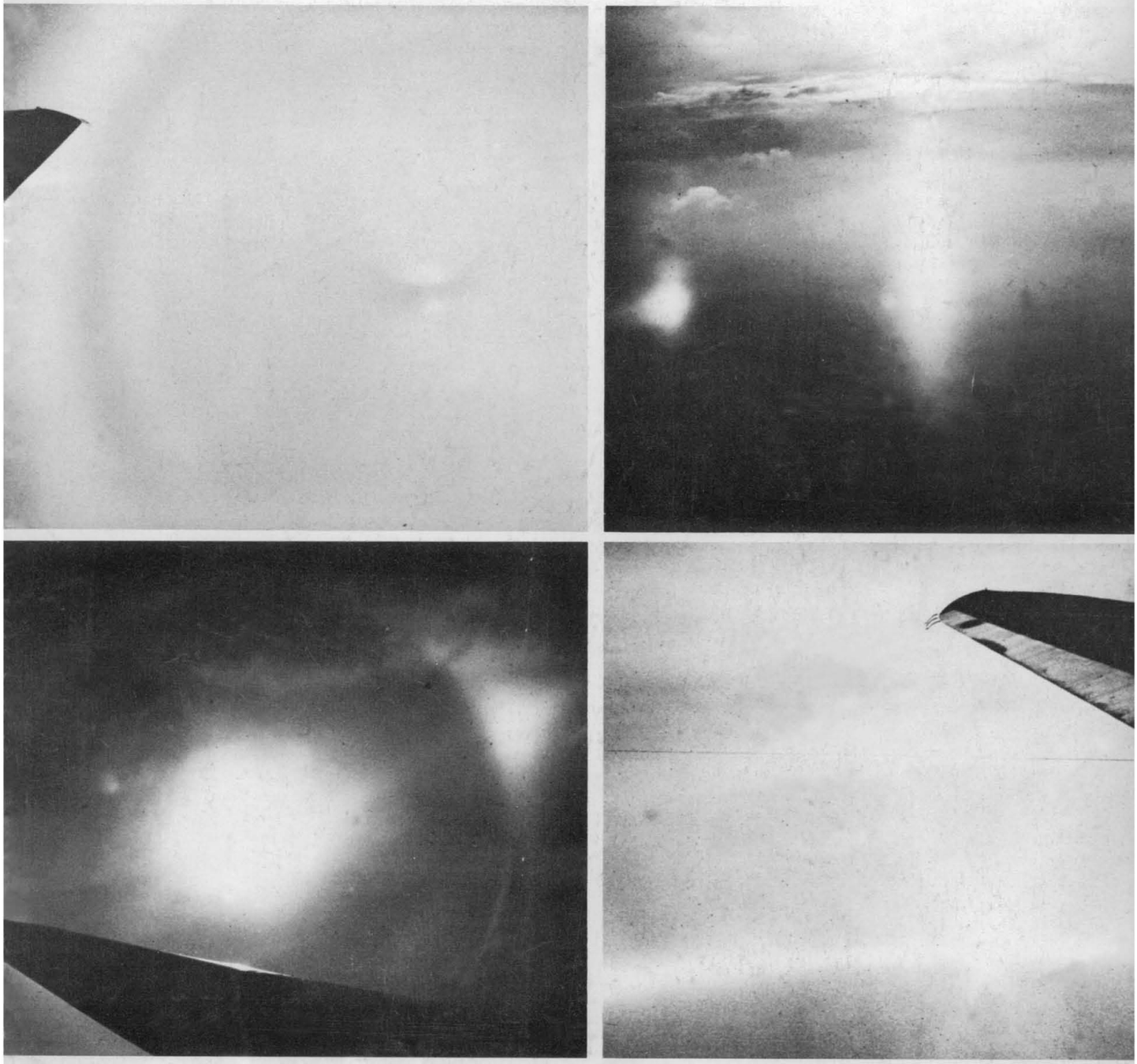
SCIENCE

14 September 1973

Vol. 181, No. 4104

AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE



I did 500 radioimmunoassays while I slept

The big, 500-sample capacity of the LKB-Wallac Automatic Gamma Sample Counter means that you, too, could set up for long uninterrupted runs overnight or on weekends. Come back in the morning and find a complete printout of results in digital form, with every sample positively identified. And with sample transfer taking as little as 10 seconds, you get fast results.

The LKB-Wallac Gamma Counter is simple to operate. You will be able to handle a high volume of samples for radioimmunoassays with a minimum of effort and at low cost. Samples can be added or removed from the counter at any time, without interrupting the run. They will always be positively identified. And you can add a binary-coded cap when you need to identify the samples of multi-users, or to give a command to your computer to select a certain program for processing the data from a group of samples.

Write now for information about LKB-Wallac Gamma Counters for either 300 or 500 samples, with one or two channels, for single or dual labelled samples.

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LKB Instruments Inc.

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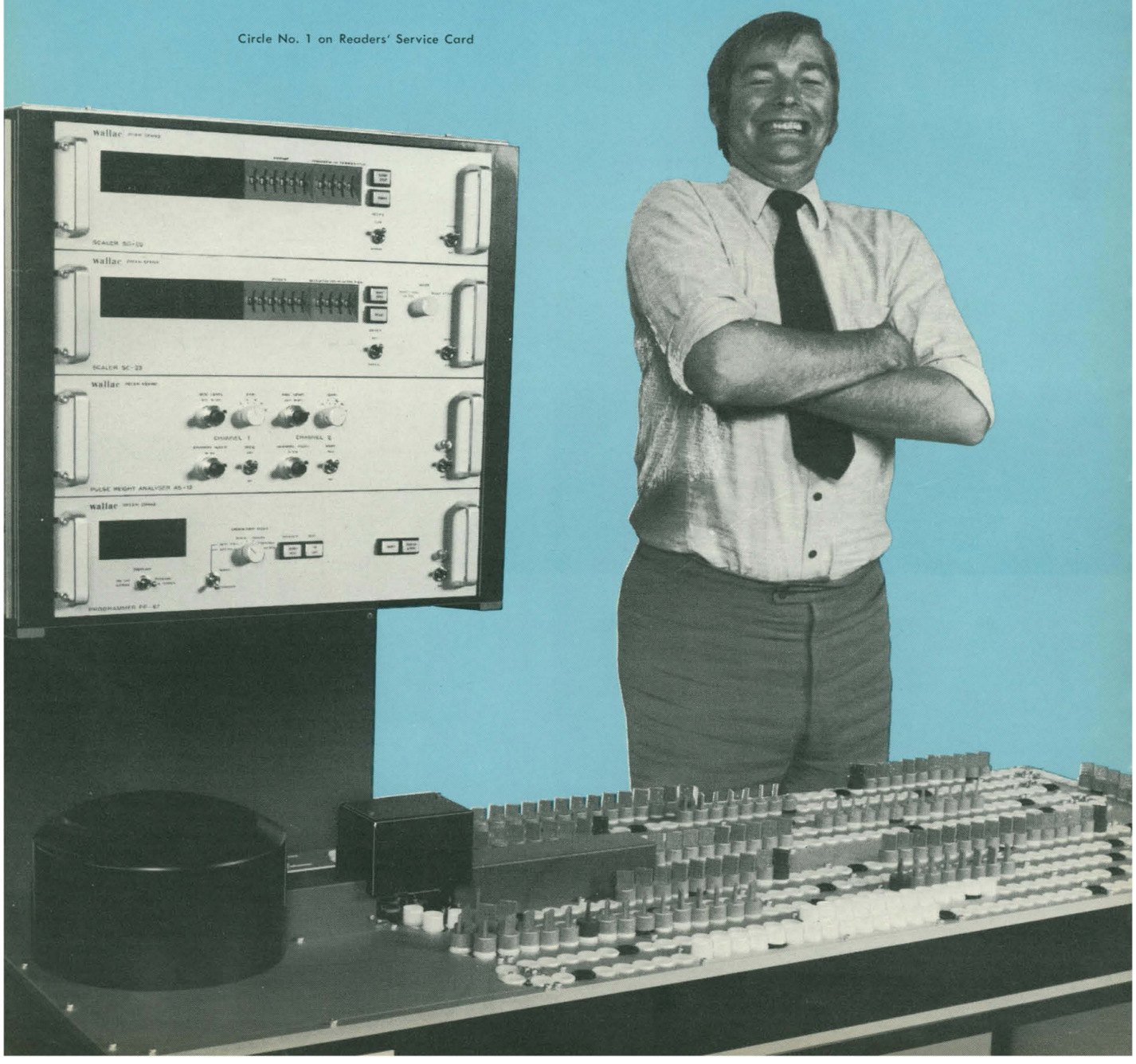
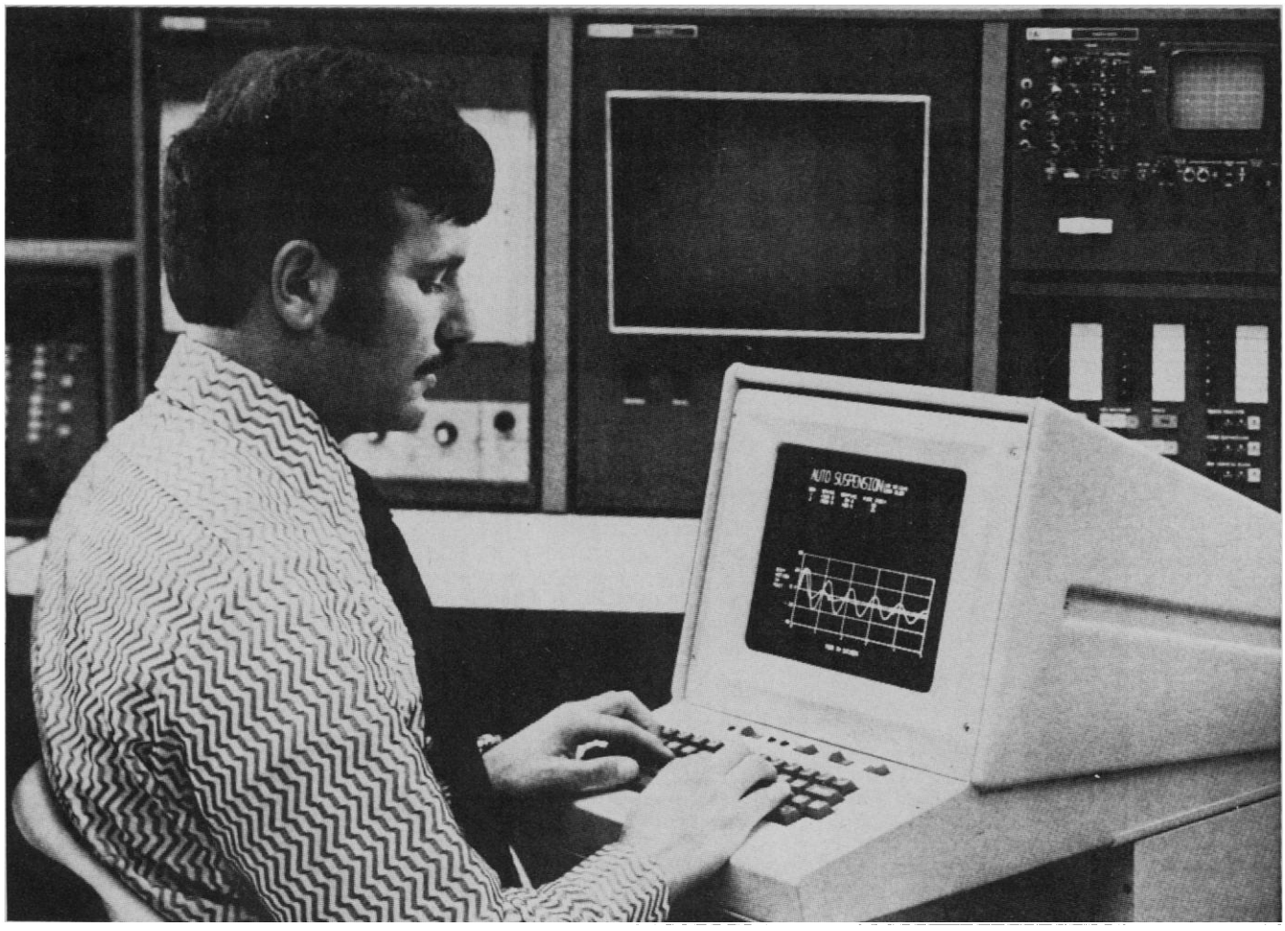




Simulation in 1/100th the Time at 1/4th the Price.

That's just a fraction of our story. The new PACER™ computer systems by EAI can actually deliver price/performance ratios that run well over 100 times those of conventional digital computers. Whether the problem is simulation, optimization, control, design or data reduction.

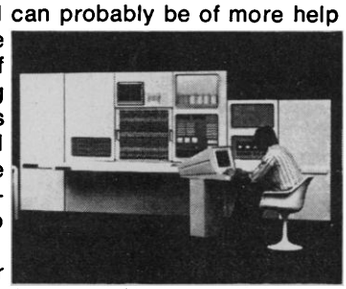
The unique efficiency of PACER systems is due to many factors: First, they combine our new fourth-generation digital processor with three new high-speed parallel processors. New peripherals and software offer interactive graphics in a conversational mode of operation. So now scientists and engineers can achieve higher computational productivity and accuracy while tackling the complexities of multivariable problems in real time or even faster than real time.

The PACER systems simply deliver far more solutions per day or per dollar than any alternative systems.

Further, we help you zero in on optimum efficiency by offering three series of systems: PACER 500, PACER 600 and PACER 700. Each series offers three sets of options with a wide choice of peripherals. To let you choose a setup with capabilities matched almost precisely to the requirements of your problems or to your preference for input/output.

Yet there is never a need to feel straitjacketed. Because PACER systems are expandable. Almost indefinitely—including interconnection to your existing computers.

As for software, EAI can probably be of more help to you than anybody else in the world. Our library of compatible engineering and scientific software is the most generally useful ever assembled, and we have over 5,000 case histories of applications to prove it.



For details on our whole PACER story, please write or call today.

EAI

Electronic Associates, Inc.
185 Monmouth Parkway
West Long Branch, New Jersey 07764
(210) 229-1100

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14 September 1973

Volume 181, No. 4104

SCIENCE

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COVER

(Upper left) Optical effects produced by water droplets in a cloud photographed 10 minutes prior to seeding with silver iodide. After artificial seeding, optical effects produced by ice crystals appeared (upper right and lower left and right). See page 1043. [Photographs, upper left and right, P. V. Hobbs and L. F. Radke, Atmospheric Sciences Department, University of Washington, Seattle; photographs lower left and right, F. M. Turner, University of Washington]

Water jacketed incubators.

Your needs? Your space? Your budget? Forma fits.

There are incubators and there are incubators. Particularly at Forma. Our water jacketed incubators are all rigidly constructed with rigid control standards. No lab air supply is necessary.

Select a size, number of compartments, shape, CO_2 capability and price that make sense. We know the incubator will.

Call or write Forma for further details.

The 3314 double decker puts twice as much incubation into the same floor space as the basic 3149, with two separately controlled CO_2 incubators.

The model 3114 – a new concept – is four separate CO_2 controlled chambers in two stacked incubators.

The model 3149 (single compartment) features a separate CO_2 system with QWIK-PURGE tension recovery and single-knob UN-I-TROL CO_2 control.

The model 3156 automatic CO_2 incubator automatically maintains CO_2 level at a pre-selected constant, returning to same after door openings. Control is within $\pm$ 0.25% with direct readout. Recalibration verification; provides destratification of CO_2. Savings in CO_2 90% and more over standard incubators.

The model 3151 (double compartment) offers all the features of the 3149, with twice as much incubation space. Two CO_2 control systems.

