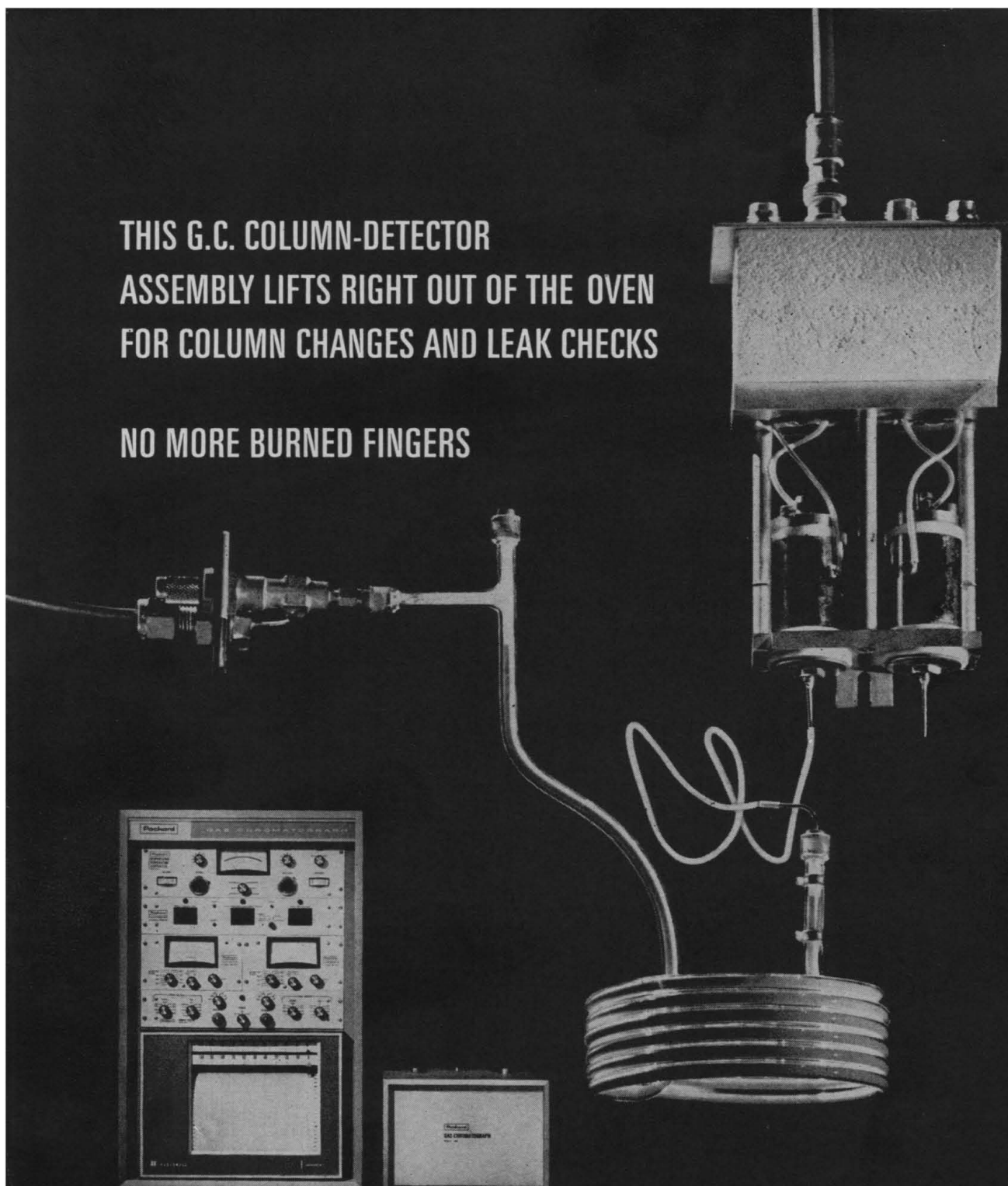
"Science for its own sake" provides the scientist with enthusiasm and motivation, but does not have strong public endorsement. It can be hoped, however, that current efforts to improve the teaching of science and to increase public understanding of science will gradually develop a firmer and more widespread understanding of the nature of scientific work and of the intellectual and esthetic benefits to society that result from a vigorous scientific program. In this effort it seems appropriate to place special emphasis upon the better education of students who are not themselves expecting to become scientists but who will shortly become the cultural, political, and business leaders of the country.

Another kind of effort is also necessary. We who are living in this time and this culture find it difficult to view our science and its relations to other aspects of our culture from an external vantage point. Yet is it not a responsibility of scientific statesmen to look at science objectively and scientifically, to study the ecology of scientific work, and to analyze the reasons for, the nature of, and the weaknesses in, the current national commitment to science? To do otherwise is to leave the future of science to the vagaries of social fashion.—DAEL WOLFLE

*Prepared for the Center for the Study of Democratic Institutions, Santa Barbara, California.

