

SCIENCE

23 January 1970

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COVER

The pieces of this clay figure were found in Ayotla subphase deposits at the site of the same name in the Basin of Mexico. It is a typical example of the large hollow figures associated with the Olmec phases of the Central Highlands and Gulf Coast of Mexico. It dates from about 1100 B.C. See page 344. [Photographer, Paul Tolstoy; layout, Donald S. Miller]

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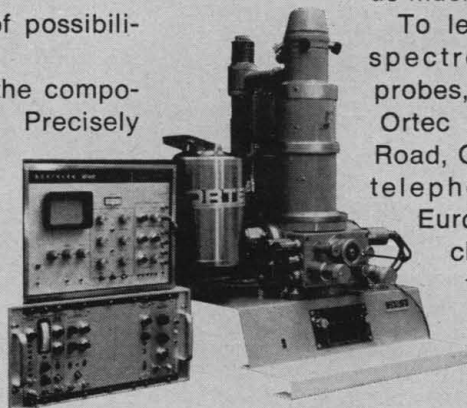
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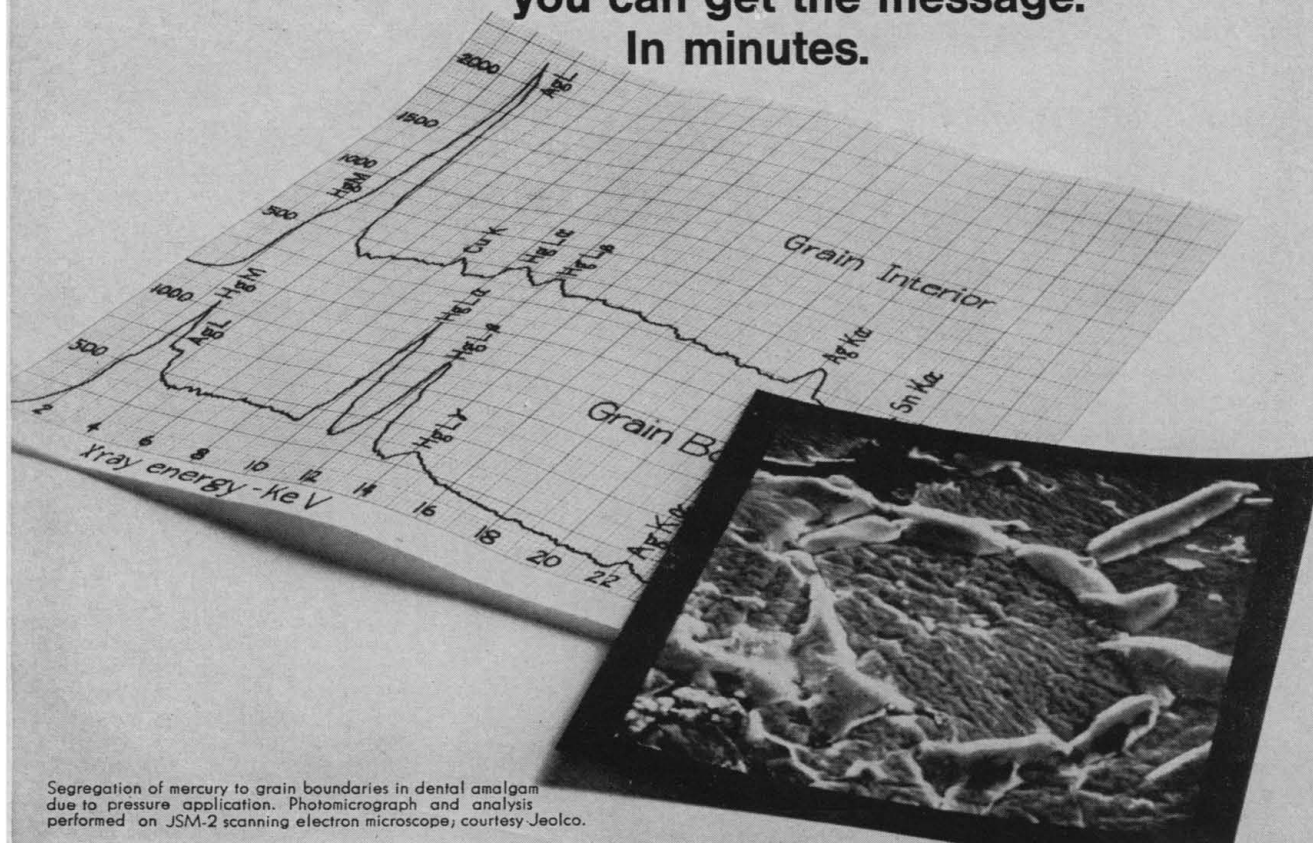