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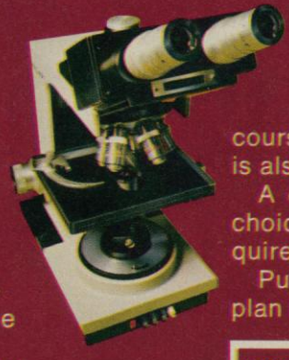
Distinctively advanced optical efficiency



Research quality images in a standard priced instrument . . . that's what you'll get with the new Bausch & Lomb Balplan Microscope. Whether you're using it alone or consulting with another through the dual-viewing module, the new, innovative optical system will show you images true in detail, color, contrast.

We've combined lateral color correcting flint and crown glasses as well as fluorite elements in a completely new system. Multi-Film coatings minimize flare. Flat fields sharp to the edge, plus extra wide field coverage (up to 17% more area) make viewing and photography richly rewarding.

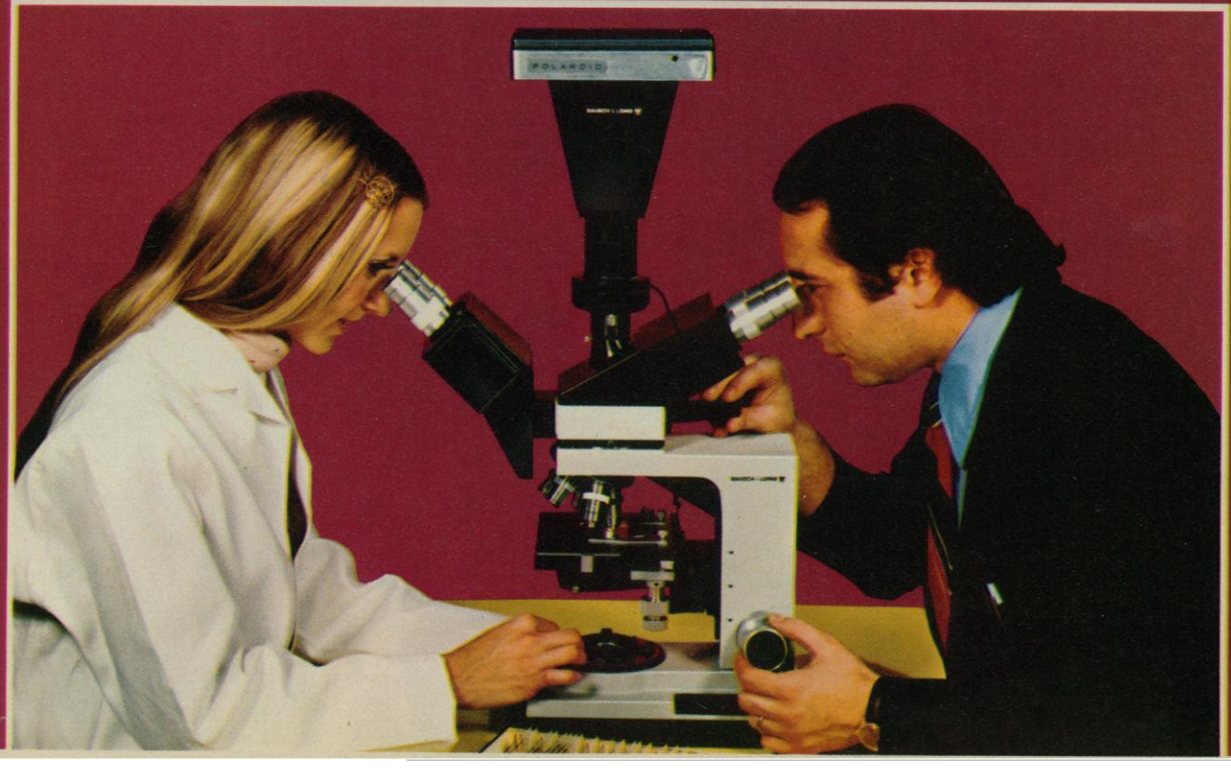
Color coded, ball detent positioned achromatic, flat field objectives start with a new 2.5X and feature the spring loaded 40X and 100X oil. All are parfocal, parcentered and interchangeable. Of course, the system is infinity corrected. There is also a selection of apochromats.

A complete line of condensers plus a full choice of integral illuminators fulfill every requirement of the system.

Put it all together and you'll agree that Balplan is different—truly one-of-a-kind.

LOOK INTO BALPLAN. No other microscope system offers so much for so little . . . a premium quality, research type microscope at up to half the price of another brand of comparable quality. See for yourself in a live demonstration in your lab with your own specimens. Send for new 24-page full color catalog 31-2411 and our free demonstration offer.

TM. Balplan is a Bausch & Lomb Tradename.



BAUSCH & LOMB, SCIENTIFIC OPTICAL PRODUCTS DIVISION, 77421 BAUSCH STREET, ROCHESTER, N.Y. 14602

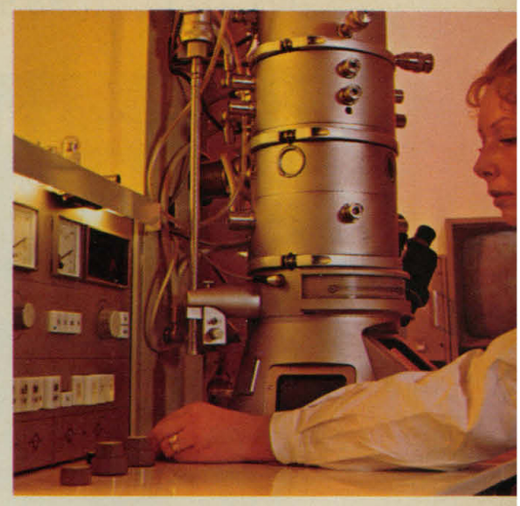
Circle Reader Service Card No. 22 for information; No. 23 for demonstration.

New Siemens Elmiskop 102
added power

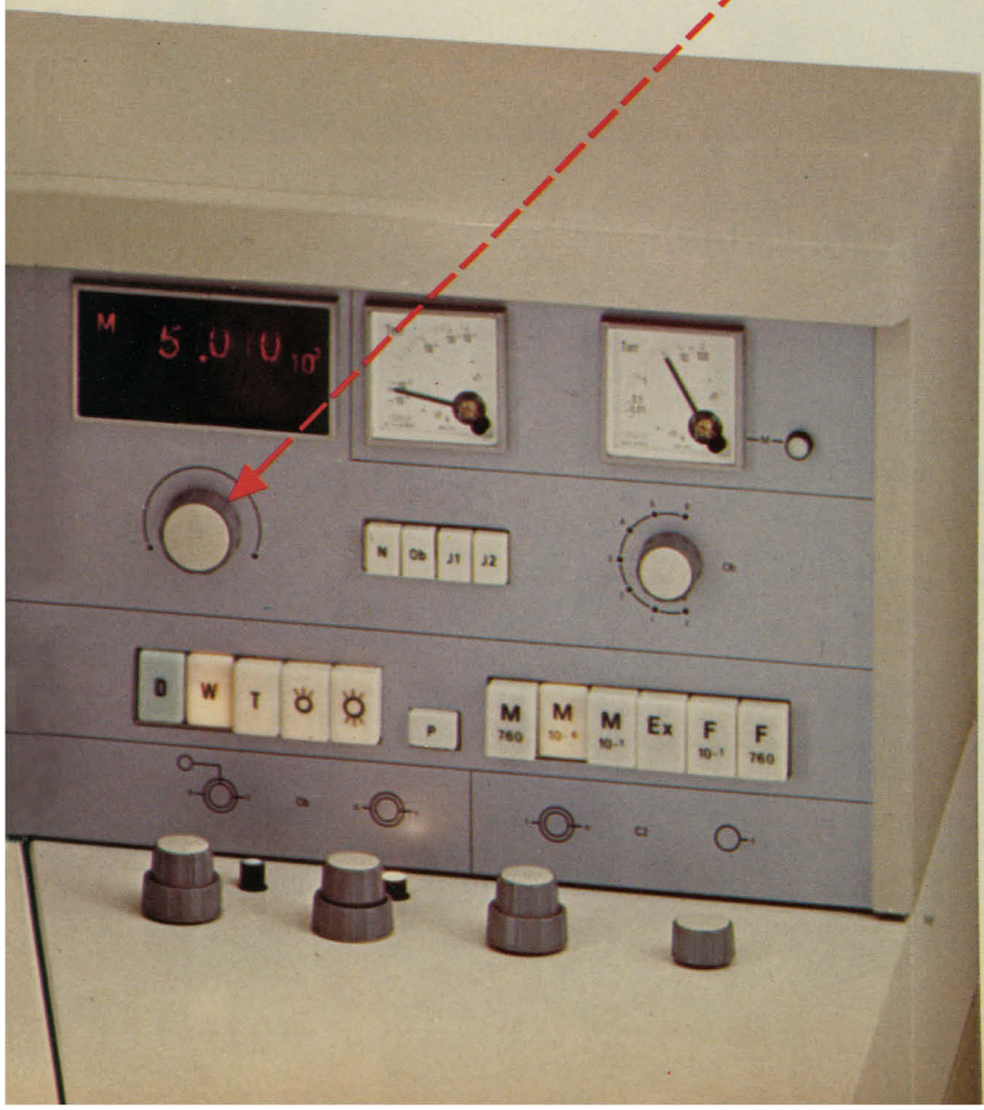
A single knob lets you select any of 33 magnification steps, from 200x to 500,000x. Additional controls allow fast, accurate "fine tuning" of illumination and focus.

Magnification and diffraction length are clearly legible on a digital display. Two push buttons select 500x or 10,000x magnification instantly. Voltage selection is push button in stages from 20 to 125 kV. Each voltage can be wobbled for perfect centering. Siemens Elmiskop 102 has many other features you'll find useful: automatic focus or illumination; automatic vacuum system; automatic photographic chamber; specimens that can be changed in 3 seconds.

One other feature you'll find useful—if you ever need it—is Siemens service. Siemens has service centers nationwide. In addition, Siemens will fly a technical expert to your location if you've got an urgent problem that can't wait. And if all you've got is a question, a phone call to Siemens brings you the answer. Isn't this what you'd expect from a world leader in electron microscopes?



and single-knob control.



For further information on Elmiskop 102 and the full line of Siemens electron microscopes, get in touch with your local Siemens specialist or: Siemens Corporation, 186 Wood Avenue South, Iselin, New Jersey 08830. (201) 494-1000, Extension 364.

SIEMENS
CORPORATION

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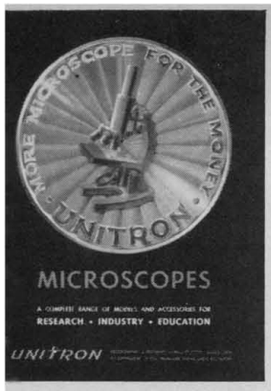
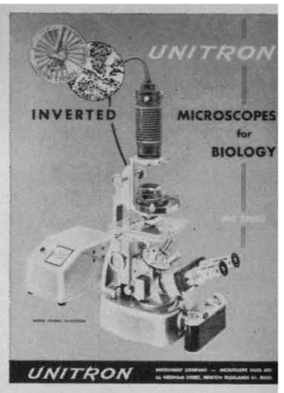
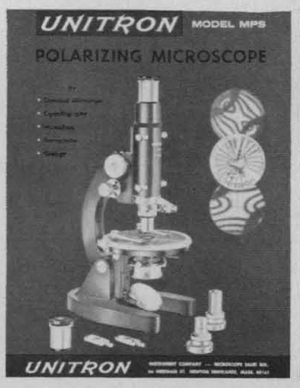


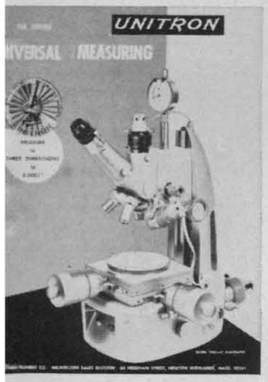
FREE MICROSCOPE BUYING GUIDE

Shown here in miniature are just some of the informative brochures which comprise the UNITRON Catalog . . . your buying guide to quality microscopes at prices within your budget. Whether your application is routine laboratory analysis, advanced biological research, or industrial quality control, you will find the instrument you need in UNITRON's complete line.

A UNITRON MICROSCOPE CATALOG is Yours for the Asking.



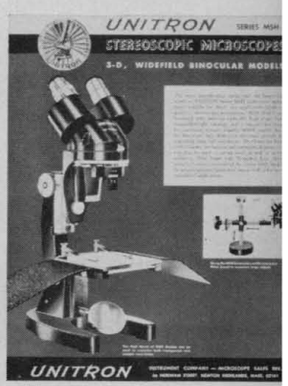


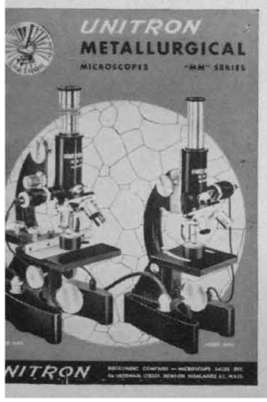


TRY ANY UNITRON MICROSCOPE FREE FOR 10 DAYS

A salesman's demonstration gives you only about 30 minutes to examine a microscope, hardly the best conditions for a critical appraisal. But UNITRON's Free 10 Day Trial gives you the opportunity to evaluate any model in your own laboratory and prove its value in your own application before you decide to purchase. See for yourself, as have thousands of other buyers, why . . .

UNITRON Means More Microscope for the Money.





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Company _____

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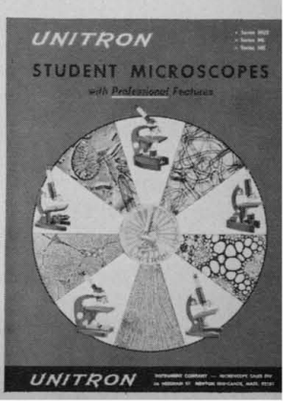
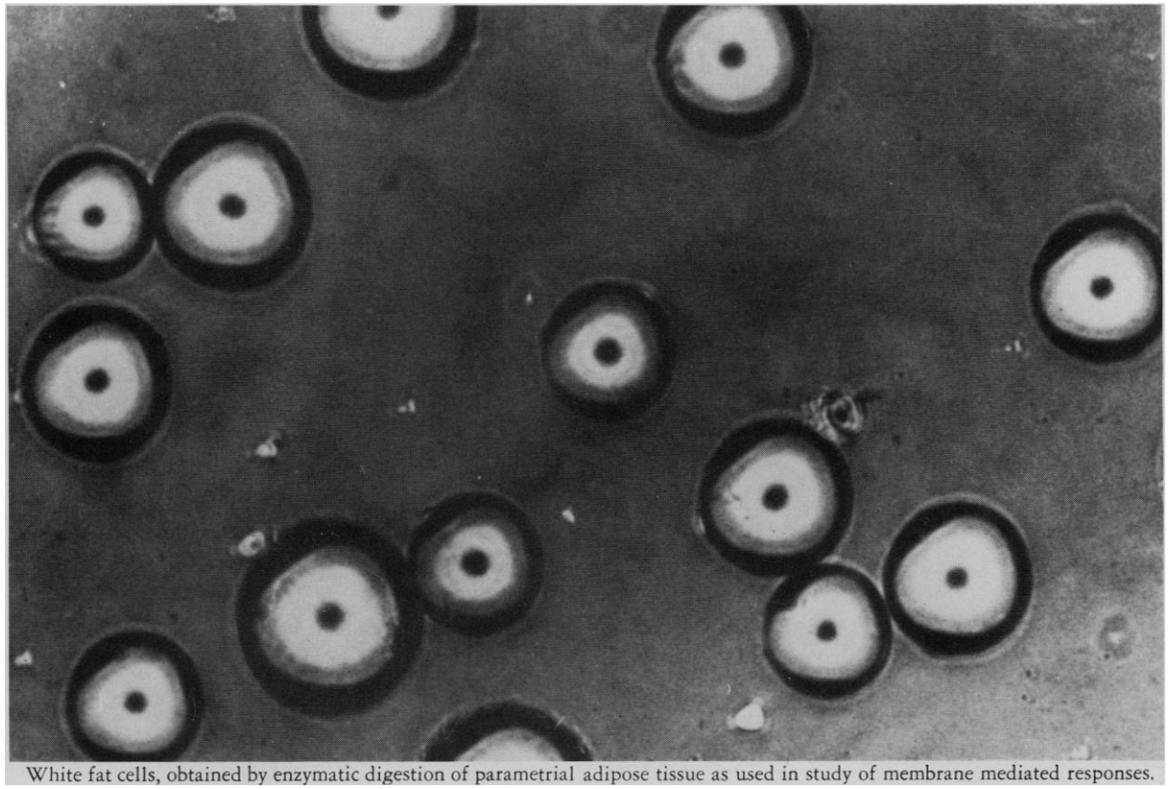


Worthington Collagenase...