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A grandfather named Jim Fuess runs the department. One measure of what he has accomplished by investing much of his life in his job is the number of authors in the world's chemical literature each year who see fit to mention Eastman as their source of compounds, despite having paid full catalog price for them.

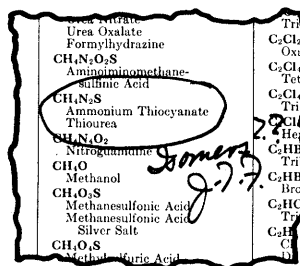
That last point goes straight to the reason for existence of this EKTACHROME Film: to serve those who, either from preference or necessity, want more individual process control over their photographs than they can get with KODACHROME Film and other popular color films. Though this supersensitive clientele constitutes a somewhat rare species, we see nothing wrong in currying favor with them and even improving our response to their desires. The fight is fairer and success is sweeter when achieved because more people like you. Which is a pretty righteous proclamation.

For List No. 44 Jim decided on a new attack against the nomenclature problem that so often frustrates buyers and sellers of organic compounds as they seek each other. The approach is characteristic of the guy: uncomplicated, unpretentious, and if nobody is dazzled by the brilliant originality of the concept, so much the better.

Let us, said Jim, triple the number of "see" references in the alphabetical listing and follow the alphabetical listing with a complete list of empirical formulas arranged according to numbers of atoms of each element in the molecule. Where several names fall under the same empirical formula, customers ought to know enough chemistry to pick the right name.

And that's what you'll find in List No. 44. As it happens, intramural busybodies occasionally intrude into Jim's communications with his customers. One such, an advertising copywriter by trade, has slipped into the catalog a statement

about how the empirical list "offers the old concept of isomerism as the bridge from a structural formula to a choice among EASTMAN Organic Chemicals of the same empirical formula." Old dictionaries notwithstanding, Jim doubts that his friends regard ammonium thiocyanate and thiourea as isomers.



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Now comes a new reason for interest in the item. *Proceedings of the IEEE* (54:425, 1966) carries a letter to the editor that beefs up its importance somewhat. Dr. Richard A. Soref of the Sperry Rand Research Center has been inspired to look at it as an erasable optical memory offering random access, high capacity, destructive readout (when the infrared hits it), and several hours of storage time. He comes up with the following estimates, which† we hope will be regarded as tantalizing:

With 1.15μ emission from a He-Ne laser focused to 3000 W/cm^2 , 5×10^5 bits of data per second could be serially read out and erased. With 1.06μ Nd^{+++} emission, the erasure efficiency should double. Spatially, the phosphor has a minimum element size of $4 \times 10^{-4}\text{ cm}^2$. Writing to exploit this packing density would take 0.8 W at 0.488μ from an argon ion CW laser, and the reading would take 1.2 W of CW Nd^{+++} laser light.

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†In combination with electro-optic light deflectors (*IBM J. Res. Dev.*, 8:64, 1964; *Bell Sys. Tech. J.*, 43:821, 1964).

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lap between these "hadal" and abyssal faunas. The great hydrostatic pressure is a factor restricting the diversity of the hadal fauna while intensive sedimentation creates favorable feeding conditions. Holothurians dominate in both number and biomass, with bivalve mollusks and polychaetes ranking second. Belyaev concluded that, owing to narrow specialization, the hadal fauna has no further evolutionary prospects and is incapable of evolving into higher taxons.

R. Hessler and H. Sanders (Woods Hole Oceanographic Institution) reported on an elegant and intensive study of the deep-sea benthic fauna and arrived at some rather unorthodox conclusions. About 100,000 specimens were collected along a transect from New England to Bermuda. They found that great diversity in fauna is characteristic of deep-sea assemblages and suggest that the deepsea is not the harsh environment it usually is assumed to be. By the very constancy of the regime, they suppose that the abyss can and does support a highly diversified fauna. They find no diminution of species with depth. The fauna is strongly layered with depth but there is a continuum of change. An abrupt break was observed only at the shelfbreak where eurythermal shallow-water forms are almost entirely replaced by deep stenothermal species.

G. L. Clarke (Harvard) reported that bioluminescence is a virtually universal oceanic phenomenon both geographically and in depth. This living light is constantly present, but variable in its manifestations. The maximum display is in the upper 100 meters (because of dinoflagellates), with a secondary display at about 900 meters. However, even at a depth of 3740 meters, bioluminescence was detected by a sensitive bathyphotometer. Flashes occur at rates from 1 to more than 100 per minute. It was inferred that in the clearest water deep-sea fish can detect ambient daylight down to 1300 meters. Similar results were presented by I. I. Guitelson (U.S.S.R.), who noted that the role of luminescence remains undetermined and not at all clear.