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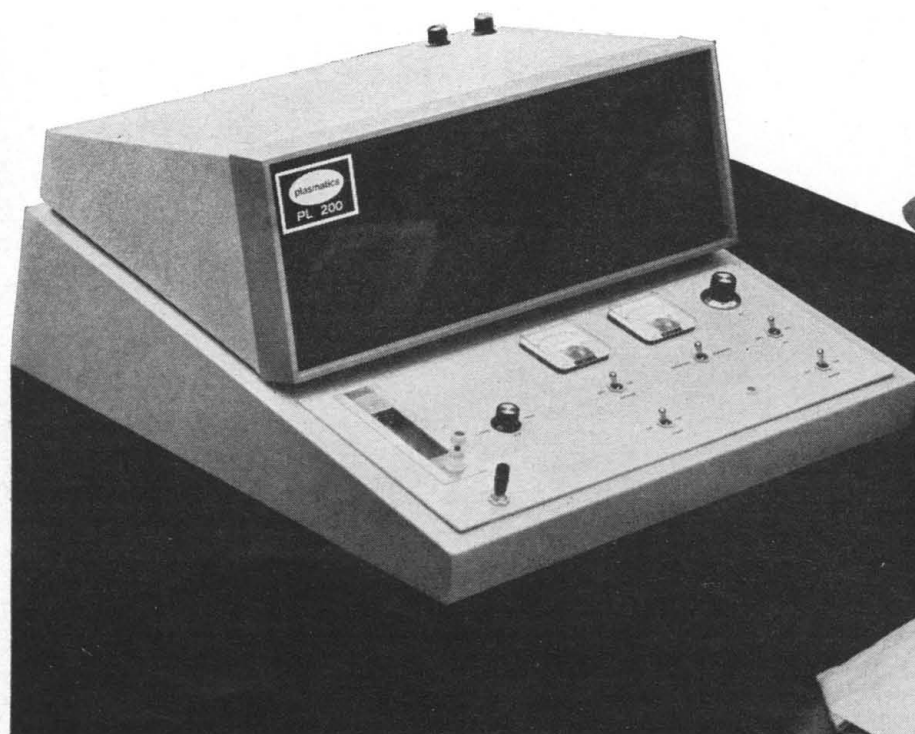
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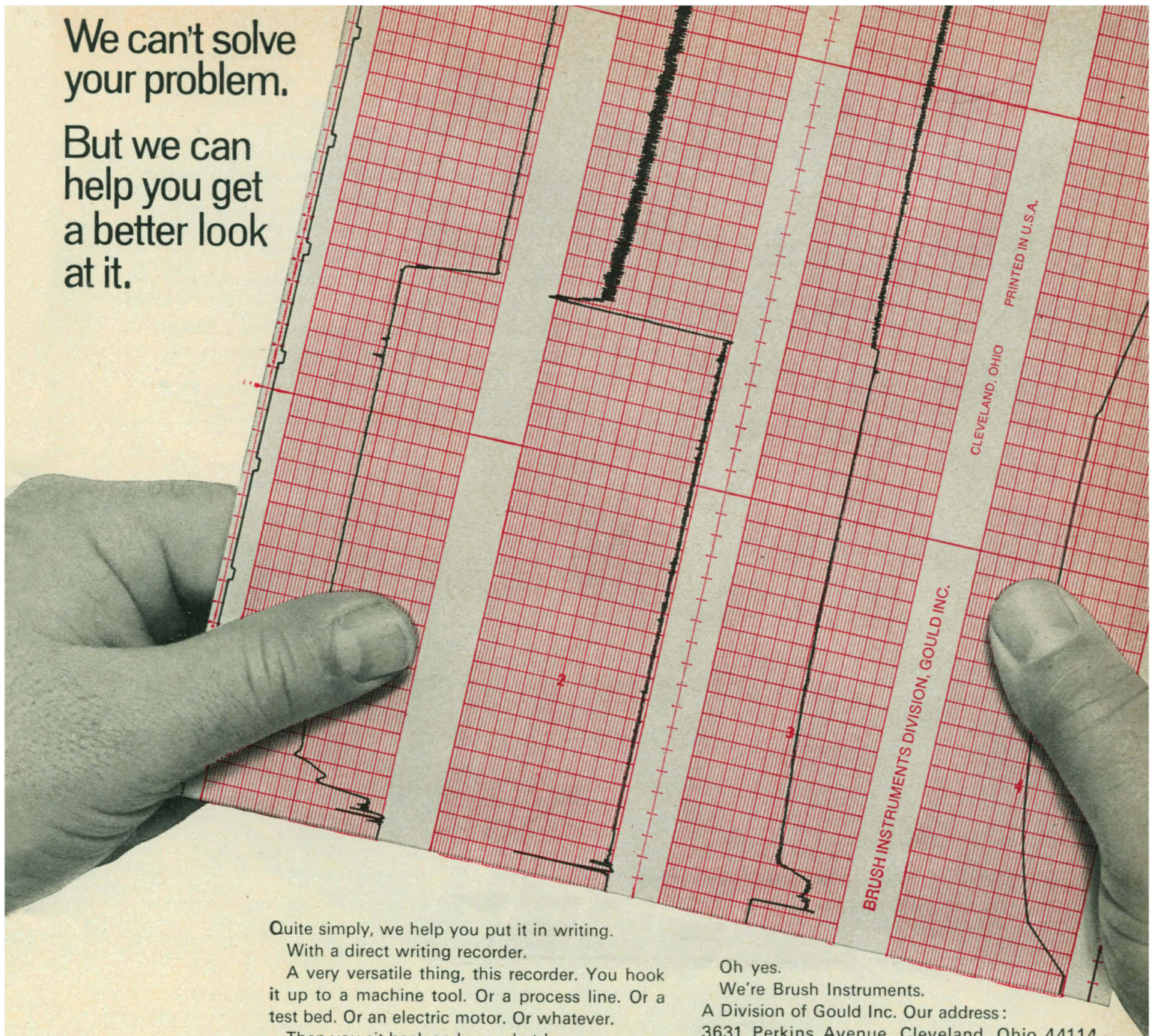
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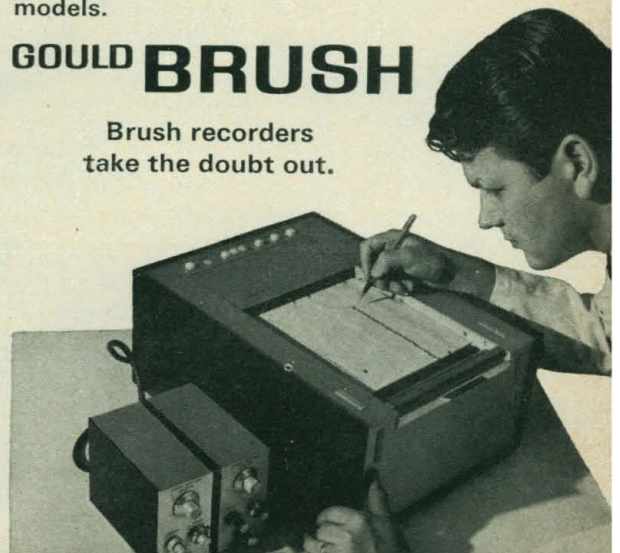
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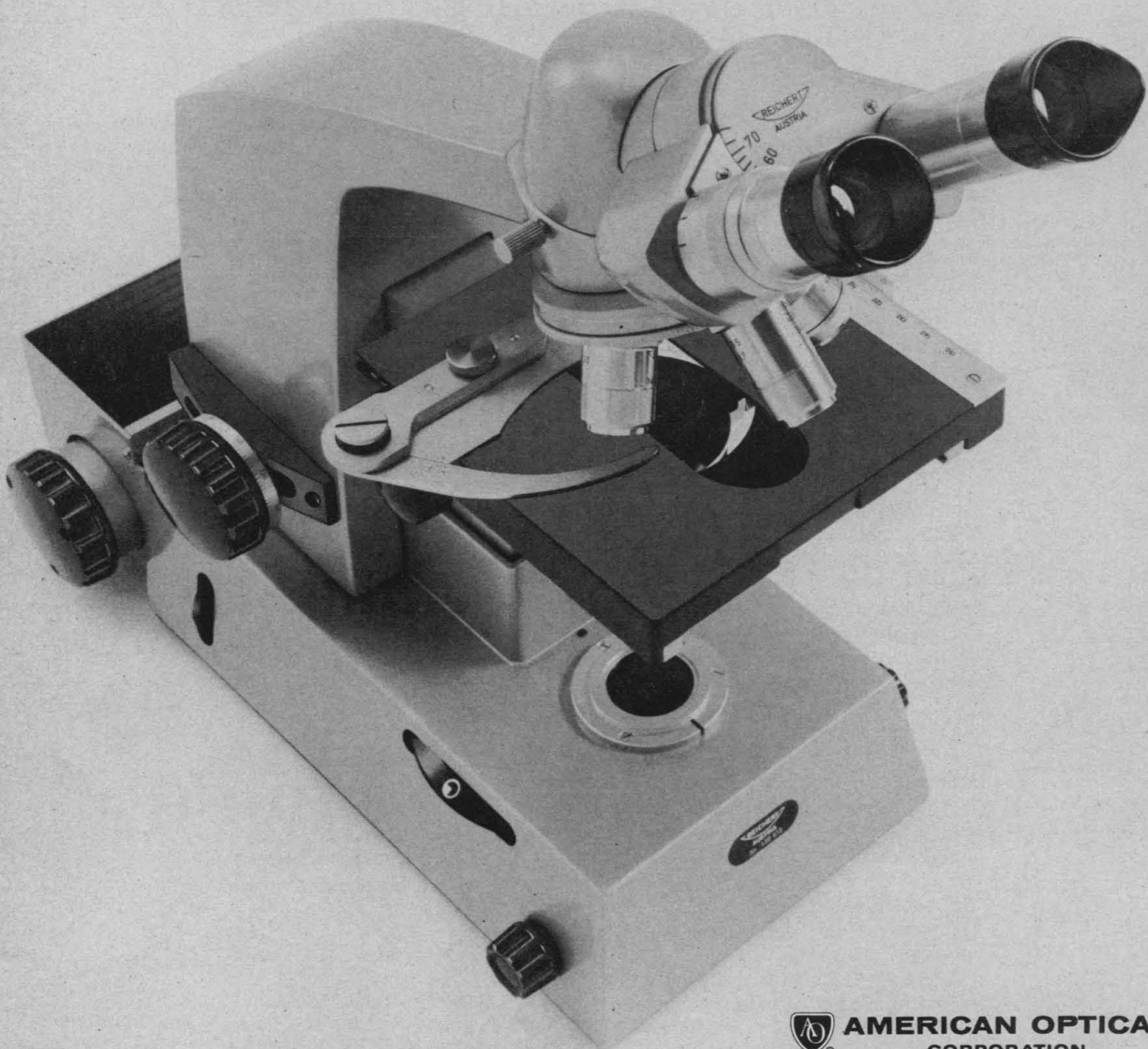
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It is now possible to record the *logarithm* of absorbance as a function of wavelength. With the proper external recorder, of course.