White fat cells, obtained by enzymatic digestion of parametrial adipose tissue as used in study of membrane mediated responses.

specifically blended for cell isolation.

In microbiological studies of animal cells, it often is desirable to isolate and separate the cells for further study. The researcher's need is to separate the cells from the connective and cementing materials without damaging the cells themselves.

Many researchers found that a natural mixture of digestive enzymes produced by a non-toxigenic strain of the bacterium *Clostridium histolyticum* provided the separation remarkably well. The enzymes, without the toxin that many of the *Colstridia* produce, effectively digest away the materials connecting the cells into a tissue, but leave the cells themselves virtually untouched.

The enzyme mixture is named after its more unique member, *Collagenase.* Worthington supplies Collagenase in several degrees of purity ranging from crude to highly-purified; researchers have generally found that the less purified material is more effective in releasing intact cells from tissues. The effectiveness, however, seemed to differ with different tissues, and it did not always match the quantitative differences noted in our assay labs.

A program was therefore initiated by Worthington aimed at correlating effectiveness of samples on specific tissues with results of our own biochemical assays. We enlisted the support of several dozen prominent researchers; they evaluated more than a hundred samples of regular production and specially prepared lots of Collagenase in their own studies.

Evaluation of these studies has enabled us to categorize our crude Collagenase into four different types which are blended and classified according to the specific tissues for which each is best suited. The four types are available as listed in our current catalog.

TYPE	CHARACTERISTIC	TISSUE BEST SUITED
I	Normal balance	Fat cells; Adrenal tissue
II	High Clostridiopeptidase	Liver, Bone, Thyroid
III	Low Proteases generally	Mammary
IV	Low Tryptic activity	Pancreatic Islet cells

The increasing use of Collagenase in cell isolation is encouraging. Credit for the program's success is due to the many researchers who cooperated so openly with their time and talent.

Your comments and interest are welcome. Additional information on this application of Collagenase and a copy of our current catalog are available on request.

WORTHINGTON

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Maryland makes more plastic cages than anybody.

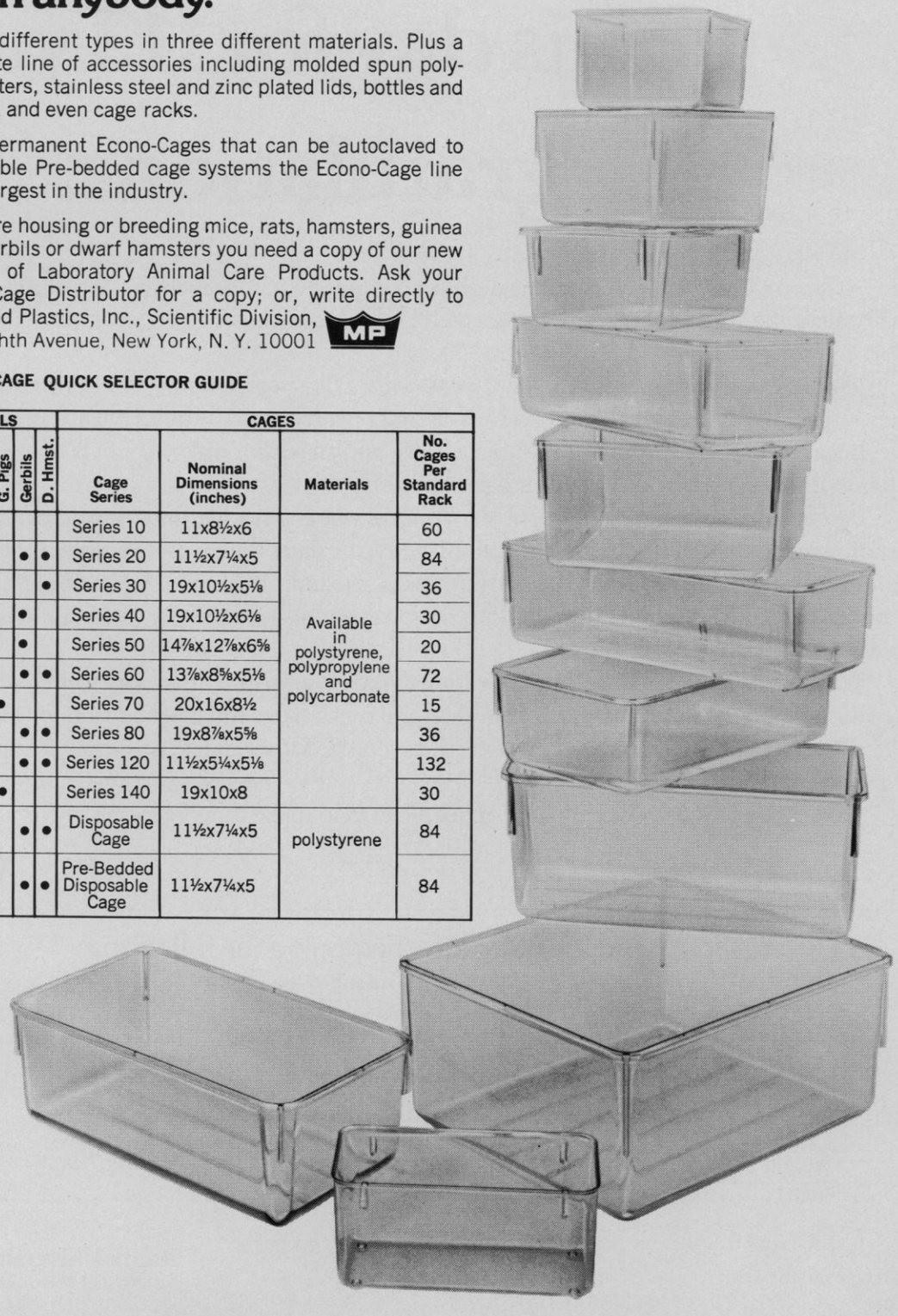
Twelve different types in three different materials. Plus a complete line of accessories including molded spun polyester filters, stainless steel and zinc plated lids, bottles and sippers, and even cage racks.

From permanent Econo-Cages that can be autoclaved to Disposable Pre-bedded cage systems the Econo-Cage line is the largest in the industry.

If you are housing or breeding mice, rats, hamsters, guinea pigs, gerbils or dwarf hamsters you need a copy of our new catalog of Laboratory Animal Care Products. Ask your Econo-Cage Distributor for a copy; or, write directly to Maryland Plastics, Inc., Scientific Division, 461 Eighth Avenue, New York, N. Y. 10001 MP

ECONO-CAGE QUICK SELECTOR GUIDE

ANIMALS						CAGES			
Mice	Rats	Hmstrs.	G. Pigs	Gerbils	D. Hmst.	Cage Series	Nominal Dimensions (inches)	Materials	No. Cages Per Standard Rack
	•	•				Series 10	11x8½x6	Available in polystyrene, polypropylene and polycarbonate	60
•		•		•	•	Series 20	11½x7¼x5		84
•					•	Series 30	19x10½x5⅛		36
	•	•		•		Series 40	19x10½x6⅛		30
	•	•		•		Series 50	14⅞x12⅞x6⅝		20
•				•	•	Series 60	13⅞x8⅝x5⅛		72
	•	•	•			Series 70	20x16x8½		15
•				•	•	Series 80	19x8⅞x5⅝		36
•				•	•	Series 120	11½x5¼x5⅛		132
	•	•	•			Series 140	19x10x8		30
•				•	•	Disposable Cage	11½x7¼x5	polystyrene	84
•				•	•	Pre-Bedded Disposable Cage	11½x7¼x5		84



EC-P-4

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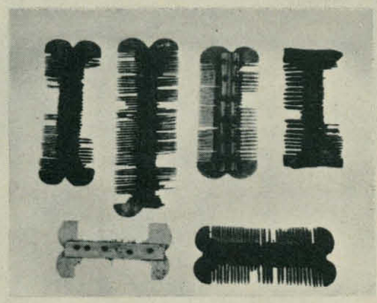
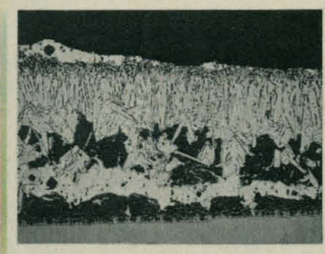
One camera took all of these pictures and delivered them in seconds.

Chromatogram of urological specimen. Type 108.

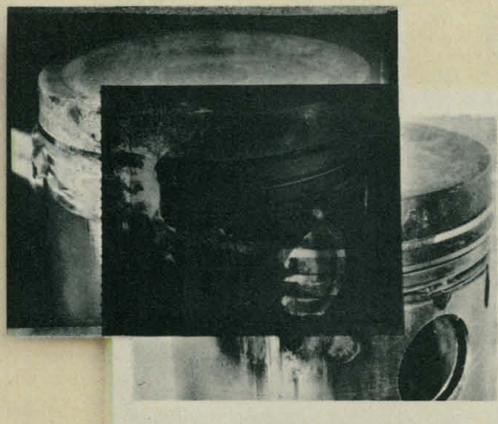


Bone combs from Middle Ages. Type 52.

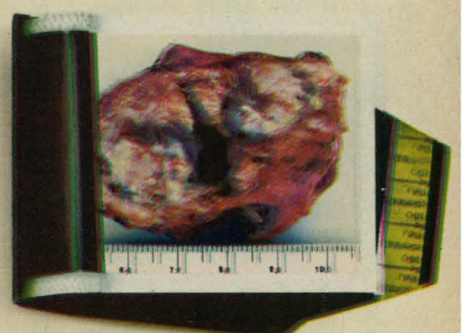


Photomicrograph of experimental galvanized coating. X100. Type 107.

35mm slide of muscle structure. Type 46L.



Damaged automobile piston. Type 55 positive/negative.



Lung with tumor. Type 108.

The new Polaroid MP-4 camera.

It's the one camera that couples speed with flexibility.

It fits practically any job you have because it lets you use 13 different Polaroid instant films in 4 x 5, pack or roll formats.

They give you exactly the records you need—in full color or black and white (fine-grain, high-speed, negative with matching positive, and even black and white transparencies).

And not one of them takes more than two minutes to develop.

The modular design of the new MP-4 lets you interchange cameras, film holders and lenses. Because the light arms are completely adjustable, it can handle even the most difficult lighting situations.

And you can shoot at any angle or perspective because both camera mount and column rotate through a complete 360 degrees.

And you can't go much further than that. The MP-4 Multipurpose Land camera belongs in every laboratory and photo studio. It delivers in seconds what other photographic processes can take hours to achieve.

For more information or a demonstration, write to Polaroid Corporation, Dept. 26-254, 549 Technology Square, Cambridge, Mass. 02139. Or call collect (617) 547-5176.

Polaroid®

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How to measure depth, height or thickness with Gaertner optical instruments.

—in the lab or shop

—in physics, metrology, biomedical engineering, vision, psychology... you name it.

Manufacturers of ***metric*** *instrumentation since 1896*

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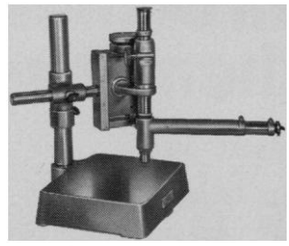
3-213

Measuring Depth?



Depth Measuring Microscopes

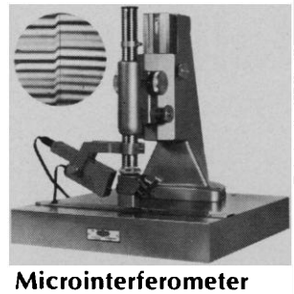
Simple to use for precision depth measuring, without special training. Non-destructive, requiring no contact with the object. Incorporates two important features: 1) high magnification (for a short depth of field that lets you precisely "zero in" on the points of interest on the object being measured—the top and bottom of a hole, for example,—and 2) a means of determining the position of the draw tube relative to the object. Changes in position as the microscope is focused on one point and then another are "translated" into measurement readings in several ways:

Methods of measurement. The *draw tube scale* is the simplest. The scale is engraved on the draw tube, with a vernier attached to the microscope body. It reads to 0.005", or 0.1mm. For some applications you might prefer a *dial gage*, actuated by a contact linked with the draw tube, and reading to about 0.0001". For greater range and accuracy, you can have your microscope mounted in a *micrometer slide* with its axis parallel to the slide's precision micrometer screw. Gaertner offers a variety of micrometer slides to solve many measuring problems, plus an extensive selection of accessories for special needs. One example: A *Parfocal Illuminator*, particularly useful where the surface to be focused is difficult to "zero in" on because of roughness.

Applications. Depth measuring microscopes are most effectively used where accuracy in the general range of 0.005" to 0.0001" is required. Typical applications include measurements of hole depth, depth of slots, coating thickness, thickness of transparent materials, thickness of TV tube faces, and etching depth. With a parfocal illuminator, microscopes are ideal for measuring the radii of curvature of lens surfaces and other spherical reflecting objects.

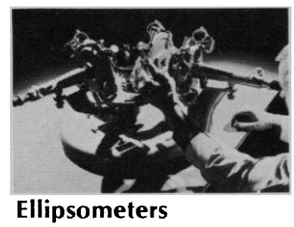
For complete information on Gaertner Measuring Microscopes and accessories, write for Bulletin 161-72.■

Need finer unit measurements?



Microinterferometer

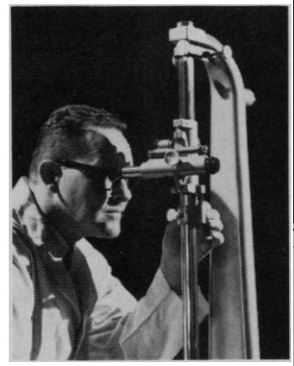
Gaertner also makes a Microinterferometer for highly precise, non-contacting measuring of surface configuration and thickness of coatings and deposits. This instrument is simple to operate. It uses the principle of interference of light to optically measure in terms of the wavelength of light—measurements to about 1/5th of a wavelength or 2 millionths of an inch. **Ask for Bulletin 209-73.■**



Ellipsometers

For measurement of ultra-thin films or study of surface phenomena requiring even smaller unit measurements, or for many chemical, biological and biomedical research studies, you'll find a Gaertner Ellipsometer does the job. It uses plane polarized light to achieve readings to a few angstroms. **Ask for Bulletin 203-73.■**

How to measure vertical distances or displacements... remotely, precisely, without contact.



Cathetometers

You can measure the height of objects not accessible to measurement by other means, with a cathetometer. Measure things you can't touch, like the height of liquids in a tube. Or the deflection of a quartz spring. Or the vertical extension of material under stress—all without physical contact.

A cathetometer consists of a viewing scope (horizontal) mounted on a carriage which moves on an accurate vertical guide. Gaertner cathetometers are offered in a variety of designs with modifications to solve all kinds of difficult vertical measurement problems. The conventional design has a one meter (40") scale with vernier reading to 0.01mm (0.001"). You can focus on objects from 12" to infinity, or shorter distances by substituting a microscope objective.