In the euphoric, popular mind the ocean is a vast cornucopia, an untapped reserve of food and mineral resources. J. Strickland (Scripps Institution of Oceanography) took issue with this rosy-hued view. He seriously doubts that we will have the requisite ability to describe, or sufficient understanding to manipulate, the ma-

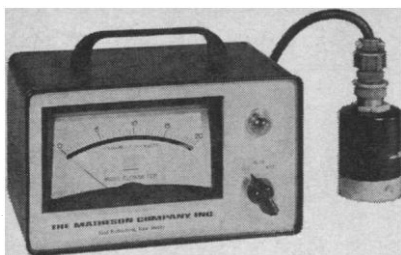
rine environment by the time mankind is faced with the ultimate need for large-scale aquaculture and waste disposal, unless we bring about a revolution in our approach to the study of the ecology of the open sea, both in technique and the magnitude of manpower and financial resources.

The congress ended at the Palace of Congress, within the Kremlin walls, with a summing up of impressions and results by a dozen or so leading scientists in the various oceanographic disciplines, a sumptuous Russian banquet, and a presentation by the Bolshoi Ballet in which the rising ballerina was, of all things, the daughter of a professor of geophysics. A third congress will be convened about 5 years hence. Many of us prodded the British to host this meeting to suitably commemorate the 100th anniversary of the sailing of the Challenger Expedition (1872-76) which founded scientific oceanography. The only offer announced at the meeting, however, was an invitation to meet in Valparaiso, Chile.

Field trips after the congress included visits to Leningrad, the Black Sea region or the Lake Baikal area. The highpoint of the Baikal trip was the visit to the Limnological Institute on Lake Baikal at the southern toe of this great crescent-shaped lake. Lake Baikal is the deepest (1620 meters) lake in the world and, although smaller in surface area than Lake Superior, Lake Michigan, or Lake Huron, it contains more water than all of the Great Lakes combined. It contains 23,000 km³ of fresh water, or about 20 percent of the world supply.

Geologically, Baikal is a rift valley like the rift valleys of Africa and is presumably related to some type of mantle activity which has placed the sialic crust under tension. One wonders if this isolated rift may somehow be an extension of the world-wide, mid-ocean rift system, as the African rifts seem to be. However, the Soviets are inclined to regard the Baikal rift as a portion of a closed system in central Siberia only 1000 kilometers in length.

The ecology of Lake Baikal is exceedingly interesting, for it is an ancient lake formed in the Miocene about 20 million years ago. Two-thirds of its 1800 animal species are endemic. There is an especially rich collection of endemic gammarid amphipods; 230 species are found here, or more than one-half of all those known in the



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world. Especially famous is the herd of 30,000 endemic Siberian seals or nerpa (*Foca siberica*). The geologic setting of Baikal is much like that of Lake Tanganyika in Africa, but the ecological situation of the oligotrophic lake offers a strong contrast.

The congress was organized by the U.S.S.R. Academy of Sciences through special agreement between Unesco and the Soviet government. It received financial support from the scientific Committee on Oceanic Research, the Food and Agriculture Organization of the United Nations, the World Meteorological Organization, and the International Atomic Energy Agency.

We may hope, and even expect, that with the next congress we will see more input from sophisticated theory, more problem-oriented rather than survey-oriented ship programming, and better and more thorough data reduction, all of which should yield a more perceptive insight into our deep and wide ocean.

ROBERT S. DIETZ

*Institute for Oceanography,
Environmental Science Services
Administration, Silver Spring,
Maryland 20910*

Forthcoming Events

October

16-20. **Planned Parenthood Fed. of America**, annual mtg., New York. (Planned Parenthood—World Population, 515 Madison Ave., New York 10022)

17-18. **Bioengineering Education**, symp., Rose Polytechnic Inst., Terre Haute, Ind. (R. M. Arthur, Rose Polytechnic Inst., Terre Haute)

17-18. **Systems Science and Cybernetics**, conf., Inst. of Electrical and Electronics Engineers, Washington, D.C. (J. E. Matheson, Stanford Research Inst., Menlo Park, Calif. 94025)

17-19. **Automation in Analytical Chemistry**, intern. symp., Technicon Corp., New York, N.Y. (J. E. Golin, Technicon, Ardsley, N. Y.)

17-19. **Chemical Inst. of Canada**, 16th Canadian **Chemical Engineering** conf., Windsor, Ont. (P. M. Reilly, Polymer Corp., Sarnia, Ont., Canada)

17-19. **National Acad. of Sciences**, autumn mtg., Duke Univ., Durham, N.C. (Home Secretary, NAS, 2101 Constitution Ave., Washington 20418)

17-19. **Plastics**, intern. congr., "Processing Polymers to Products," Amsterdam, Netherlands. (Congress Bureau Royal Netherlands Industries Fair, Vredenburg 49, Utrecht)

17-20. **Cellular Chemistry**, intern. symp., Ohtsu, Japan. (S. Seno, Biwako Hotel, Ohtsu)

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