But before we detail for you some of the advantages of log-absorbance recording, a few fundamentals.

We discuss here some of the advantages of recording the logarithm of absorbance...

To begin, the term absorbance (*A*) is defined thus:

$$A = ecl$$

where *c* is the concentration of sample in the absorption cell,

l is the *light-path* (the inside distance between front and back windows of the cell), and

e is a numerical coefficient.

The fact is that *e* is a characteristic of each compound or substance. It

But watch what happens with our original equation,

$$A = ecl$$

when we take the logarithm of both sides,

$$\log A = \log ecl$$

Since the logarithm of a product is the sum of the logarithms of its factors,

$$\log A = \log e + \log cl$$

such as for "fingerprinting" a compound...

Now when we plot *log A* versus wavelength (figure 2), we immediately see our three 1:2:5 samples are represented by curves that have identical shapes. Each curve is that of *log e* displaced along the *log A* axis by the amount *log cl*. And each curve is separated by intervals that correspond to the 1:2:5 ratio of *cl*.

Here's where the "fingerprinting" of compounds comes in. Reference files of *log A* recordings facilitate the identification of unknown compounds by making it easy to compare their *log A* curves to those already on file. Large files of this sort are used in organic synthesis.

Now, a new topic: *log A* recording is also a valuable technique in studies of the kinetics of first-order reactions.

A few manipulations of this basic equation yield:

$$t = \left[\frac{2.303}{k} \log c \right] - \left[\frac{2.303}{k} \log (c-x) \right]$$

Wherein we note that the first term in brackets is a constant and, therefore, the reaction time, *t*, is directly proportional to the second bracketed term, *log (c-x)/k*.

Since (c-x) is the concentration at time *t*, it will be proportional to the absorbance, *A*. And *log (c-x)* will likewise be proportional to *log A*.

and for quickly determining reaction rates...

As long as the reaction is first-order, both *log (c-x)* and *log A* will be linear with time. So when we plot *log A* versus time at a fixed wavelength for a first-order reaction of a dye fading, we get the curve shown in figure 3.

The linearity of the curve in figure 3, in itself, tells us that this is a first-order equation. And where the linear section of the curve terminates (at the right of the curve) indicates a departure from strict first-order reaction. Finally, the rate constant, *k*, can be determined from the slope of the linear section.

These applications—for fingerprinting a compound and for studying the kinetics of first-order reactions—are but two to which *log A* recording is eminently suited. Other applications

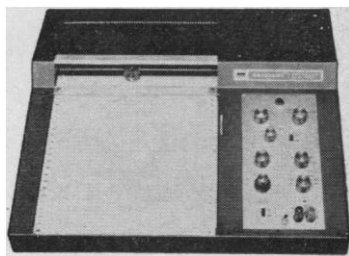
automatically at all points in the *log* scale. There's also a switch for inactivating the zero adjustment and automatically setting the voltage-divider zero-point. Conformance of the logarithmic scale to the theoretical function is ± 0.003 at any point.

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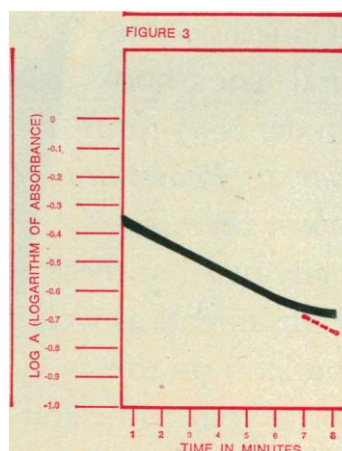
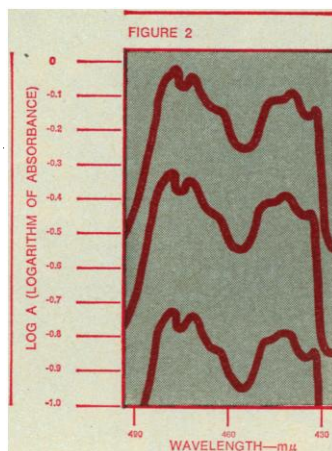
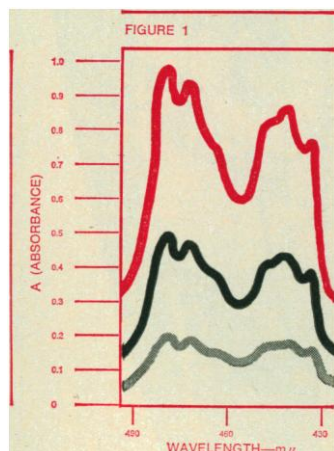
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is dependent on temperature and wavelength, but independent of either the concentration, *c*, or the light-path length, *l*.

If we plot *A* versus wavelength for three samples of the same substance in concentrations in the ratio 1:2:5, we get the curves shown in figure 1. There is, unhappily, no basic correspondence among them.

For proof of this statement, we resort once again to a basic equation:

$$-\frac{dc}{dt} = kc$$

where $-\frac{dc}{dt}$ is the rate at which the concentration is decreasing with time.