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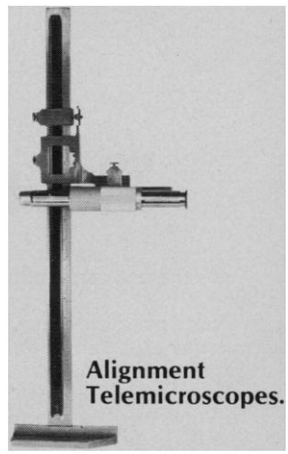

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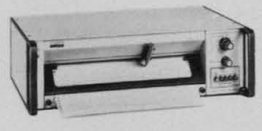

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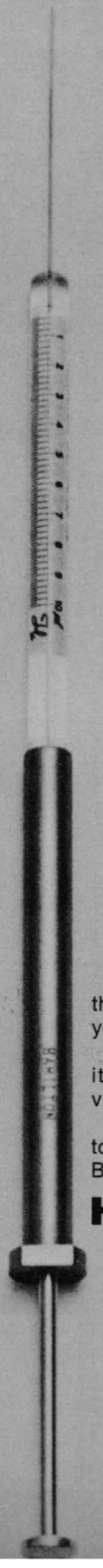

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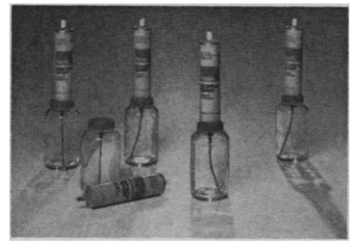

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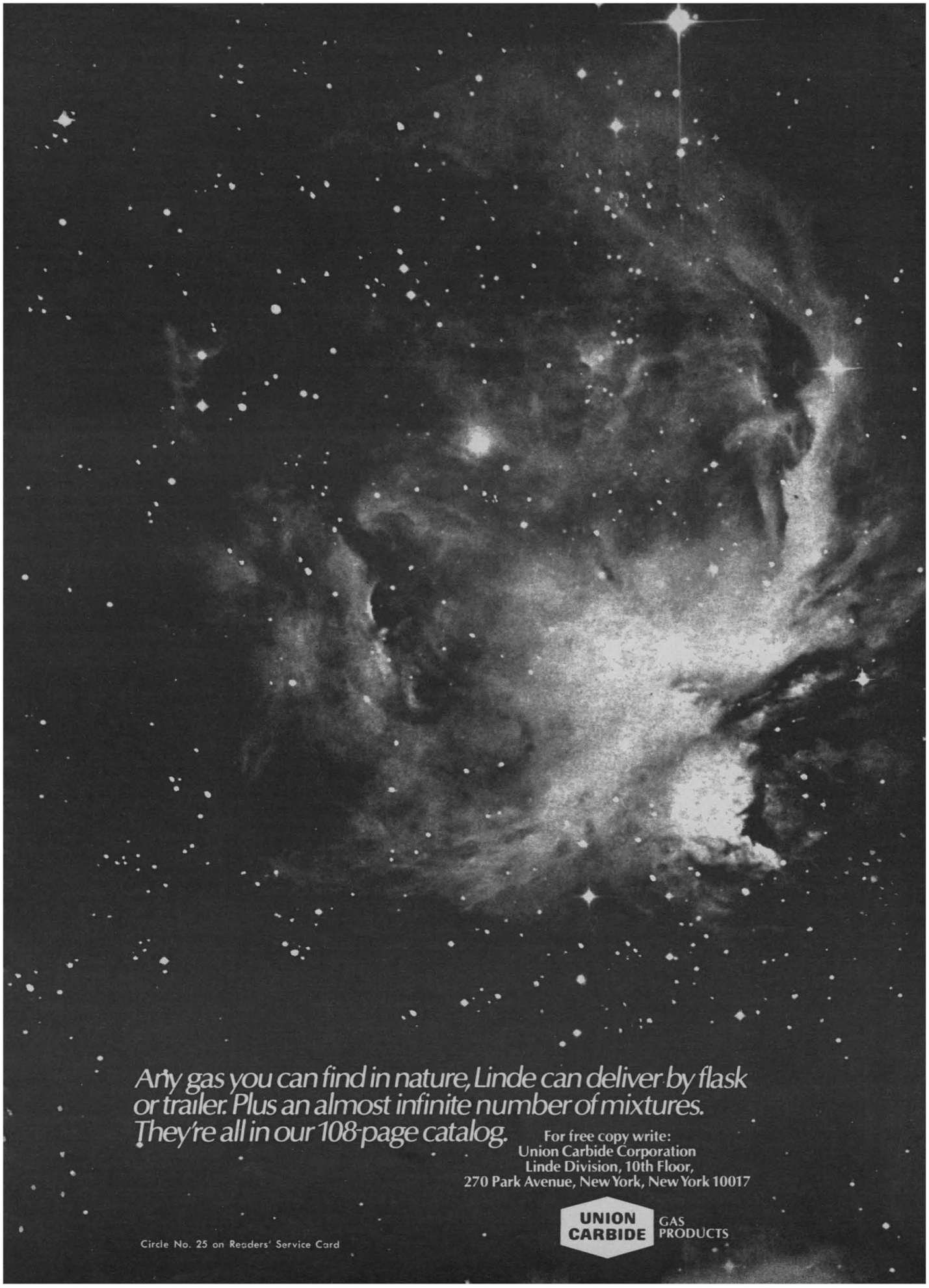

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is essential is that all plans, hypotheses, work-programs, or other preliminaries are regarded as disposable. Great advances may emerge from a scientific exercise carried through to the last of a series of preplanned experiments. However, many have arisen from the inspired pursuit of ideas engendered by chance observations that were either irrelevant to the planned exercise or were embarrassingly awkward. It is second nature to bacteriologists to discard cultures with stray infections. Fortunately Fleming did not (*1*), and we have antibiotics. A parasitologist, Keilin, was curious to learn what happened during pupation to the intracellular hemoglobin of the botfly larva. He could find no hemoglobin in the adult, but he did find a pigment that he named cytochrome (*2*). Working on his own, he established the role of cytochrome in cell respiration and ushered in a new era for biochemistry.

Although Stetten's dictum, "Research is the invasion of the unknown" (Editorial, 18 Aug. 1972, p. 565), is applicable to such ventures, a more explicit expression of his views would be, "research is the unplanned invasion of the unknown." Earlier planning brought Fleming and Keilin to the points where they could make their crucial observations. Did each, thenceforward, in pursuit of the unknown, work without plans? With Henderson, I believe that Szent-Györgyi's nocturnal digestion (*3*) is a process of metabolizing yesterday's experiences into tomorrow's plans of action. Certainly it is not research if you know what you are going to find, but it is research to set out, plans in hand (as many of us do), in an attempt to reach a defined but hitherto unattained objective. Even Stetten's "trudging through the jungle" calls for a modicum of planning—for example, a decision on a compass bearing lest he walk in a circle. To Stetten, planning means strategic planning; for Henderson and Stein, as for myself, planning may be both strategic and tactical.

Sanger's brilliant elucidation of the amino acid sequence of insulin (*4*) was research of a high order, but what of the sequence determination of cytochrome c from yet another species? Yet from accumulated data on cytochrome c has developed the exciting concept of the functional evolution of proteins (*5*), and fuller development of this concept requires still more sequence determinations (*6*). With techniques fully charted, the growing tedium of such exercises calls urgently for automation (*5*), although current knowledge of structural homologies enables guesswork to play a useful role in sequence determination (*7*). Is this research? I say that it is, since my criterion is not the means but the end; not the originality of the techniques but the growth of comprehension.

Among laymen there persists a picture of the researcher as one prodding at the unknown by hit-and-miss methods. This view was expressed with inane felicity by Belloc (*8*): ". . . anyone of common mental and physical health can practise scientific research. . . . Anyone can try by patient experiment what happens if this or that substance be mixed in this or that proportion with some other under this or that condition. Anyone can vary the experiment in any number of ways. He that hits in this fashion on something novel and of use will have fame. . . . The fame will be the product of luck and industry. It will not be the product of special talent." As Stein reminds us, since the public provides most of the money, it is essential that the public come to appreciate the principles and logic of scientific research. Presenting it as a game of chance, unplanned and lacking objectives, is not only misleading but a disincentive to the holders of purse strings. Equally misleading, and also amoral, is the premise that expenditure of x million dollars over y years will ensure a desired result (for example, a cure for cancer). Sponsors must become convinced that the essential conditions for innovative research are freedom to think laterally and freedom to risk taking a chance, to ponder not only the route to the declared objective but also the experiment that fails and the result that sticks out like a sore thumb; and to respond to the promptings of intuition—with new plans.

EDWARD F. HARTREE

Agricultural Research Council, Unit of Reproductive Physiology and Biochemistry, 307 Huntingdon Road, Cambridge CB3 OJQ, England

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Scientist in the Senate

Constance Holden (News and Comment, 18 May, p. 720) wrote that there is only one scientist in Congress—Mike McCormack (D–Wash.), a chemist. Locke White, Jr., writes (Letters, 3 July, p. 112) that another scientist, James D. Martin (R–N.C.), former associate professor of chemistry at Davidson College in North Carolina, is also in Congress. I would like to bring to your attention a third scientist in Congress, Senator Dewey F. Bartlett (R–Okla.). Bartlett was a practicing geologist in Oklahoma for many years until he became governor of Oklahoma, and then senator. He is still an outstanding geologist.

A. A. MEYERHOFF
American Association of Petroleum Geologists, 1444 South Boulder, Box 979, Tulsa, Oklahoma 74101

PCB Formation

Although Thomas H. Maugh II's report "DDT: An unrecognized source of polychlorinated biphenyls" (Research News, 11 May, p. 578) deals with vapor-phase photolysis, it gives the misleading impression that such a reaction pathway is novel and ignores earlier published research. DDT [1,1,1-trichloro-2,2-bis(*p*-chlorophenyl)ethane] was certainly recognized as a source of polychlorinated biphenyls (PCB's) by 1969.

It is correct that Guenzi and his associates (*1*) did not observe the formation of PCB's or DDMU [1-chloro-2,2-bis(*p*-chlorophenyl)ethylene] by photolysis of solid DDT or DDT in hexane after irradiation at 253 nanometers. However, in 1969 we clearly showed that DDMU, dichlorobenzophenone, and dichlorobiphenyl were products of DDT or DDE [1,1-dichloro-2,2-bis(*p*-chlorophenyl)ethylene] photolysis in methanol at 260 nm (*2*). Moreover, we investigated the photolysis of dichlorobenzophenone and reported that 4,4′-dichlorobiphenyl (a PCB) was one of the photoproducts. Our proposed reaction schemes were supported by the identification of many products derived by a series of radical reactions. Among the products was 3,6-dichlorofluorenone, which we had reported as a major photolysis product of DDE in 1969 (*3*). We also found that photooxidation of this compound to 3,3′-dichlorobiphenyl-2-carboxylic acid oc-

curred. Subsequent decarboxylation of this acid could yield traces of PCB's, as could the decarbonylation of trichlorobenzophenone (also reported by us as a photolysis product). The experimental work reported in the two publications cited indicated clearly that some PCB's were products of DDT photolysis. The suggestion that a proportion of the PCB's in the environment might result from photodecomposition by DDT was voiced by Peakall and Lincer (*4*) in 1970. However, they were of the opinion that, since PCB's extracted from biological material resembled the more highly chlorinated members of this class, it was highly unlikely that PCB's found in the environment were derived from other chlorinated pesticides. Nisbet and Sarofim (*5*) stated that a large proportion of the PCB isomers with four or fewer chlorine atoms are missing from animal samples indicating that these have been degraded in the environment.

JACK R. PLIMMER
UTE I. KLINGEBIEL
Pesticide Degradation Laboratory, Agricultural Environmental Quality Institute, Agricultural Research Service, Beltsville, Maryland 20705

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Malignant Tumors in Monkeys

Edwin J. Andrews (Letters, 20 Apr., p. 255) and J. R. Allen and D. H. Norback (p. 256) refer to a spontaneous malignant gastric tumor in a rhesus monkey that I reported several years ago (*1*). This rhesus monkey had ingested DDT as well as Demeton during certain periods of his life. In both letters it was pointed out that the described lesion occurred in response to exposure to DDT and Demeton.

When I reported this lesion, I concluded that the development of the tumor was spontaneous rather than related to the exposure to pesticides. This same monkey had been in a poliomyelitis study and, in addition, had periodically been given 5 percent alcohol solutions. I do not think that the observation of a lesion in one animal that happens to have been exposed to DDT and Demeton should lead to the conclusion that these chemicals induce malignant tumors in monkeys.

Unfortunately, these deductions are very often made, but, unless controlled studies with more animals are conducted, one has to assume that the gastric lesion observed in this one rhesus monkey developed spontaneously. Seven additional rhesus monkeys of about the same age that we studied did not develop the same lesion even though they had also been exposed to DDT and Demeton.

RENATE D. KIMBROUGH
Bioeffects Branch, Environmental Protection Agency, Chamblee, Georgia 30341

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Correct Formulas

In his article "The 1972 Nobel Prize for Economic Science" (Research News, 3 Nov. 1972, p. 487) Paul Samuelson states that "relative factor shares in GNP" according to Sir John Hicks is

$$\alpha_i = V_i \partial Q(V)/\partial V_i$$

where V_i is an input factor of production (for example, labor) and Q is the total output. Actually this is not the "relative factor share" but the "total factor share" received by the factor V_i. Thus, the relative factor share is

$$\alpha_i = \frac{1}{Q}[V_i \partial Q(V)/\partial V_i]$$

MANOUCHER PARVIN
Hunter College of the City University of New York, New York 10021

I am grateful to Parvin for pointing out the typographical error in the factor-share formula. The correct version of the formula appears later in my article, so no informed reader should have been misled.

Another typographical error in my article should also be corrected. The equation involving Hick's net demand functions should read

$$0 = -F[P] = -(f_j[p_1, \ldots, p_n]) \equiv -F[\lambda p]$$

PAUL A. SAMUELSON
Department of Economics, Massachusetts Institute of Technology, Cambridge 02139

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14 September 1973, Volume 181, Number 4104

SCIENCE

Agriculture, Research, and Shortages of Funds and Food

Agricultural research in this country is being starved at the very time that rising prices and tight supplies of food both at home and abroad demand that it be given major support as one of the nation's top tasks.

America's ability to produce an abundance of food represents this country's greatest potential for doing good in the world and for making its influence felt in the world. During World War II, America greatly contributed to the breadbasket of our allies, and after that war American food helped to sustain the populations and rebuild the economies of a score of countries, those of wartime friends and foes alike. That crisis over, American agricultural know-how, machines, seeds, and fertilizers energized and modernized agricultural economies in many parts of the world and lifted regions previously fettered by ineffectual traditional methods to unheard-of levels of performance in farming and food production. At home, America's agriculture has provided for our citizens ample food of a staggering variety, for a far smaller percentage of the average take-home pay than is the rule almost anywhere in the world.

Agricultural research of a scope and variety unparalleled anywhere, any time, has been the wellspring from which this bounty has flowed. That research, begun in an empirical fashion in the early days of the Republic, grew later into a broad, sophisticated enterprise extending from the field to the laboratory, from the packing shed to the pilot plant, from the feedlot to the experimental kitchen. Such was the success of this research and the agriculture to which it gave rise that "food surpluses" became an issue for politicians appealing to a predominantly urban population complacently accustomed to supermarket shelves well stocked with food at reasonable prices.

The euphoria of rising agricultural production, worldwide, and of cheap food at home is over. Drought on four continents and other factors have curtailed food supplies and raised the specter of starvation. Massive shipments of wheat and other foods have done away with the safeguard of full granaries in the United States. The Department of Agriculture has discontinued its monthly list of plentiful foods because there aren't enough items to qualify, with supplies tight and prices high and climbing.

This is not the place for an analysis of the many factors that have conspired to bring this situation about. But one thing is certain: if the attrition now afflicting agricultural research in this country is not reversed, the prospect of improvement of the current situation will recede ever farther into the future. Throughout the country, budgets for agricultural research, especially research aimed at production, are stationary or shrinking. Funds earmarked for production research are cut at a time of much concern for urban and ghetto problems, as if getting enough cheap food were not important to the people who live there. Positions at land grant colleges and agricultural experiment stations which used to be staffed the year around are being cut to 9 months, as though, like students, crops and livestock took summer vacations. Grant support, always hard to come by for agricultural research, is getting even more scarce.

Food, in adequate quantity and at moderate cost, is the most keenly felt need of the people everywhere. We, as a nation, must resolve to put first things first. Food is first. We must reemphasize and revitalize agricultural research. No single other investment can do more to earn for this country goodwill abroad, and at home, to restore to Americans their traditional confidence in having a reliable supply of ample, cheap food.

—EMANUEL EPSTEIN, *Professor of Plant Nutrition, College of Agricultural and Environmental Sciences, University of California, Davis 95616*

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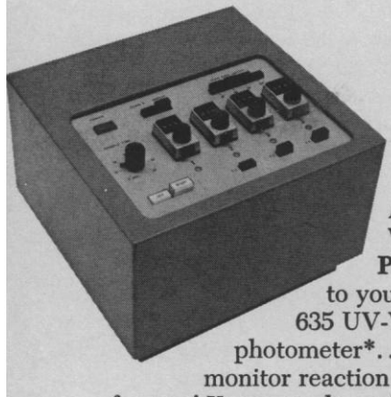

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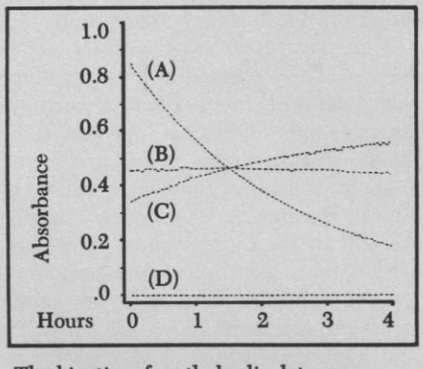

The kinetics of methyl salicylate hydrolysis monitored at four wavelengths: (A) 333 nm (B) 309 nm (C) 300 nm (D) 400 nm. Temperature, 30°C.

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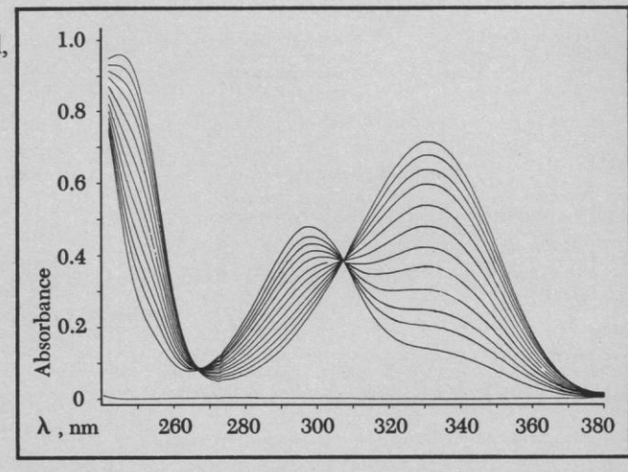

Repetitive scans of a methyl salicylate hydrolysis reaction. Absorption at 333 nm decreases with increase at 300 nm; two isosbestic points defined. Temperature, 30°C.

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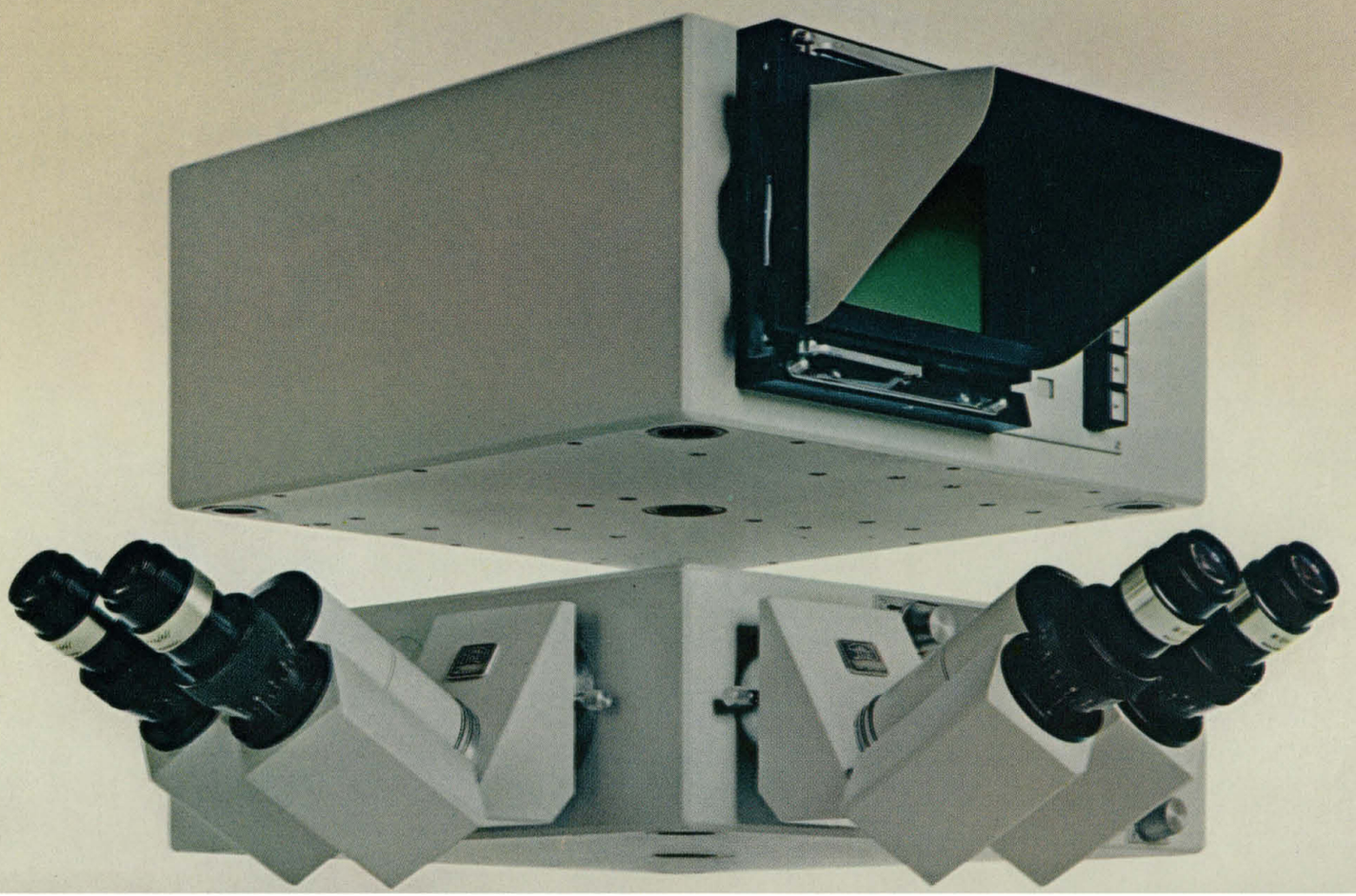

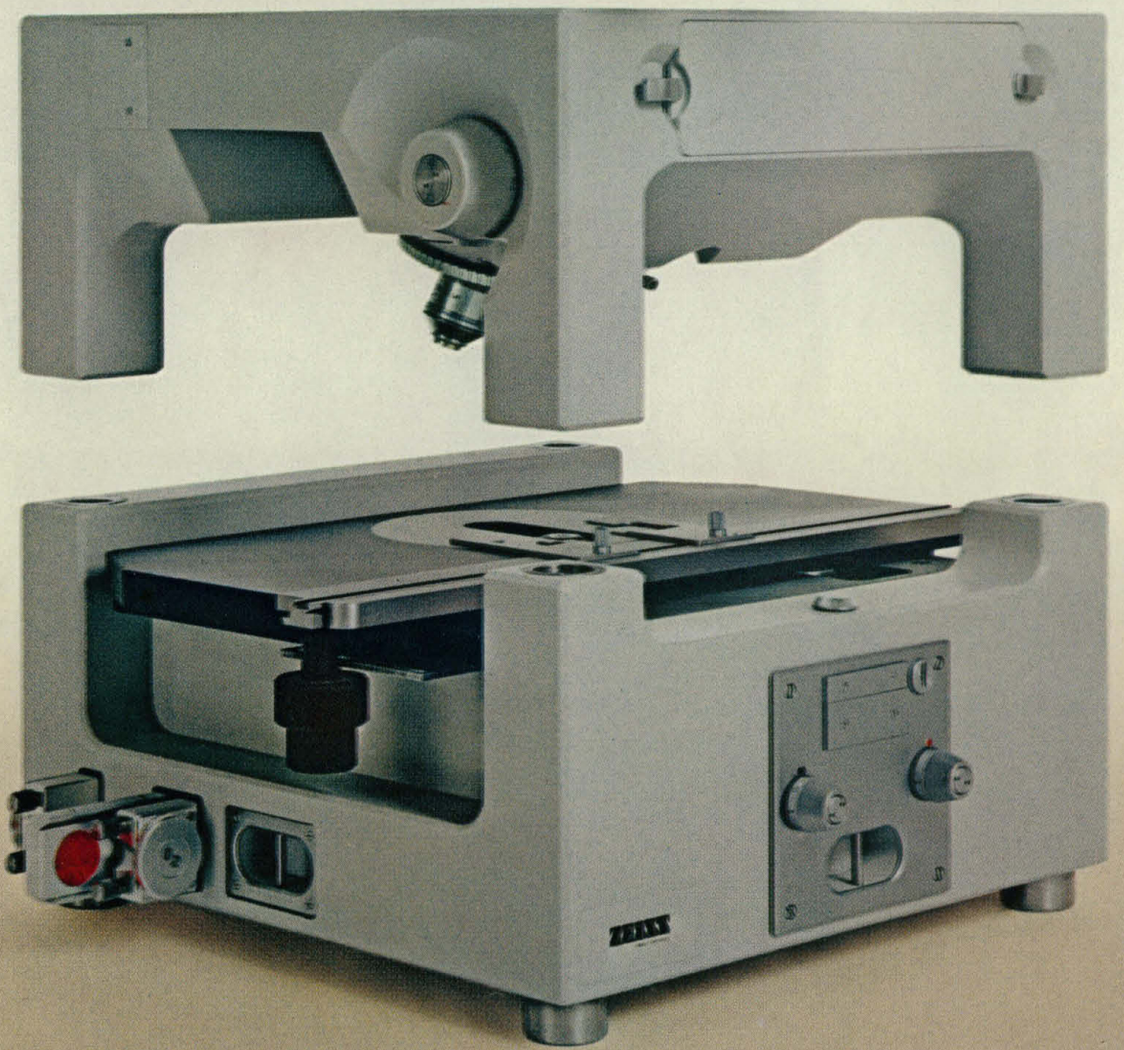

A revolution in microscope design—the Modular concept—a combination of modules for any application without any compromise.

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Zeiss Axiomats.
Microscopes without compromise.

For over 200 years, microscope design has seen one compromise after another . . . necessary compromises, everyone thought, to achieve the benefits of advancing techniques and science. But now microscope design has been rethought. Axiomats are constructed of square modules, broken down by major microscope functions and with the optical axis of each module coincident with the axis of symmetry. The result is a series of microscopes with unequalled stability, optical performance, convenience and ease of operation—in fact, until you see an Axiomat for yourself, you probably won't believe it.

Axiomats for every purpose.
No matter what your field, you can use an Axiomat for the most specialized and highly advanced techniques. Pictured here are just four of the many configurations that can be assembled from the 12 basic modules:

1. Axiomat . . . for inverted transmitted-light microscopy. The only such instrument that permits *all* types of quantitative microscopy and, *simultaneously*, fully automatic photography.

2. Axiomat . . . for upright transmitted-(and reflected-) light microscopy. Ideal for biology and medicine.

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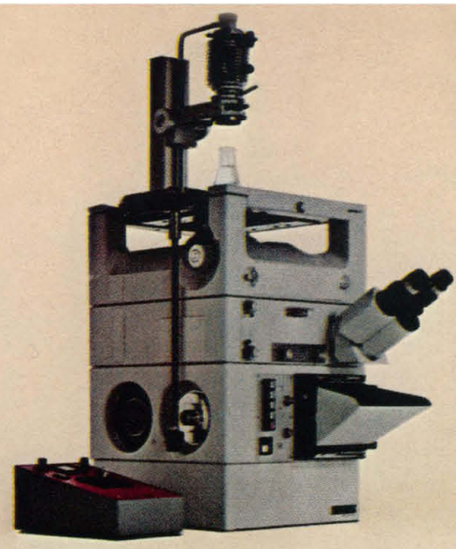

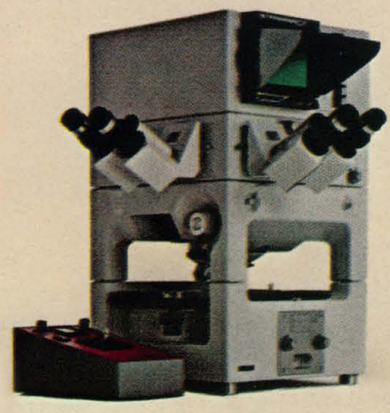

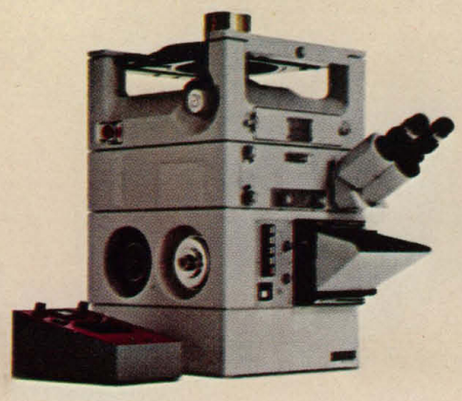

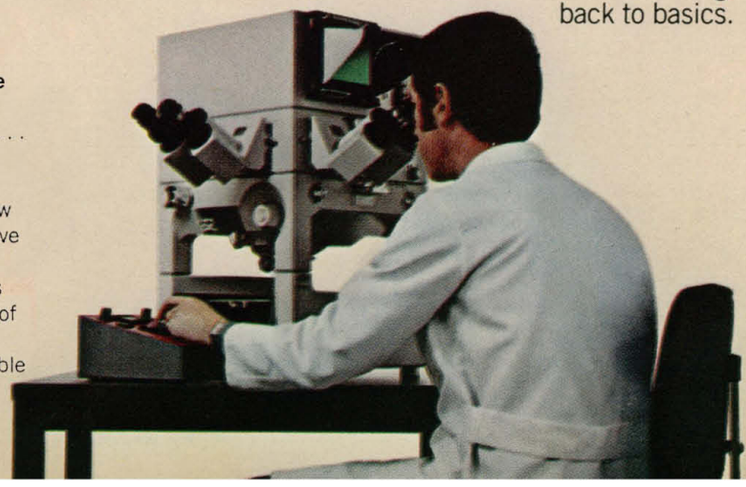

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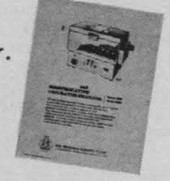

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Chicago, Ill. (IEEE, 345 E. 47 St., New York 10017)

15–17. **Energy Resources** Symp., Royal Soc. of Canada, Ottawa, Ont. (Executive Secretary, RSC, 395 Wellington, Ottawa, K1A0 N4)

15–17. National **Noise Control Engineering** Conf., Washington, D.C. (R. Cohen, Ray W. Herrick Labs., School of Mechanical Engineering, Purdue Univ., Lafayette, Ind. 47907)

15–17. **Soil Microcommunities** Conf., 3rd, Syracuse, N.Y. (D. L. Dindal, Dept. of Zoology, College of Environmental Sciences and Forestry, State Univ. of New York, Syracuse 13210)