k is the velocity or rate constant, and

c is the concentration

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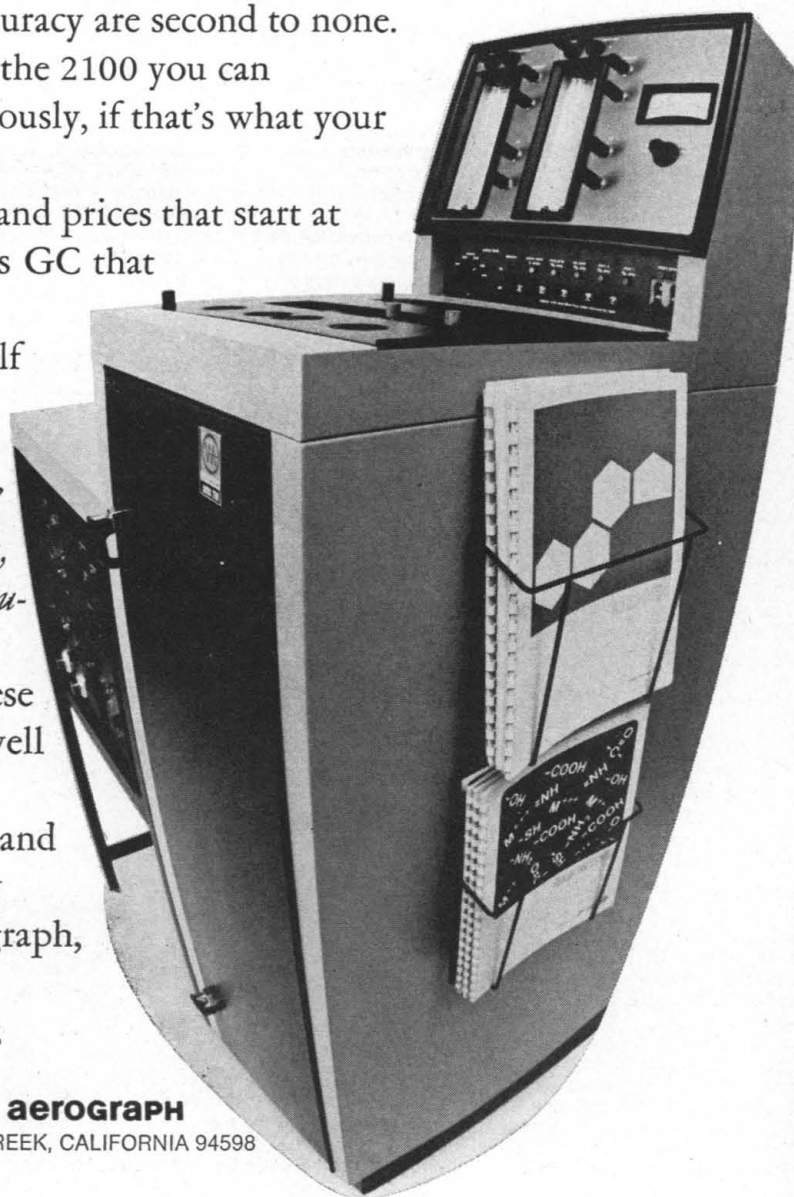
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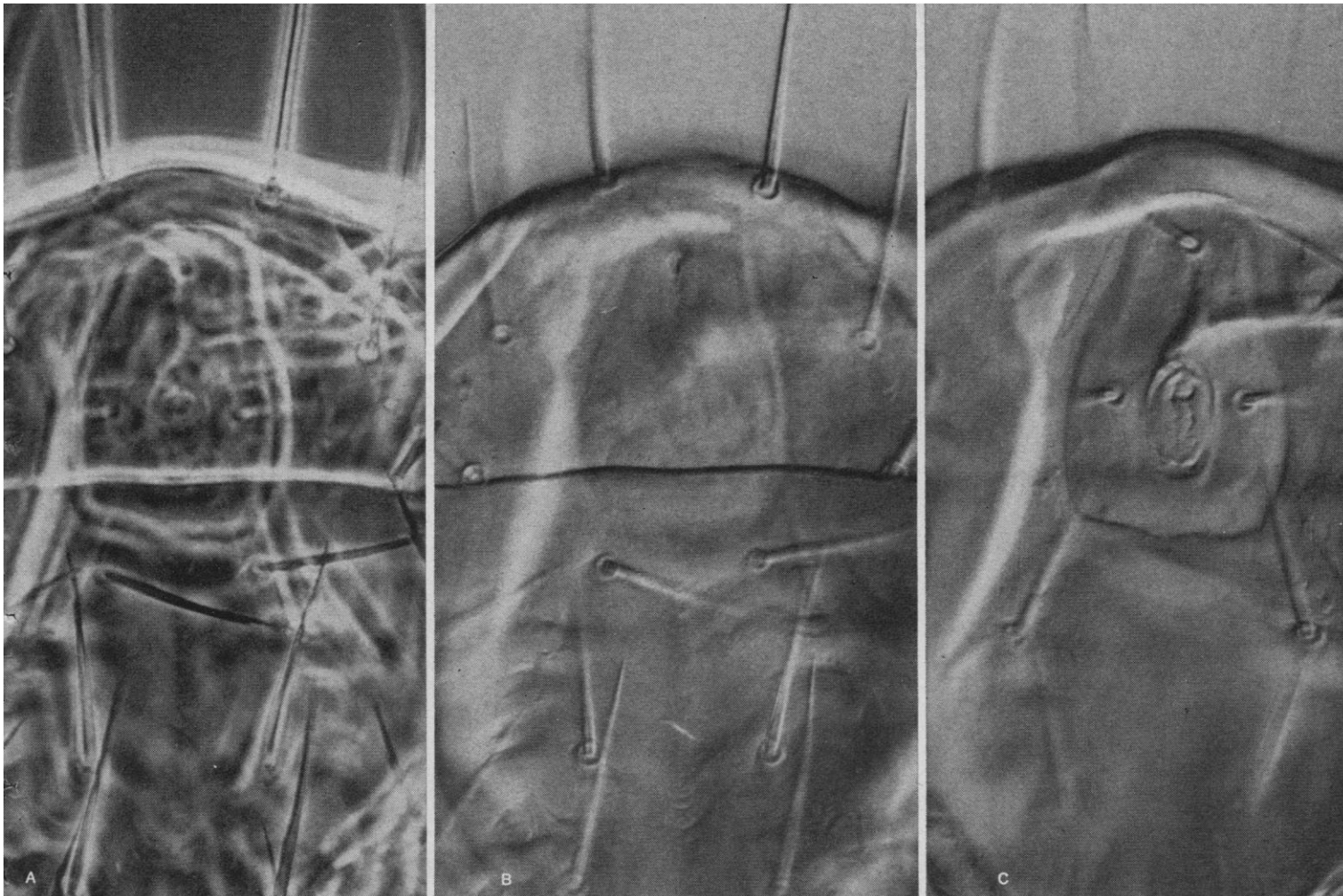
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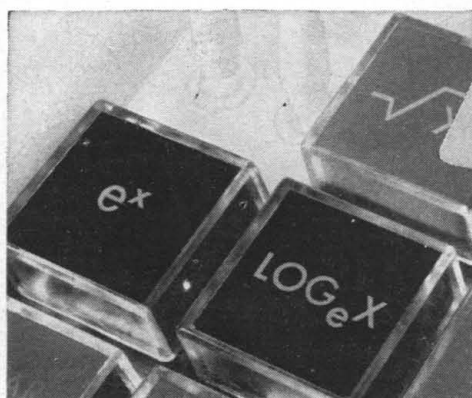
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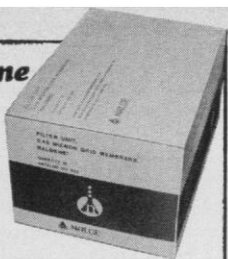
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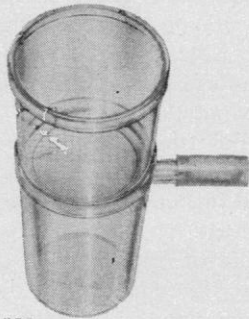
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and industries into those metropolitan centers which had officially been determined to be at the saturation point. Similarly, out-migration from such areas should be stimulated, through bonuses or tax credits to individuals, and through incentives and subsidies to spur the movement of industry and commerce into presently underpopulated areas. In this connection, we may note President Nixon's reference, in his message on population, to the need for new cities to be built in places removed from present centers of population.

The cost of stemming the tide of population being swallowed up by our megalopolitan areas will be considerable, in economic terms, as well as in terms of the limitations which may have to be set on our prized freedom of movement. Yet it will be small compared to that which we are paying today in trying to cope with the increasingly insoluble problems of housing, traffic, urban decay and sprawl, and of the degeneration of human values which beset urban America.

JOACHIM F. WOHLWILL

*Department of Psychology,
Clark University,
Worcester, Massachusetts 01610*

At the International Botanical Congress Donald S. Farner, president of the International Biological Union, stated "Population increase must be reduced to zero," but proposed no effective means of accomplishing this objective. Joseph J. Spengler ("Population problem: In search of a solution," 5 Dec., p. 1234) implies that the so-called right to parenthood should be transformed into a privilege. His proposals for population control involve government action, but beyond that are so utterly Utopian as to border on the fantastic.

Population increase can be reduced to zero only by laws which make sterilization compulsory. Such laws will be passed only when a significant majority in a given nation are ready to accept them. Biologists may propose such action now without committing professional suicide; politicians cannot.

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nied; fatherhood may be not only denied, but may well be unknown. Setting the number of children a woman may bear at three will come as close as possible to balancing, on the one hand, women who have none or but one (through choice or otherwise) and, on the other hand, those whose final permissible pregnancy results in multiple births.

C. GARDNER SHAW

*Department of Plant Pathology,
Washington State University,
Pullman 99163*

Brighter Future for Latin American Science Education

In response to Schwartz's letter (14 Nov.) concerning Latin American science education, I am pleased to report that in spite of "current budget cut-backs in Washington," financial support for the science and technology programs of the Organization of American States (OAS) has been increased during the past year about 20 times above the previous level. This increase has been approved by all of the member countries in spite of the well-known economic difficulties of the majority of these countries and of a less enthusiastic atmosphere for U.S. support of foreign assistance.

Beginning with meetings of chiefs of state at Punta del Este, Uruguay, in 1967, the OAS has given concrete evidence of increasing appreciation of the basic role of science and technology in the cultural and economic development of the Latin American countries. Among the programs which have been initiated with better financial support are those for the improvement of primary and secondary science education. The major thrust, however, is toward the training of larger numbers of high-level specialists who are receiving their graduate education at Latin American institutions.

Another very encouraging aspect of the Latin American science picture is the creation, or strengthening, of national research councils or their equivalents by several Latin American countries during the past few years. Some of these councils are now being asked to contribute to the formulation of national development plans.