15–18. **Estuarine Research** Federation, 2nd intern. conf., cosponsored by American Soc. of Limnology and Oceanography, Myrtle Beach, S.C. (A. B. Williams, Systematics Lab., Natl. Marine Fisheries Service, U.S. Natl. Museum, 10th and Constitution Ave., NW, Washington, D.C. 20560)

15–18. **Instrument** Soc. of America 28th mtg., Houston, Tex. (H. S. Kindler, ISA, 400 Stanwix St., Pittsburgh, Pa. 15222)

15–18. **Lubrication** Conf., American Soc. of Mechanical Engineers and American Soc. of Lubrication Engineers, Atlanta, Ga. (ASME, United Engineering Center, 345 E. 47 St., New York 10017)

15–18. American Inst. of **Ultrasound in Medicine**, 18th annual, Detroit, Mich. (M. Wainstock, Dept. of Ophthalmology, Univ. of Michigan Medical School, Ann Arbor 48105)

15–19. American College of **Surgeons**, 59th annual clinical congr., Chicago, Ill. (E. W. Gerrish, ACS, 55 E. Erie St., Chicago 60611)

15–19. **Youth in a World of Change**, World Psychiatric Assoc. and Australian and New Zealand College of Psychiatrists, Sydney, Australia. (Congress Secretary, Box 475, G.P.O., Sydney, New South Wales 2001)

15–20. International Soc. of **Radiology** Congr., 13th, Madrid, Spain. (J. Bonmati, ISRC, Lagasca 27, Madrid 1)

16–18. Society of **Automotive Engineers**, aerospace engineering and manufacturing mtg., Los Angeles, Calif. (A. J. Favata, SAE, 2 Pennsylvania Plaza, New York 10001)

16–19. American **Chemical** Soc., rubber chemistry mtg., Denver, Colo. (F. M. O'Connor, Harwick Standard Chemical Co., 60 S. Seiberling St., Akron, Ohio 44305)

16–19. Society for **Experimental Stress Analysis**, Indianapolis, Ind. (B. E. Rossi, SESA, 21 Bridge Sq., Westport, Conn. 06880)

16–19. **Human Factors** Soc., Washington, D.C. (M. G. Knowles, HFS, P.O. Box 1369, Santa Monica, Calif. 90406)

16–20. American Assoc. of **Stratigraphic Palynologists**, 6th annual, Anaheim, Calif. (K. N. Piel, Union Oil Research, P.O. Box 76, Brea, Calif. 92621)

16–21. American Soc. of **Clinical Hypnosis**, 16th annual, Toronto, Ont., Canada. F. D. Nowlin, ASCH, 800 Washington Ave., SE, Minneapolis, Minn. 55414)

17–20. American Soc. of **Human Genetics**, Atlanta, Ga. (W. E. Nance, Medical Genetics, Univ. of Indiana, 1100 W. Michigan St., Indianapolis 46202)

18–19. Oklahoma **Education** Assoc., 83rd annual, Oklahoma City. (M. Leyerle, OEA, 323 East Madison, Oklahoma City 73105)

18–19. **Endocrinology and Metabolism**, 9th Midwest conf., Columbia, Mo. (A. D. Kenny, Dalton Research Center, Univ. of Missouri, Columbia 65201)

18–20. Symposium on **Low Altitude Rocketry**, U.S. Air Force Acad. and Southwest Research Assoc., U.S. Air Force Acad., Colo. (R. A. Golobic, Frank J. Seiler Research Lab., U.S. Air Force Acad. 80840)

18–20. Central **Neuropsychiatric** Assoc., Chicago, Ill. (D. W. Sprague, CNA, 1417 Marlowe Ave., Lakewood, Ohio 44107)

18–20. Central Assoc. of **Obstetricians and Gynecologists**, Scottsdale, Ariz. (C. P. Goplerud, University Hospitals, Iowa City, Iowa 52240)

18–21. American Acad. of **Child Psychiatry**, Washington, D.C. (E. Bogan, AACP, 1700 18th St., NW, Washington, D.C. 20009)

18–21. **Phi Delta Kappa**, Houston, Tex. (L. C. Rose, PDK, 8th and Union Sts., P.O. Box 789, Bloomington, Ind. 47401)

19. American **Pharmaceutical** Assoc., 13th annual Eastern regional (Industrial Pharmacy section), Morristown, N.J. (A. J. Scarpone, Pharmaceutical Product

Development Dept., Lederle Labs., American Cyanamid Co., Pearl River, N.Y. 10965)

20–23. Institute of **Electrical and Electronics Engineers**, electron devices mtg., Washington, D.C. (Office of the Technical Activities Board, IEEE, 345 E. 47 St., New York 10017)

20–24. American Acad. of **Pediatrics**, 42nd annual, Chicago, Ill. (E. Kittrell, AAP, 1801 Hinman Ave., Evanston, Ill. 60204)

21–24. American College of **Apothecaries**, White Sulphur Springs, W.Va. (D. C. Huffman, Jr., 5291 Rock Ridge Rd., Memphis, Tenn. 38128)

21–25. American College of **Chest Physicians**, 39th fall scientific assembly, Toronto, Ont., Canada. (A. Soffer, ACCP, 112 E. Chestnut St., Chicago, Ill. 60611)

21–25. Society of **Exploration Geophysicists**, Mexico City, Mexico (H. Breck, P.O. Box 3098, Tulsa, Okla. 74101)

21–25. American Soc. for **Information Science**, Los Angeles, Calif. (H. R. Koller, ASIS, 1140 Connecticut Ave., NW, Washington, D.C. 20036)

21–26. Association of **Engineering Geologists**, 16th annual, North Hollywood, Calif. (C. A. Yelverton, AEG, Suite 506, 201 S. Lake Ave., Pasadena 91101)

21–26. American Assoc. for **Hand Surgery**, Hollywood, Fla. (K. K. Lie, 27500 Hoover Rd., Warren, Mich. 48093)

21–26. American Soc. of **Plastic and Reconstructive Surgeons**, Hollywood, Fla. (D. F. Whaley, ASPRS, 29 E. Madison, Chicago, Ill. 60602)

21–26. American Congr. of **Rehabilitation Medicine**, Washington, D.C. (C. C. Herold, 30 N. Michigan Ave., Chicago, Ill. 60602)

21–26. American **Water Resources** Assoc., 9th, Seattle, Wash. (S. P. Gessel, Dean of the College of Forestry, University of Washington, Seattle 98105)

21–27. American College of **Gastroenterology**, Los Angeles, Calif. (D. Weiss, ACG, 299 Broadway, New York 10007)

22–24. International **Pollution Engineering** Congr., 2nd, Philadelphia, Pa. (Clapp & Poliak, Inc., 245 Park Ave., New York 10017)

22–25. **Civil Aviation Medical** Assoc., Guadalajara, Mexico. (A. Carriere, 801 Green Bay Rd., Lake Bluff, Ill. 60044)

22–26. American **Dietetic** Assoc., Denver, Colo. (R. M. Yakel, ADA, 620 N. Michigan Ave., Chicago, Ill.)

22–26. Symposium on **Effects on Neutron Irradiation upon Cell Function**, Intern. Atomic Energy Agency, Neuherberg near Munich, Federal Republic of Germany. (L. B. Sztanyik, Radiation Biology Section, Div. of Life Sciences, IAEA, Karntnerring 11-13, P.O. Box 590, A-1011 Vienna, Austria)

23–25. American College of **Emergency Physicians**, 5th scientific assembly, Dallas, Tex. (ACEP, 241 E. Saginaw, East Lansing, Mich. 48823)

23–25. International Symp. on **Immunoglobulin A System**, 25th, Birmingham, Ala. (F. W. Kraus, Box 103, University Station, Birmingham 35294)

23–26. International Conf. on **Environmental Health**, American Medical As-

soc., Primosten, Yugoslavia. (Dept. of Environmental, Public and Occupational Health, AMA, 535 N. Dearborn St., Chicago 60610)

24–25. International Technico-Economical Symp. on **Environmental Chemistry**, Intern. Business Contact Club, Brussels, Belgium. (IBCC, Nieuwelaan, 65, B-1820-Strombeek, Belgium)

24–25. International Symp. on **Gonorrhea**, Health Protection Branch, Dept. of Natl. Health and Welfare, Ottawa, Ont., Canada. (J. R. Renaud, Food and Drug Bldg., Room 105, Health Protection Branch, NHW, Tunney's Pasture, Ottawa K1A OL2)

25–26. **Vehicle Emission Control** Programs Conf., Madison, Wis. (K. Sparks, Engineering Dept., Univ. of Wisconsin–Extension, 432 N. Lake St., Madison 53706)

25–27. Indiana **Acad. of Science**, Indianapolis. (J. J. Nisbet, Biology Dept., Ball State Univ., Muncie, Ind. 47306)

25–27. Academy of **General Dentistry**, Houston, Tex. (R. G. O'Donnell, AGD, 211 E. Chicago Ave., Chicago, Ill. 60611)

25–28. **Atherosclerosis**, 3rd intern. symp., West Berlin, Germany. (G. Schettler, Bergheimer Str. 58, D69 Heidelberg, Germany)

25–28. Society for **Psychophysiological Research**, Galveston, Tex. (P. J. Lang, Dept. of Psychology, Univ. of Wisconsin, Madison 53706)

25–28. Society for the **Scientific Study of Religion**, San Francisco, Calif. (W. V. D'Antonio, SSSR, Box U68A, Univ. of Connecticut, Storrs 06268)

25–30. **Radiological** Soc. of North America, Chicago, Ill. (H. L. Baker, Jr., Room 604, 713 E. Genesee St., Syracuse, N.Y. 13210)

26. Utah Acad. of **Sciences, Arts, and Letters**, Ogden. (H. Buchanan, Dept. of Botany, Weber State College, Ogden 84403)

27–28. American College of **Dentists**, Houston, Tex. (R. J. Nelsen, 7316 Wisconsin Ave., Bethesda, Md. 20014)

28–1. American **Dental** Assoc., Houston, Tex. (C. G. Watson, ADA, 211 E. Chicago Ave., Chicago, Ill. 60611)

29–31. **Electrical Insulation and Dielectric Phenomena** Conf., National Acad. of Sciences, Varennes, P.Q., Canada. (N. T. Grisamore, NAS, 2101 Constitution Ave., NW, Washington, D.C. 20418)

29–2. International Conf. on **Atomic Spectroscopy**, 4th, Toronto, Ont., Canada. (C. L. Chakrabarti, Dept. of Chemistry, Carleton Univ., Ottawa K1A 5B6, Ont., Canada)

29–2. American Soc. of **Civil Engineers**, New York, N.Y. (E. Zwoyer, ASCE, 345 E. 47 St., New York 10017)

30–1. American Assoc. for the **Study of Liver Diseases**, Chicago, Ill. (F. Schaffner, Mount Sinai Hospital, Fifth Ave. and 100 St., New York 10029)

30–2. **Acoustical** Soc. of America, Los Angeles, Calif. (B. H. Goodfriend, ASA, 335 E. 45 St., New York 10017)

30–2. American **Ceramic** Soc., Nuclear Div., 26th, San Francisco, Calif. (J. M. Leitnaker, Bldg. 4500-S, Room A-156, Oak Ridge Natl. Lab., Oak Ridge, Tenn. 37830)

30–4. American **Physical** Soc. plasma

physics div., Philadelphia, Pa. (W. W. Havens, Jr., 335 E. 45 St., New York 10017)

31–2. **Entomological** Soc. of America, Eastern branch, 45th annual, New York, N.Y. (D. J. Sutherland, Dept. of Entomology and Economic Zoology, Rutgers–The State Univ. of New Jersey, P.O. Box 231, New Brunswick 08903)

November

1. American **Pancreatic** Study Group, Chicago, Ill. (P. D. Webster, Dept. of Medicine, Medical College of Georgia, Augusta 30902)

1–3. Association for **Academic Surgery**, Rochester, N.Y. (J. Cerilli, Ohio State Univ. Hospital, 410 W. Tenth Ave., Columbus, Ohio 43210)

1–3. West Coast **Allergy** Soc., Honolulu, Hawaii. (E. D. Lynch, 2164 SW Park Place, Portland, Ore. 97205)

1–3. American **Chemical** Soc., 9th Western regional, San Diego, Calif. (D. Pettitt, Kelco Research, 8225 Arrow Dr., San Diego 92106)

1–3. Central Soc. for **Clinical Research**, Chicago, Ill. (G. G. Bole, Room 4669, Kresge Bldg., Univ. of Michigan Medical Center, Ann Arbor 48105)

1–3. National Council for **Geographic Education**, Washington, D.C. (L. S. Mitchell, NCGE, Room 1226, 111 W. Washington St., Chicago, Ill. 60602)

1–3. American **Physical** Soc., Nuclear Physics Div., Bloomington, Ind. (M. W. W. Havens, APS, 335 E. 45 St., New York 10017)

1–3. **Psychonomic** Soc., Inc., St. Louis, Mo. (F. A. Mote, Psychology Dept., Psychology Bldg., Univ. of Wisconsin, Madison 53706)

1–4. Association of **Clinical Scientists**, Washington, D.C. (F. W. Sunderman, Jr., Univ. of Connecticut School of Medicine, Box G, Farmington, Conn. 06032)

1–4. American **Folklore** Soc., Nashville, Tenn. (R. Bauman, Folklore Dept., Room 306, Social Work Bldg., Univ. of Texas, Austin 78712)

2–3. **Frontiers in Neurology and Neuroscience Research** Symp., Toronto, Ont., Canada. (G. E. MacDonald, Dept. of Psychology, Univ. of Toronto, Toronto M58 1A1)

2–4. Association of American **Medical Colleges**, Washington, D.C. (J. A. Cooper, 1 Dupont Circle, NW, Washington, D.C. 20036)

3–4. Pediatric Anesthesia Conf. on **Pediatric Emergencies**, Toronto, Ont., Canada. (D. J. Steward, Hospital for Sick Children, 555 University Ave., Toronto 2)

4–7. **Industrial Pharmacy Management** Conf., Fontana, Wis. (K. W. Kirk, Extension Services in Pharmacy, Univ. of Wisconsin, 425 N. Charter St., Madison, 53706)

4–8. American Assoc. of **Cereal Chemists**, St. Louis, Mo. (R. Tarleton, AACC, 1821 University Ave., St. Paul, Minn. 55104)

4–8. Conf. on **Engineering in Medicine and Biology**, Institute of Electrical and Electronics Engineers, Minneapolis, Minn. (Technical Activities Board, IEEE, 345 E. 45 St., New York 10017)

4–8. **Research in Medical Education**, 12th conf., 84th mtg., Assoc. of American Medical Colleges, Washington, D.C. (RIME Conf., AAMC, Suite 200, 1 Dupont Circle, NW, Washington, D.C. 20036)

4–9. International and **Civil Affairs Health** Soc., San Francisco, Calif. (J. P. Pappas, CAHS, 960 E. Third St., Chattanooga, Tenn. 37403)

4–10. Symposium on **Oriental Entomology**, Univ. of Calcutta and the Zoological Soc., Calcutta, India. (D. N. Raychaudhuri, Dept. of Zoology, Univ. of Calcutta, 35 Ballygunge Circular Rd., Calcutta 700 019)

5–7. **Sonics and Ultrasonics** Symp., Inst. of Electrical and Electronics Engineers, Monterey, Calif. (J. de Klerk, Westinghouse Research & Development Center, Beulah Rd., Pittsburgh, Pa. 15235)

5–7. **Thermal Conductivity**, 13th intern. conf., Lake of the Ozarks, Rolla, Mo. (R. L. Reisbig, Extension Div., Univ. of Missouri–Rolla, Rolla 65401)

5–9. Symposium on **Environmental Surveillance around Nuclear Installations**, Intern. Atomic Energy Agency, Warsaw, Poland. (J. H. Kane, Office of Information Services, Atomic Energy Commission, Washington, D.C. 20545)