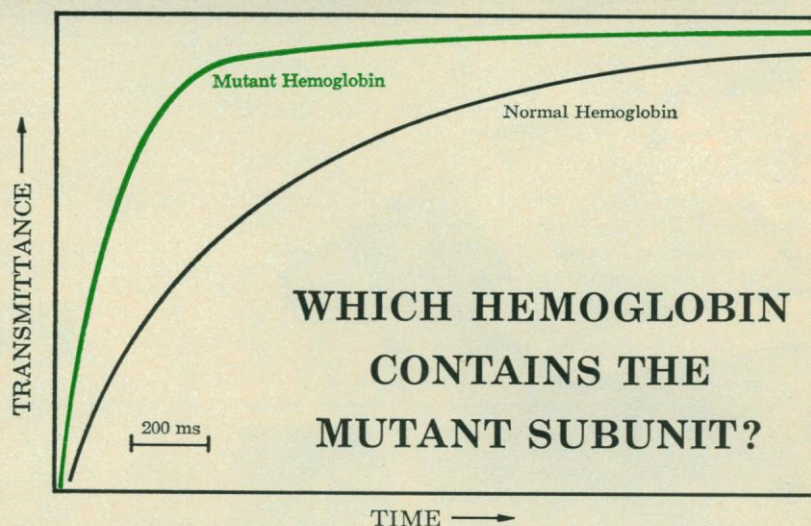
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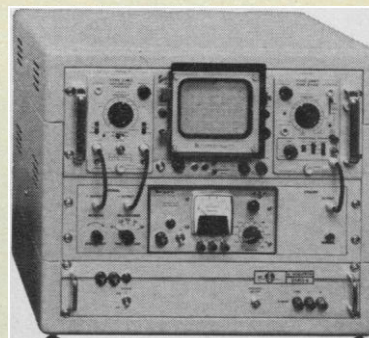
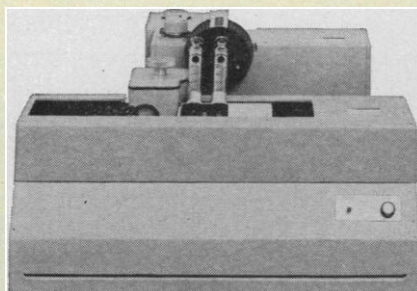


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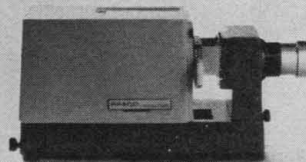
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Population Control, Sterilization, and Ignorance

We recently submitted a questionnaire to students and faculty at Cornell University designed to test attitudes and preferences concerning family size and contraceptive technique. The 1059 respondents (74 percent males) were a mixed lot who represented the physical and biological sciences, humanities, and social sciences and who included faculty (294), graduate students (174), upperclassmen (264), and freshmen (327). Given the level of education of the sample, the results were unexpected in several respects.

First, although there was general agreement (84 percent) on the desirability of limiting family size, a substantial majority (65 percent) said it wanted three children (39 percent) or more (26 percent). Only 30 percent favored two children, and a mere 5 percent expressed preference for one or none. Choice was in no major way affected by age, sex, marital status, parenthood, or professional specialty. Even the respondents whom we expected to be most concerned about the population crisis (for example, graduate students and young faculty in biology) included a minimum of 50 percent with a desire for three children or more.

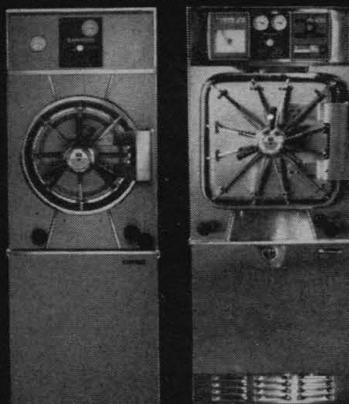
As regards contraception, about one-half favored "the pill" over all other available means as a way both to space children (53 percent) and to maintain family size at its desired limit (50 percent). Other contraceptive appliances such as condoms, diaphragms, and intrauterine devices were each given top preference by no more than 13 percent of the sample. Voluntary sterilization, either of man or woman, was judged as decidedly undesirable. Only 6 percent opted in favor of vasectomy as the preferred form of contraception once full family size had been achieved; the corresponding number favoring ligation of the oviducts was 2 percent. A majority (52 percent of males and 61 percent of females) said they would *never* undergo sterilization, even after having had the desired number of children. The operation was judged to be as undesirable as abortion and abstinence for prevention of family growth beyond the set limit. It is of interest in this connection that the consequences of sterilization are not generally understood. For example, asked whether vasectomy would abolish the ability to ejaculate, nearly half the respondents (49 percent) confessed to ignorance or expressed either certainty or probability that emission would no longer accompany orgasm. Biology students scored no better than nonbiologists, and graduate students, even after marriage and parenthood, seemed to be no better informed than freshmen. The only exceptional group was the biology faculty, but, even there, 30 percent were either misinformed or uninformed on this point. Comparable ignorance prevails with respect to oviduct ligation: 37 percent of respondents were certain, or thought it probable, that the operation would interfere with the menstrual cycle.

We are bothered by these results. Perhaps of least general concern is the probability that proponents of voluntary sterilization are backing a hopeless or nearly hopeless cause. But what are we to make of the educated youth growing up among us that is either unconcerned about population growth or, at the very least, unable or unwilling to apply to itself the simple arithmetic of compound interest? And what, if any, are the prospects for improved sex education when ignorance about the reproductive system is widespread even among those who should know best?—THOMAS EISNER, ARI VAN TIENHOVEN, FRANK ROSENBLATT, *Cornell University*

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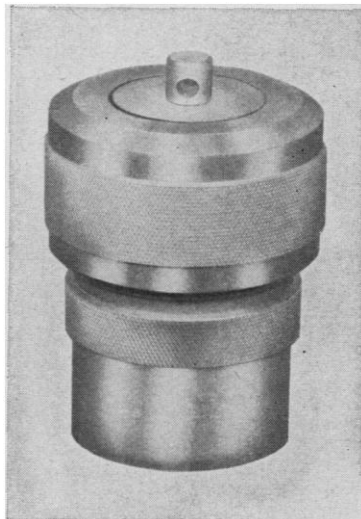
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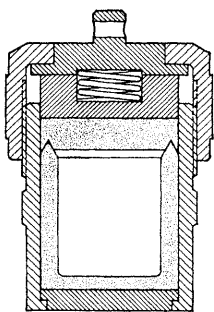
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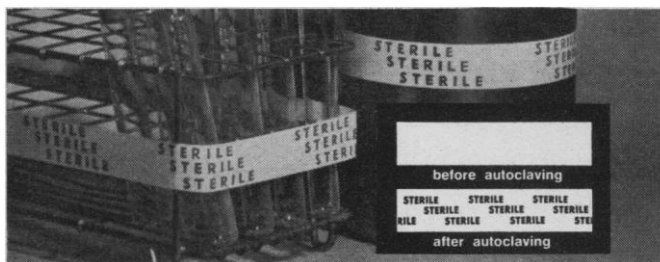
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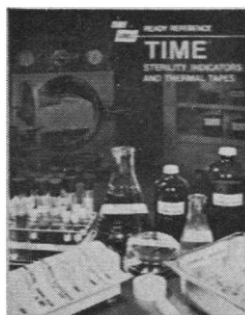
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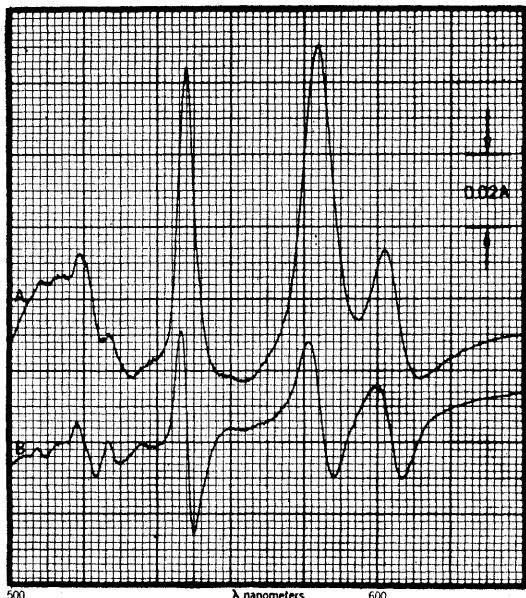


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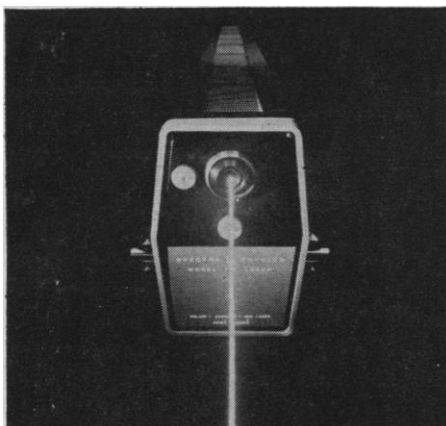
A combination of the two methods offers the results shown in the curves at left.

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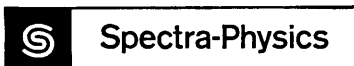
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MEETINGS

North American Paleontological Convention

Paleontology deals with dead organisms, but it is far from being a dead science. The liveliness of the profession was demonstrated at the North American Paleontological Convention, 5-7 September 1969, in Chicago. There are estimated to be about 1500 paleontologists in this hemisphere; more than one-third of them attended these meetings to hear 80 papers and to exchange information directly with their colleagues.

The convention was held at the Field Museum of Natural History; it was a joint venture of the Paleontological Society, Society of Economic Paleontologists and Mineralogists, Society of Vertebrate Paleontologists, Paleobotanical Section of the Botanical Society of America, and American Association of Stratigraphic Palynologists. This was the first profession-wide meeting to be held in at least four decades.

The subject matter of paleontology overlaps the disciplinary boundaries of both biology and geology, exchanging concepts and data with each. However, with biology moving toward the molecular level and geology toward geophysics, the paleontologist at national meetings has been in the position of the man tied between two Roman chariots; he may not be torn to bits, but he certainly feels uncomfortable from time to time.

Even though the students of fossils chose to meet apart from their allied scientists, they still recognized their allegiances by beginning with a convention-wide symposium concerned with various philosophies of correlation of rocks by their enclosed fossils (organized by R. H. Tedford, American Museum of Natural History) and closed with a comparable symposium inquiring into the evolution of the major biologic categories, from early algae to the vertebrates (Nicholas Hotton III, National Museum of Natural History). The tone for this last session was set, in part, by the banquet address of Philip Abelson (Carnegie Institution of Washington, Geophysical Laboratory) on evolution of proteins.

The perennial subject of reefs was discussed, and new interpretations were derived, both from the standpoint of the organisms that help to build reefs (Norman D. Newell, American Muse-

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um of Natural History) and changes in the reef community through time (J. Keith Rigby, Brigham Young University). The general topic of overall community evolution was also considered (Leigh Van Valen, University of Chicago).

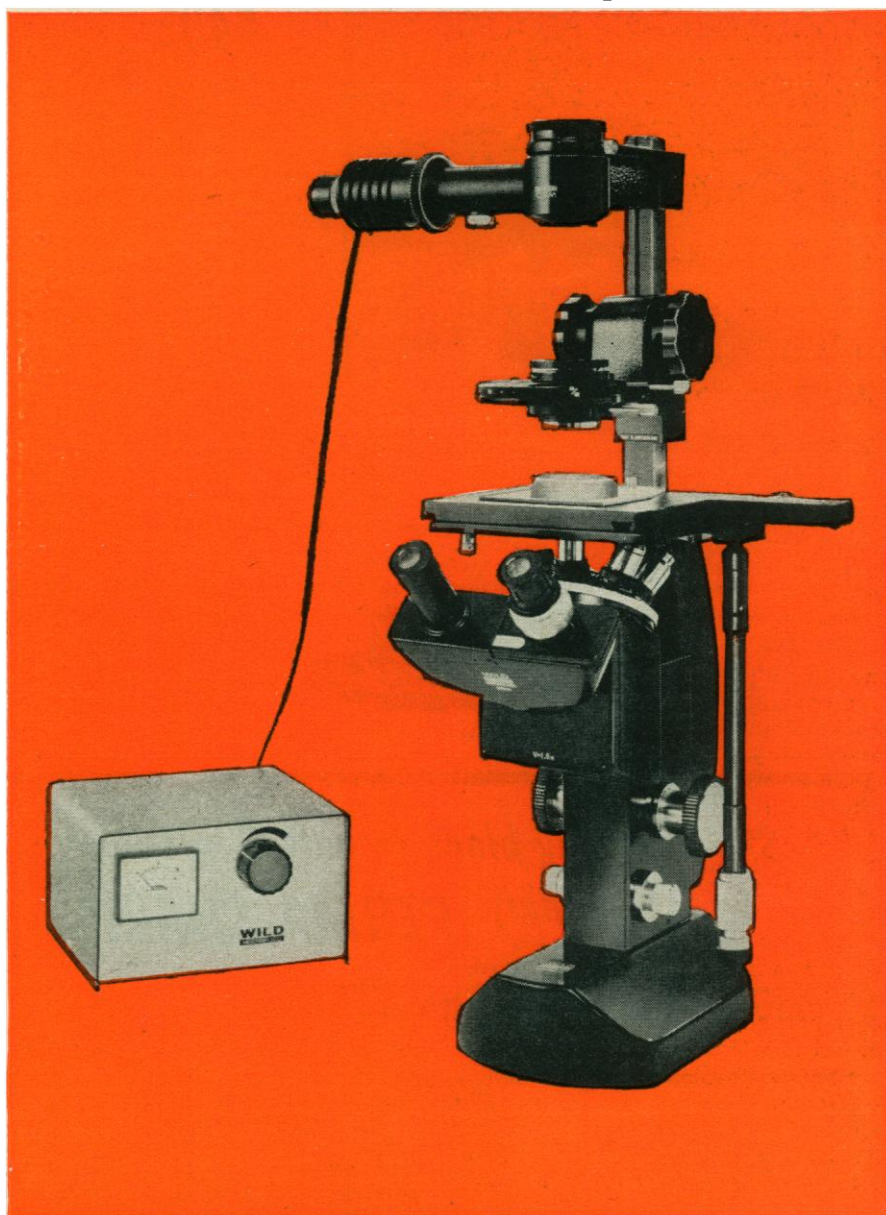
In the past decade, the study of nanoplankton has undergone an explosive development, comparable to that of the Foraminifera in the 1920's when these organisms came to be recognized as economically important. This growing field was surveyed in one symposium on the organic-walled forms (A. R. Loeblich, Jr., Chevron Oil Field Research Company) and in another on the calcareous and siliceous organisms (Helen N. Tappan, University of California at Los Angeles). Larger organisms and a more geochemical approach were evident in a session on phosphate in fossils (Charles W. Collinson, Illinois Geological Survey).

As could be predicted, a variety of viewpoints were espoused in a symposium on the genus concept (Thomas W. Amsden, Oklahoma Geological Survey), each speaker being influenced by the peculiarities of the organisms he studied. Similar disagreement characterized a session on teaching of paleontology (Robert M. Linsley, Colgate University) which had been accurately subtitled as a methodological inquiry into the eschewal of pedantical pedagogical approach to obfuscation. This lighthearted touch carried over to the smoker which included nearly 2 hours of reminiscences by senior members of the profession (Harold E. Vokes, Tulane University).