5–9. American College of **Obstetricians and Gynecologists**, Honolulu, Hawaii. (ACOG, Suite 1016, 2222 Kalakaua Ave., Honolulu 96815)

5–9. American **Public Health** Assoc., 101st, San Francisco, Calif. (T. R. Hood, APHA, 1740 Broadway, New York 10019)

6–9. **Engineering Problems of Fusion Research**, 5th symp., American Nuclear Soc., Princeton, N.J. (R. G. Mills, Plasma Physics Lab., Box 451, Princeton 08540)

6–9. American Soc. of **Tropical Medicine and Hygiene**, Houston, Tex. (G. R. Healy, Box 15208, Emory Univ., Atlanta, Ga. 30333)

6–11. American Soc. of **Clinical Hypnosis**, Toronto, Ont., Canada. (F. D. Nowlin, 800 Washington Ave., SE, Minneapolis, Minn. 55414)

7–8. Michigan **Pesticide** Assoc., Lansing. (A. J. Lemin, Upjohn Co., Kalamazoo, Mich. 49001)

7–8. Symposium on **Possible Relationships between Solar Activity and Meteorological Phenomena**, Greenbelt, Md. (W. R. Bandeen, Meteorology Program Office, Code 120, Goddard Space Flight Center, Greenbelt 20771)

7–9. Pittsburgh **Diffraction** Soc., 31st annual conf., Pittsburgh, Pa. (R. J. Kadlec, Dept. of Biochemistry, Univ. of Pittsburgh, Pittsburgh 15213)

7–9. **Radiologic and Other Biophysical Methods in Tumor Diagnosis**, 18th conf., Houston, Tex. (J. Brandenberger, M. D. Anderson Hospital and Tumor Inst., Houston 77025)

7–9. International Symp. on **Thermal Expansion of Solids**, Lake of the Ozarks, Rolla, Mo. (R. L. Reisbig, Extension Div., Univ. of Missouri–Rolla, Rolla 65401)

7–10. American Soc. of **Cytology**, Salt Lake City, Utah. (W. R. Lang, 7112 Lincoln Dr., Philadelphia, Pa. 19119)

7–10. **Gerontological** Soc., Miami Beach, Fla. (E. Kaskowitz, GS, Suite 520, 1 Dupont Circle, NW, Washington, D.C. 20036)

7–10. American **Medical Women's** Assoc., Palm Beach, Fla. (G. Conroy, 1740 Broadway, New York 10019)

7–10. Society for **Neuroscience**, 3rd mtg., San Diego, Calif. (B. C. Nichols, SN, 9650 Rockville Pike, Bethesda, Md. 20014)

8–10. **School Science and Mathematics** Assoc., Des Moines, Iowa. (D. M. Shafer, Lewis House, Indiana Univ. of Pennsylvania, Indiana 15701)

8–10. American **Social Health** Assoc., New York, N.Y. (E. G. Lippincott, ASHA, 1740 Broadway, New York 10019)

8–11. American **Heart** Assoc., 46th scientific session, Atlantic City, N.J. (A. Salerno, AHA, 44 E. 23 St., New York 10010)

8–12. American Assoc. for **Cancer Education**, Honolulu, Hawaii. (R. F. Bakemeier, Univ. of Rochester School of Medicine, 260 Crittendon Blvd., Rochester, N.Y. 14620)

9–11. Society for **Computer Medicine**, Denver, Colo. (M. Laney, 1515 Spencerville Rd., Spencerville, Md. 20868)

9–11. American **Medical Curling** Assoc., Wilmette, Ill. (T. G. Brown, 447 S. Main St., Hillsboro, Ill., 62049)

11–15. American Inst. of **Chemical Engineers**, 66th annual, Philadelphia, Pa. (A. S. West, Rohm & Haas Research Labs., 5000 Richmond St., Philadelphia 19137)

11–15. American Soc. of **Mechanical Engineers**, 94th annual, Detroit, Mich. (A. B. Conlin, Jr., ASME, 345 E. 47 St., New York 10017)

11–15. Academy of **Pharmaceutical Sciences**, San Diego, Calif. (W. C. Roemer, APS, Room 924, 211 E. Chicago Ave., Chicago, Ill. 60611)

11–16. American Soc. of **Agronomy**, Las Vegas, Nev. (M. Stelly, ASA, 677 S. Segoe Rd., Madison, Wis. 53711)

11–16. American Assoc. of **Blood Banks**, Bal Harbour, Fla. (L. J. James, AABB, Suite 608, 1828 L St., NW, Washington, D.C. 20036)

11–16. Latin American Congr. of **Gerontology and Geriatrics**, Buenos Aires, Argentina. (Congr. Secretary, Marcelo T. de Alvear 2149, 50 piso A. Buenos Aires)

11–16. American **Nuclear** Soc., San Francisco, Calif. (O. J. DuTemple, ANS, 244 E. Ogden Ave., Hinsdale, Ill. 60521)

11–20. **Reliability Engineering and Management** Inst., 11th annual conf., Tucson, Ariz. (D. Kececioglu, Aerospace and Mechanical Engineering Dept., Univ. of Arizona, Tucson 85721)

12–14. **Geochemical** Soc., Dallas, Tex. (E. E. Angino, Dept. of Geology, Univ. of Kansas, Lawrence 66044)

12–14. **Geological** Soc. of America, Dallas, Tex. (E. B. Eckel, GSA, P.O. Box 1719, Boulder, Colo. 80302)

12–14. **Operations Research** Soc. of America, 44th mtg., San Diego, Calif. (J. V. Ravenis, Research and Advanced Technology, MS7-15, General Dynamics Electronic Dynamics Div., Box 127, San Diego 92112)

12–14. **Paleontological** Soc., Dallas, Tex. (W. O. Addicott, U.S. Geological Survey, 345 Middlefield Rd., Menlo Park, Calif. 94025)

12–16. Conference on **Hemoglobins: Comparative Molecular Biology Models**

for the Study of Disease, New York Acad. of Sciences, Silver Spring, Md. (S. Sinanian, NYAS, 2 E. 63 St., New York 10021)

12–16. Symposium on the **Physical Behaviour of Radioactive Contaminants in the Atmosphere**, Intern. Atomic Energy Agency and World Meteorological Organization, Vienna, Austria. (J. H. Kane, Office of Information Services, Atomic Energy Commission, Washington, D.C. 20545)

12–17. Society of **Photographic Scientists and Engineers**, Tokyo, Japan. (F. W. Gerretson, SPSE, Bywater Rd., Annapolis, Md. 21401)

13–15. Eastern **Analytical** Symp., American Chemical Soc., New York, N.Y. (L. Brancone, Lederle Labs., American Cyanamid Co., Pearl River, N.Y. 10965)

13–16. **Magnetism and Magnetic Materials** Conf., 19th, Inst. of Electrical and Electronics Engineers, Boston, Mass. (IEEE, 345 E. 47 St., New York 10017)

14. **Viruses in the Environment and Their Potential Hazards** Conf., Burlington, Ont., Canada. (B. J. Dutka, Microbiology Labs., Canada Centre for Inland Waters, P.O. Box 5050, Burlington, K7R 4A6)

14–16. **Applied Remote Sensing of Arid Lands Resources and Environment**, 4th conf., Tucson, Ariz. (M. A. Peel, Jr., Div. of Continuing Education, Univ. of Arizona, Tucson 85721)

14–16. Society for **Applied Spectroscopy**, New York, N.Y. (R. F. Hirsch, Chemistry Dept., Seton Hall Univ., South Orange, N.J. 07079)

14–16. International Conf. on **Health Technology Systems**, Soc. for Advanced Medical Systems and Operations Research Soc. of America, San Francisco, Calif. (M. F. Collen, 3779 Piedmont Ave., Oakland, Calif. 94611)

14–16. **Nuclear Science** Symp., Inst. of Electrical and Electronics Engineers, San Francisco, Calif. (Technical Activities Board, IEEE, 345 E. 47 St., New York 10017)

14–17. American Assoc. for **Automotive Medicine**, Oklahoma City, Okla. (A. Carriere, 801 Green Bay Rd., Lake Bluff, Ill. 60044)

14–17. American Acad. of **Neurological Surgery**, Pasadena, Calif. (R. H. Patterson, Jr., AANS, 525 E. 68 St., New York 10021)

14–17. Western **Surgical** Assoc., Houston, Tex. (W. P. Mikkelsen, WSA, 1127 Wilshire Blvd., Los Angeles 90017)

14–18. American **Anthropological** Assoc., Houston, Tex. (E. J. Lehman, AAA, 1703 New Hampshire Ave., NW, Washington, D.C. 20009)

14–18. American Assoc. of **Psychiatric Services for Children**, Chicago, Ill. (AAPSC, 1701 18th St., NW, Washington, D.C. 20009)

15. Symposium on **Fatigue Behaviour of Composite Materials**, Inst. of Physics, London, England. (Meetings Officer, IP, 47 Belgrave Sq., London SW1X 8QX)

15–16. Symposium on **Childhood Obesity**, New York, N.Y. (M. Winick, Inst. of Human Nutrition, Columbia Univ., 511 W. 166 St., New York 10032)

15–16. **Electron Diffraction for the Investigation of Structure** Conf., Inst. of Physics, London, England. (Meetings

Officer, IP, 47 Belgrave Sq., London SW1X 8QX)

15–16. Society of **Naval Architects and Marine Engineers**, 81st annual, New York, N.Y. (SNAME, 74 Trinity Pl., New York 10006)

15–17. American Soc. for **Cell Biology**, Miami Beach, Fla. (G. D. Pappas, Dept. of Anatomy, Albert Einstein College of Medicine, 1300 Morris Park Ave., Bronx, N.Y. 10461)

16. American **Geographical** Soc., New York, N.Y. (B. W. Adkinson, AGS, Broadway at 156 St., New York 10032)

16–17. Oklahoma **Acad. of Science**, Oklahoma City. (J. Lovell, Biological Sciences Dept., Southwestern State College, Weatherford, Okla. 73096)

16–17. Tennessee **Acad. of Science**, Nashville. (J. D. Caponetti, Dept. of Botany, Univ. of Tennessee, Knoxville 37916)

17–20. American Assoc. of **Gynecological Laparoscopists**, New Orleans, La. (J. M. Phillips, 11239 S. Lakewood Blvd., Downey, Calif. 90241)

18–21. Academy of **Psychosomatic Medicine**, Williamsburg, Va. (K. Shannon, Jr., 813 River Rd., Shreveport, La. 71105)

19–21. American **Physical** Soc., Fluid Dynamics Div., New Haven, Conn. (W. W. Havens, APS, 335 E. 45 St., New York 10017)

19–22. International Conf. on **High Voltage DC and/or AC Power Transmission**, Institution of Electrical and Radio Engineers, London, England. (IERE, 8-9 Bedford Square, London WC1B, 3RG)

19–24. Philippine Acad. of **Ophthalmology and Otolaryngology**, Manila. (G. D. Lim, PAOO, P.O. Box 1510, Manila)

20–22. European Conf. on **Research into Management of Information Services and Libraries**, Assoc. of Special Libraries and Information Bureaus, Paris, France. (E. Lowry-Corry, ASLIB, 3 Belgrave Sq. London, SW1X 8PL, England)

24–25. National Federation of Catholic **Physicians Guilds**, Anaheim, Calif. (R. H. Herzog, NFCPG, 2825 N. Mayfair Rd., Milwaukee, Wis. 53222)

25–28. Association of **Military Surgeons** of the U.S., 80th annual, Washington, D.C. (W. Welham, AMSUS, 8502 Connecticut Ave., NW, Chevy Chase, Md. 20015)

26–28. **Chemical Marketing Research** Assoc., St. Louis, Mo. (C. C. Harvey, Ethyl Corp., 451 Florida St., Baton Rouge, La. 70801)

25–30. **Radiological** Soc. of North America, Chicago, Ill. (J. W. Beeler, RSNA, 713 E. Genesee St., Syracuse, N.Y. 13210)

26–29. **Entomological** Soc. of America, Dallas, Tex. (W. P. Murdoch, 4603 Calvert Rd., College Park, Md. 20740)

26–29. Conference on **Na^+,K^+ ATPase Complex**, New York Acad. of Sciences, New York, N.Y. (S. Sinanian, NYAS, 2 E. 63 St., New York 10021)

26–30. International Symp. on the **Earth's Gravitational Field and Secular Variations in Position**, Australian Acad. of Science and Intern. Assoc. of Geodesy, Sydney. (R. S. Mather, School of Surveying, Univ. of New South Wales, P.O. Box 1, Kensington, NSW 2033)

27–28. **Divers' Gas Purity** Symp., Columbus, Ohio. (P. S. Riegel, Battelle-Columbus Labs., 505 King Ave., Columbus 43201)

27–29. Symposium on **Wildlife in an Urbanizing Environment**, Springfield, Mass. (D. R. Progulske, Dept. of Forestry and Wildlife Management, Univ. of Massachusetts, Amherst 01002)

27–2. Society for **Clinical and Experimental Hypnosis**, Newport Beach, Calif. (M. Kenn, SCEH, 140 West End Ave., New York 10023)

28–30. International Symp. on **Recycling and Corporate Goals: A New Environmental Technology or a New Economic Priority?**, Rüschlikon/Zurich, Switzerland. (R. Brun, Gottlieb Duttweiler Inst. for Economic and Social Studies, CH-8803 Rüschlikon/Zurich)

28–30. Intra-**Science Research** Foundation, 7th mtg., Santa Monica, Calif. (S. M. Pokras, ISRF, P.O. Box 430, Santa Monica 90406)

28–2. American **Anthropological** Assoc., New Orleans, La. (E. J. Lehman, AAA, 1703 New Hampshire Ave., NW, Washington, D.C. 20009)

29–30. **Effectiveness of On-Line Biomedical Computing**, 2nd natl. conf., Advancement of Medical Instrumentation, Rosslyn, Va. (J. Skillin, AAMI, Suite 417, 1500 Wilson Blvd., Arlington, Va. 22209)

29–30. Conference on the **Managua Earthquake**, Earthquake Engineering Research Inst. and the Ministry of Public Works of Managua, San Francisco, Calif. (C. Rojahn, U.S. Geological Survey, Room 7067, 390 Main St., San Francisco 94105)

30–3. American **Psychoanalytic** Assoc., New York, N.Y. (S. Goodman, APA, 1 E. 57 St., New York 10022)

December

1–2. National Federation of **Catholic Physicians' Guilds**, Anaheim, Calif. (R. H. Herzog, 2825 N. Mayfair Rd., Milwaukee, Wis. 53222)

1–4. American Soc. of **Hematology**, Chicago, Ill. (S. Tobinson, Beth Israel Hospital, Boston, Mass. 02215)

1–5. **American Medical Assoc.**, Anaheim, Calif. (E. B. Howard, AMA, 535 N. Dearborn St., Chicago, Ill. 60610)

1–6. American Acad. of **Dermatology**, Chicago, Ill. (D. P. Compton, AAD, 2250 Northwest Flanders St., Portland, Ore. 97210)

2–4. **Technology of Water Quality** Conf., American Water Works Assoc., Cincinnati, Ohio. (AWWA, 2 Park Ave., New York 10016)

2–6. American Acad. for **Cerebral Palsy**, Washington, D.C. (J. E. Bryan, AACP, 1255 New Hampshire Ave., NW, Washington, D.C. 20036)

2–6. Interdisciplinary Symp. on Advanced Concepts and Techniques in the Study of **Snow and Ice Resources**, U.S. Natl. Committee for the Intern. Hydrological Decade, Monterey, Calif. (H. S. Santeford, Jr., USNC/IHD, Natl. Acad. of Sciences, 2101 Constitution Ave., NW, Washington, D.C. 20418)

2–10. International Union for **Quaternary Research**, Christchurch, New Zealand. (J. M. Sons, University of Canterbury, Christchurch, N.Z.)