Interdisciplinary mixing of vertebrate and plant evidence was evident in a symposium on late Paleozoic to early Mesozoic climatic change (Stanley J. Olsen, University of Florida). All biotic elements were considered in a survey knowledge of Cretaceous paleogeography (Karl M. Waage, Yale University). The significance of computers was considered—from data storage, through modeling of shapes, to quantification of distribution (David M. Raup, University of Rochester).

A symposium evoking considerable interest was devoted to atypical preservation of fossils (Eugene S. Richardson, Jr., Field Museum of Natural History), whereby the occurrence of soft-bodied organisms was examined. Some half-dozen localities in the world have provided keyholes through which to view the forms that have otherwise not been preserved in the last 600 million years

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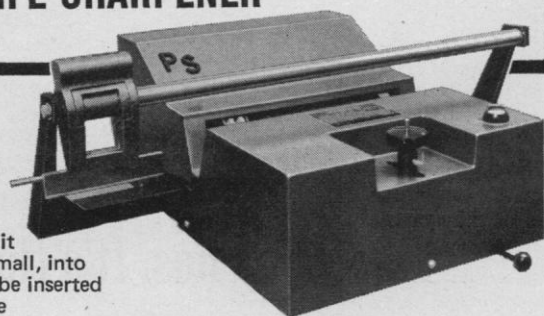
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of earth history. Recent finds of organisms of Pennsylvanian age near Chicago are particularly noteworthy and were featured in a special museum exhibition. Coincidentally, the finding of soft parts of conodonts was reported; small phosphatic toothlike structures have been known since 1856, but their biologic position is enigmatic.

Paleontology is not a science given to spectacular scientific breakthroughs. However, it is a steadily maturing and growing field of inquiry. The North American Paleontological Convention shows the profession to be in a busy, healthy state. Because the meetings provided both a survey of the kind of work pursued and the current state of the numerous activities, plans are under way to publish a number of the symposia in the near future.

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*U.S. Geological Survey,
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Courses

Correction: The date for **Electron Microscopy in the Biological Sciences** (see p. 212, 9 Jan.) should have been 9-27 February. The other information remains unchanged.

Fermentation Technology, Cambridge, Mass., 22-26 June. This summer program will emphasize the application of biological and engineering principles to problems involving microbial and biochemical systems, review fundamentals, and provide an up-to-date account of current knowledge in fermentation technology. *Deadline for applications:* 15 May. (Director of Summer Sessions, Massachusetts Institute of Technology, Cambridge 02139)

Training in Nuclear Materials Safeguards, Argonne, Ill., 30 March-22 May. The program for assuming responsibilities in safeguards and nuclear materials management is being offered in four segments, although designed as a unit. Individuals may enroll for one or more segments, but all should attend the final workshop week. Introduction to Nuclear Technology, 30 March-10 April; Measurements in Nuclear Materials Safeguards, 13 April-1 May; Fundamentals of Nuclear Materials Control, 4-15 May; and Workshop in Safeguards, 18-22 May. The fees are \$150 per week. (Dr. Manuel A. Kanter, Safeguards Training Program, Argonne Center for Educational Affairs, Argonne, Ill. 60439)

Organic Mass Spectrometry, St. Louis, Mo., 2-5 March. The main subject areas are basic aspects of mass spectrometry instrumentation, interpretation of the mass spectrum, high-resolution techniques, combined gas chromatography mass spectrometry, and computer processing of mass spectral data. (Dr. Ram L. Levy, Division of Continuing Professional Education, Washington University, Box 1048, St. Louis, Mo. 63130)

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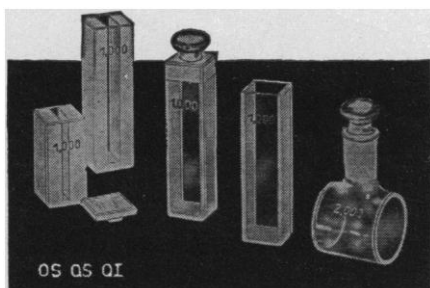
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T. R. P. Maickel, R. H. Cox, J. Saillant, and F. P. Miller, Int.
J. Neuropharmacol. 7, 275 (1968)

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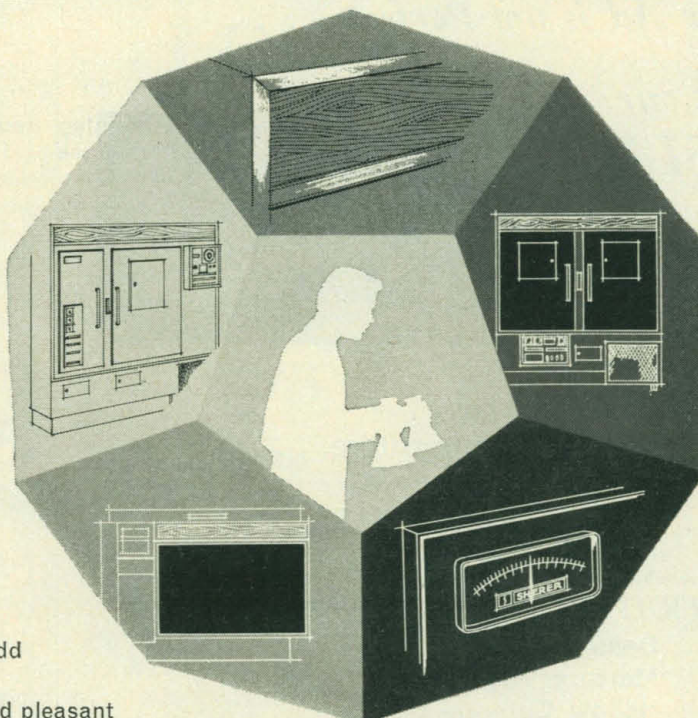
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BOOKS RECEIVED

(Continued from page 367)

Alchemy and the Occult. A Catalogue of Books and Manuscripts from the Collection of Paul and Mary Mellon Given to Yale University Library. Compiled by Ian Macphail. With essays by R. P. Multhau and Aniela Jaffé, and additional notes by William McGuire. Yale University Library, New Haven, Conn., 1968. Vol. 1, *Printed Books 1472-1623* (liv + 276 pp., illus.); vol. 2, *Printed Books 1624-1790* (xiv + pp. 277-584, illus.). Boxed, \$100.

American Epic. The Story of the American Indian. Alice Marriott and Carol K. Rachlin. Putnam, New York, 1969. 256 pp. + plates. \$6.95.

The Analysis of Communication Content. Developments in Scientific Theories and Computer Techniques. Annenberg School Conference, Philadelphia, November 1967. George Gerbner, Ole R. Holsti, Klaus Krippendorff, William J. Paisley, and Philip J. Stone, Eds. Wiley, New York, 1969. xxii + 602 pp., illus. \$14.95.

An Analysis of the Eurasian and Australian Neptini (Lepidoptera: Nymphalidae). John Nevill Eliot. British Museum (Natural History), London, 1969. 156 pp. + plates. Paper, £4. Bulletin of the British Museum (Natural History): Entomology, Suppl. 15.

Analytical Serology of Microorganisms. Vol. 2. J. B. G. Kwapinski, Ed. Interscience (Wiley), New York, 1969. x + 694 pp., illus. \$27.50.

The Anatomy of Paramecium Aurelia. A. Jurand and G. G. Selman. Macmillan, London; St. Martin's, New York, 1969. xiv + 218 pp., illus. \$18.

Annual Review of Physical Chemistry. Vol. 20. H. Eyring, C. J. Christensen, and H. S. Johnston, Eds. Annual Reviews, Palo Alto, Calif., 1969. viii + 520 pp., illus. \$8.50.

The Application of Modern Physics to the Earth and Planetary Interiors. A NATO Advanced Study Institute, Newcastle upon Tyne, England, March-April 1967. S. K. Runcorn, Ed. Wiley-Interscience, New York, 1969. xvi + 692 pp., illus. \$35.

The Arid Zones. Kenneth Walton. Aldine, Chicago, 1969. 176 pp., illus. \$5. University Library of Geography.

Atlas of Protein Sequence and Structure 1969. Vol. 4. Margaret O. Dayhoff. National Biomedical Research Foundation, Silver Spring, Md., 1969. xxvi + 364 pp., illus. Paper, \$12.50.

Back to Nature. The Arcadian Myth in Urban America. Peter J. Schmitt. Oxford University Press, New York, 1969. xxiv + 232 pp. \$6.50. Urban Life in America Series.

Behavioral Genetics. Method and Research. Martin Manosevitz, Gardner Lindzey, and Delbert D. Thiessen, Eds. Appleton-Century-Crofts, New York, 1969. x + 774 pp., illus. \$17.50. Century Psychology Series.

Bibliography and Index of the Geology of Puerto Rico and Vicinity, 1866-1968. Marjorie Hooker. Geological Society of Puerto Rico, San Juan, 1969. viii + 56 pp. Paper, \$5; 3 by 5 card set, \$50.

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1969, 542 pp., 88 illustrations, \$31.00

SYMPOSIUM ON HEALTH HAZARDS IN MAN'S ENVIRONMENT

edited by **IRVING J. SELIKOF**, *Environmental Sciences Laboratory, Mount Sinai School of Medicine, New York, New York 1969*

DERIVATIVES OF CARBOXYLIC ORTHO ACIDS

by **ROBERT H. DeWOLFE**, *Department of Chemistry, University of California, Santa Barbara, California*

March 1970, about 510 pp., in preparation

MOLECULAR ASYMMETRY IN BIOLOGY

by **RONALD BENTLEY**, *Department of Biochemistry, Faculty of Arts and Sciences, and Graduate School of Public Health, University of Pittsburgh, Pittsburgh, Pennsylvania*

Volume 1, 1969, 322 pp., \$15.00

Volume 2, April 1970, about 550 pp.,

in preparation

CONJUGATES OF STEROID HORMONES

by **HARRY EARL HADD** and **ROBERT T. BLICKENSTAFF**, *Indiana University School of Medicine, Indianapolis, Indiana*

1969, 366 pp., \$18.50

SEPARATION METHODS IN ORGANIC CHEMISTRY AND BIOCHEMISTRY

by **FRANK J. WOLF**, *Merck, Sharp & Dohme, Research Laboratories, Rahway, New Jersey*

1969, 237 pp., \$11.50

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symposium, Dallas, December 1968. W. B. Cassidy, Ed. American Astronautical Society, Tarzana, Calif., 1969. xii + 150 pp., illus. \$9.75. AAS Science and Technology Series, vol. 20.

Biologically Active Amines Found in Man. Their Biochemistry, Pharmacology, and Pathophysiological Importance. Franz Franzen and Kurt Eysell. Pergamon, New York, 1969. viii + 244 pp., illus. \$13.50.

Biostructura. Eugen Macovschi. Editura Academiei Republicii Socialiste Romania, Bucharest, 1969. 260 pp., illus. Lei 18.50.

Cell Structure and Function. Ariel G. Loewy and Philip Siekevitz. Holt, Rinehart and Winston, New York, ed. 2, 1969. xii + 516 pp., illus. \$9.95.

Chemical and Botanical Guide to Lichen Products. Chicita F. Culberson. University of North Carolina Press, Chapel Hill, 1969. xii + 628 pp., illus. \$12.50.

The Coming of the Golden Age. A View of the End of Progress. Gunther S. Stent. Published for the American Museum of Natural History by Natural History Press, Garden City, N.Y., 1969. xiv + 146 pp., illus. \$4.95.

Comparative Morphology of Hematopoietic Neoplasms. A symposium, Washington, D.C., March 1968. Carolyn H. Lingeman and F. M. Garner, Eds. National Cancer Institute, Bethesda, Md., 1969 (available from the Superintendent of Documents, Washington, D.C.). xii + 368 pp., illus. \$5.50. National Cancer Institute Monograph 32.

Computer Applications in Genetics. Proceedings of a conference dedicated to Lawrence Hasbrouck Snyder, Honolulu, September 1969. Newton E. Morton, Ed. University of Hawaii Press, Honolulu, 1969. x + 170 pp., illus. \$10.

The Dawn Warriors. Man's Evolution Toward Peace. Robert Bigelow. Atlantic-Little, Brown, Boston, 1969. x + 278 pp. \$6.95.

Delinquency. Selected Studies. Thorsten Sellin and Marvin E. Wolfgang, Eds. Wiley, New York, 1969. viii + 168 pp., illus. \$7.95.

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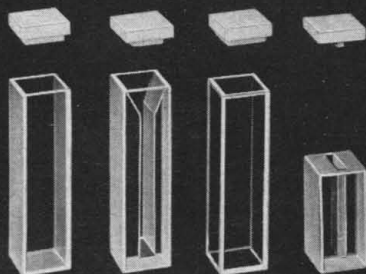


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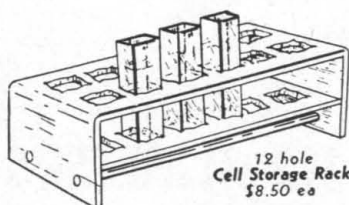
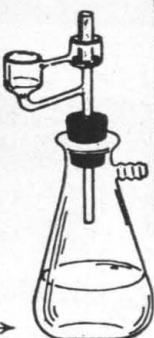
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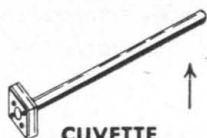


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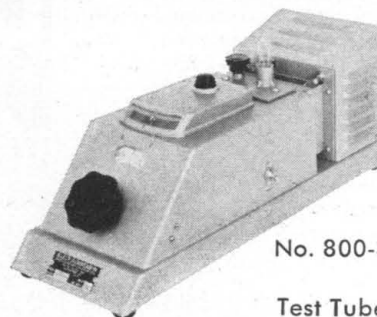
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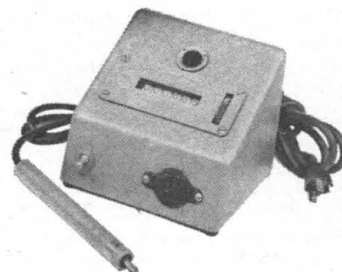


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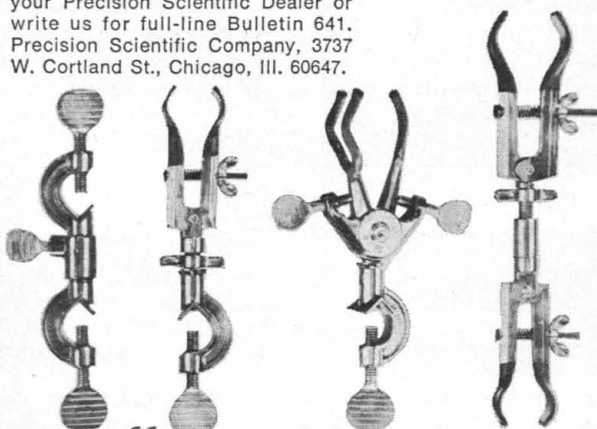
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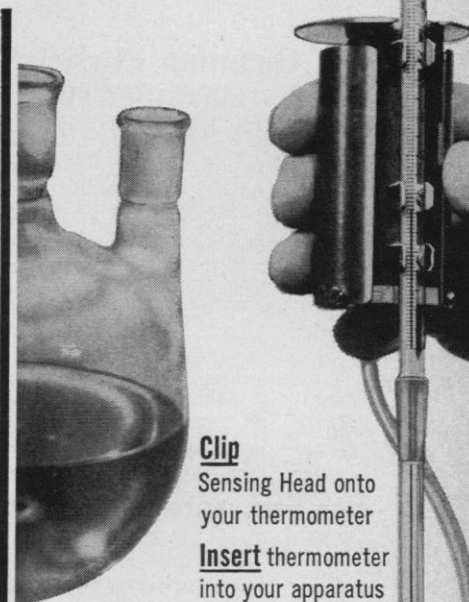
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