3–5. Southern **Surgical** Assoc., Hot Springs, Va. (D. C. Sabiston, Duke Univ. Medical Center, Durham, N.C. 27710)

4–8. Central American **Medical** Congr., 15th, San José, Costa Rica. (G. Jiménez, Colegio de Medicos, San José)

5–7. **Electric Furnace** Conf., American Inst. of Mining, Metallurgical & Petroleum Engineers and Metallurgical Soc., Cincinnati, Ohio. (C. Moore, AIMMPE, 345 E. 47 St., New York 10017)

6–7. American College of **Chemosurgery**, Chicago, Ill. (R. S. Moraites, ACC, 7721 Montgomery Rd., Cincinnati, Ohio 45236)

6–8. International Study Group for **Steroid Hormones**, 6th, Rome, Italy. (C. Conti, ISGSH, Istituto di Patologia Medica II, Policlinico Umberto I, Universita di Roma, Rome)

6–11. American Acad. of **Optometry**, San Francisco, Calif. (C. C. Koch, AAO, 214-215 Foshay Tower, Minneapolis, Minn. 55402)

7–9. American Acad. of **Psychoanalysis**, New York, N.Y. (J. Barnett, AAP, 40 Gramercy Park N., New York 10024)

9–13. American Soc. of **Hospital Pharmacists**, 8th, New Orleans, La. (J. A. Oddis, ASHP, 4630 Montgomery Ave., Bethesda, Md. 20014)

10–12. **Sensing of Environmental Pollutants**, 2nd conf., American Inst. of Aeronautics and Astronautics and Inst. of Electrical and Electronics Engineers, Washington, D.C. (AIAA, 1290 Avenue of the Americas, New York 10019)

10–14. American Soc. of **Agricultural Engineers**, Chicago, Ill. (J. L. Butt, ASAE, P.O. Box 229, St. Joseph, Mich. 49085)

10–14. American Geophysical Union, Section on **Hydrology**, San Francisco, Calif. (R. Lee, Div. of Forestry, 337 Percival Hall, West Virginia Univ., Morgantown 26506)

11–14. International Symp. on **Biomembranes**, Madurai, India. (J. Jayaraman, ISB, Dept. of Biological Sciences, Madurai Univ., Madurai 625021)

12–15. Latin American Federation of **Parasitologists**, 3rd congr., Medellin, Colombia. (M. Restrepo, Dpto. de Microbiologia y Parasitologia, Facultad de Medicina, Apartado aero 883, Medellin)

12–16. American **Psychoanalytic** Assoc., New York, N.Y. (M. A. Berezin, 90 Forest Ave., West Newton, Mass. 02165)

17–19. Conference on **Computers in Spectroscopy**, Soc. for Analytical Chemistry and Inst. of Physics, London, England. (Meetings Officer, IP, 47 Belgrave Sq., London, SW1X 8QX)

17–21. Association of **Engineers and Architects in Israel**, 3rd world congr., Tel-Aviv. (AEAI, Engineers Inst., 200 Dizengoff Str., POB 3082, Tel-Aviv)

17–21. **Marine Waste Disposal**, 2nd intern. congr., Assoc. Nazionale di Ingegneria Sanitaria, San Remo, Italy. (Istituto di Ingegneria Sanitaria, del Politecnico di Milano, Segreteria per 1 Convegni Intern., Piazza Leonardo da Vinci, 32 Milano, Italy)

17–23. International Assoc. for **Medical Research and Cultural Exchange**, Yaounde, Cameroun. (IAMR, 4, rue de Seze, 75 Paris 9e, France)

26–30. Society for the **History of Technology**, San Francisco, Calif. (M. Kranzberg, Dept. of Social Sciences, Georgia Inst. of Technology, Atlanta, Ga. 30332)

27–30. **Animal Behavior** Soc., Houston, Tex. (N. M. Jessop, Dept. of Biology, U.S. International Univ., San Diego, Calif. 92106)

27–30. **Biometric** Soc., Eastern North American region, New York, N.Y. (F. B. Cady, Biometric Unit, 337 Warren Hall, Cornell Univ., Ithaca, N.Y. 14850)

27–30. Institute of **Mathematical Statistics**, New York, N.Y. (L. Katz, Statistical Lab., Michigan State Univ., East Lansing 48823)

27–30. Western Society of **Naturalists**, San Diego, Calif. (D. H. Montgomery, Dept. of Biological Sciences, California Polytechnic State Univ., San Luis Obispo 93401)

27–30. Society of **Protozoologists**, Houston, Tex. (D. M. Hammond, Dept. of Zoology, Utah State Univ., Logan 84321)

27–30. American **Statistical** Assoc., New York, N.Y. (J. W. Lehman, ASA, 806 15th St., NW, Washington, D.C. 20005)

27–30. American Soc. of **Zoologists**, Houston, Tex. (C. J. Goodnight, Dept. of Biology, Western Michigan Univ., Kalamazoo 49001)

28–29. **Industrial Relations** Research Assoc., New York, N.Y. (D. B. Johnson, 7114 Social Science Bldg., Univ. of Wisconsin, Madison 53706)

28–30. **Archaeological** Inst. of America, St. Louis, Mo. (E. A. Whitehead, AIA, 260 West Broadway, New York 10013)

28–30. American **Economic** Assoc., New York, N.Y. (R. Fels, 1313 21st Ave. S., Nashville, Tenn. 37212)

28–30. **History of Science** Soc., San Francisco, Calif. (R. H. Stuewer, School of Physics and Astronomy, Univ. of Minnesota, Minneapolis 55455)

28–30. **Linguistic** Soc. of America, San Diego, Calif. (T. A. Sebeok, LSA, Room 800, 1717 Massachusetts Ave., NW, Washington, D.C. 20036)

PRODUCTS and MATERIALS

Heavy Metal Analysis

The model 260 chemical analyzer detects cadmium in concentrations from 0 to 1 part per million. It detects other metals such as lead, copper, chromium, silver, and manganese among 60 different tests. The device is a spectrophotometer with specific wavelength settings for the various tests. The analyzer comes with a booklet of test methods recommended by the U.S. Environmental Protection Agency. Delta Scientific Corporation. Circle No. 135 on Readers' Service Card.

Automatic Thermal Value Determinator

The FP5 control instrument and FP51 furnace form a system that automates the determination of melting and boiling points. The operator selects from five different heating and/or cooling rates. Results of three simultaneous measurements are displayed and held until the digital display is cleared. The control unit is operated with push buttons. Platinum resistance sensors are used and heating and cooling is uniform due to the placement of heating elements above and below the sample. The control unit also operates the FP52 thermal microscopy stage and the FP53 furnace that detects softening points and dropping points of molten samples. Mettler Instrument Corporation. Circle No. 134 on Readers' Service Card.

Controlled Temperature Optical Bench

Dimensional changes due to temperature fluctuation are eliminated or controlled in Gaertner's optical benches. A labyrinth is embedded in the bench with an inlet and an outlet for the circulation of temperature-controlling fluid. The benches are the "V-and-flat lathe-bed" type and lengths available range from 120 centimeters to more than 6.8 meters. The short benches are straight to within 0.01 millimeter, and all are guaranteed to be straight to within 0.025 millimeter. The benches are constructed of meehanite and the labyrinths are corrosion-resistant. Gaertner Scientific Corporation. Circle No. 137 on Readers' Service Card.

Automatic All-Glass Still

Autostill 5 features automatic cut-off when distillate receiver is full, cut-off of electrical system if water supply fails and vice versa, and cut-off for either high temperature or low water level in the boiler. Its capacity is 5 liters per hour and the distillate is free of pyrogens with a resistivity of 1.5 to 1.7 megohms per centimeter in single-distilled water. The tubing is inert Teflon and only quartz and borosilicate glass are in contact with the water. Wheaton Scientific. Circle No. 136 on Readers' Service Card.

Precision Syringe

The 800 series Microliter syringe (Fig. 1) has an extension handle that improves the balance of the device. The metal handle attaches to the barrel by a rigid taper and its plunger screws onto the upper end of the syringe plunger. These syringes are available in 5- and 10-microliter capacities and there is a 10-microliter model with replaceable needles that is accurate to ± 1 percent. The barrels of these syringes are also replaceable. Hamilton Company. Circle No. 130 on Readers' Service Card.

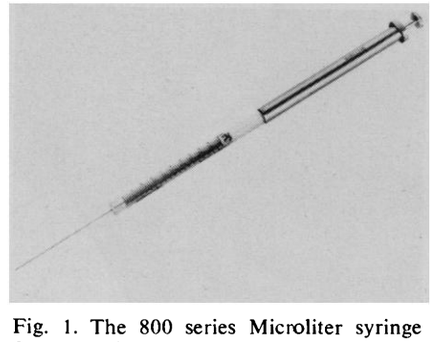

Fig. 1. The 800 series Microliter syringe from Hamilton Company. The metal handle improves the balance of the syringe, acts as a supporting sleeve for the syringe plunger, and isolates the barrel and its contents from the user's body heat.

Gamma Counters

The Gamma 300 and 310 systems are automated counters capable of handling 300 samples. They both employ two- or three-channel operation. They incorporate a 3-inch detector crystal and a 2¼-inch lead shutter above the sample to reduce background. Data is displayed in counts per minute. The 300 series has a rate meter and the 310 series features a digital display. Either system utilizes Iso-Set, a system of modules that select windows for isotopes of interest. Both systems are equipped with teletypewriter, tape punch printout, and the capacity to interface with computers. These systems are useful for radioimmunoassay applications. Beckman Instruments. Circle No. 133 on Readers' Service Card.

Microdensitometer

The model J II clinical microdensitometer features automatic baseline computing. The densitometer presents paired tracings; first, the analog tracing of the absorbance peaks in which the areas are proportional to the respective concentrations, and second, a computing trace in which the base widths of the absorbance peaks are proportional to the respective concentrations. With an adjustable ruler, the operator may read percent concentration or grams per deciliter or international enzyme units. The device accommodates cellulose acetate strips, acrylamide gel disks, thin-layer plates, or other gels and slabs. The operator varies recording characteristics to suit his needs. Resolving power is 150 microns. Canalco Incorporated. Circle No. 131 on Readers' Service Card.

Newly offered instrumentation, apparatus, and laboratory materials of interest to researchers in all disciplines in academic, industrial, and government organizations are featured in this space. Emphasis is given to purpose, chief characteristics, and availability of products and materials. Endorsement by *Science* or AAAS is not implied. Additional information may be obtained from the manufacturers or suppliers named by circling the appropriate number on the Readers' Service Card (see pages 986A and 1082C) and placing it in the mailbox. Postage is free.—RICHARD G. SOMMER

Recording Osmometer

The series 230 recording osmometer (Fig. 2) may be used to determine molecular weights from osmotic pressure of solutions in clinical and research applications. The stainless steel cell contains two compartments separated by a membrane, a flexible stainless steel diaphragm with a strain gauge, an adjustable temperature controller and there is a stable power supply. Deflection of the diaphragm is measured by the strain gauge and the electric output is delivered to a potentiometric recorder. The response time is rapid, 5 to 30 minutes, because solvent flow is only about 1 percent of that required by capillary osmometers. The membrane is suitable for samples in water or in organic solvents. Wescan Instruments. Circle No. 132 on Readers' Service Card.

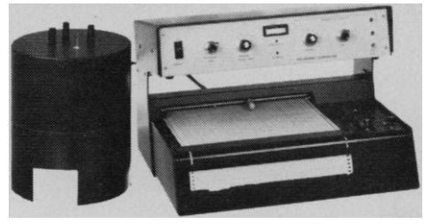

Fig. 2. The series 230 recording osmometer eliminates hydrostatic pressure addition systems with a strain-gauge detection system. It is available from Wescan Instruments.

Literature

Time Consecutive Numbering Systems for the Laboratory describes adhesive tape labels for slides, specimens, samples, and so forth. Professional Tape Company. Circle No. 138 on Readers' Service Card.

Pierce Rapid Stat Kits and Prepared Diagnostic Reagents catalogs a line of clinical chemicals and reagents. The chemistry, procedure, and clinical significance of the colorimetric tests is described. Pierce Chemical Company. Circle No. 139 on Readers' Service Card.

Microbiological Laboratory Procedures for Water, Beverages and Food is a 40-page manual descriptive of techniques for control of microorganisms. Science Essentials Company. Circle No. 140 on Readers' Service Card.

AB Metal Digest is a newsletter for metallurgists in research and industry. Volume 18, number 1, describes metallography for the electroplater. Buehler, Limited. Circle No. 141 on Readers' Service Card.

Anemometry is the subject of a 98-page catalog. There are sections devoted to systems and electronics, probes and sensors, and theory and applications. Thermo-Systems, Incorporated. Circle No. 142 on Readers' Service Card.

Manual of Clinical Enzyme Measurements and *Worthington Enzyme Manual* are 56- and 216-page publications, respectively. The former is a handbook and the latter a hardbound volume. Both volumes have bibliographies. The measurement handbook features history, theory, and applications and the enzyme manual describes characteristics, means of assay, reagents, procedure, calculation, and extensive references for enzymes, related biochemicals, and clinical reagents. Worthington Biochemical Corporation. Circle No. 143 on Readers' Service Card.

Modular Instrument System for Automating Analytical Procedures is outlined in a brochure that describes sampling, measuring, reading, and reporting results of spectrophotometry, titration, *p*H measurement, and balance weighing. Arthur H. Thomas Company. Circle No. 144 on Readers' Service Card.

MLA Pipetting Systems lists a line of precision pipettes and stresses the protection of technicians from contamination by radioactive and hazardous fluids. Medical Laboratory Automation. Circle No. 145 on Readers' Service Card.

Condensed Catalog 1973–74 features a 100-picosecond dual-channel signal averager and the Synchro-Het lock-in amplifier among other new products. Princeton Applied Research Corporation, SSR Instruments Company. Circle No. 146 on Readers' Service Card.

Developing A High-Speed Liquid Chromatography Separation is the subject of a 12-page bulletin. Factors involved in liquid chromatography, types of column packing materials, and interactions of packing materials with solvent systems are covered. Waters Associates. Circle No. 147 on Readers' Service Card.

Sarstedt's Catalog describes a line of disposable plastic test tubes, centrifuge tubes, and specimen tubes. The Sarpette pipetting system and the Monovette blood sampling system are also featured. Walter Sarstedt, Incorporated. Circle No. 148 on Readers' Service Card.

BOOKS RECEIVED

(Continued from page 1039)

Elsevier, New York, 1972. xii, 506 pp., illus. $38.

Ökologie und Lebensschutz in internationaler Sicht. Ecology and Bioprotection. International Conclusions. Harald Sioli, Ed. Rombach, Freiburg, Germany, 1973. 548 pp. DM132.

The Opaque Minerals in Stony Meteorites. Paul Ramdohr. Elsevier, New York, 1973. 246 pp., illus. $22.50.

Operant Learning. Procedures for Changing Behavior. Jon L. Williams. Brooks/Cole (Wadsworth), Monterey, Calif., 1973. viii, 248 pp., illus. $6.50.

Psychology. B. von Haller Gilmer. Harper and Row, New York, ed. 2, 1973. x, 646 pp., illus. Paper, $7.95.

Public Science Policy and Administration. Albert H. Rosenthal. University of New Mexico Press, Albuquerque, 1973. xx, 322 pp. $12.

Reforming School Finance. Robert D. Reischauer and Robert W. Hartman with the assistance of Daniel J. Sullivan. Brookings Institution, Washington, D.C., 1973. xiv, 186 pp. Cloth, $6.95; paper, $2.50. Studies in Social Economics.

Relativity and Cosmology. William J. Kaufmann, III. Harper and Row, New York, 1973. viii, 134 pp., illus. Paper, $2.95.

System Sensitivity Analysis. Jose B. Cruz, Jr., Ed. Dowden, Hutchinson and Ross, Stroudsburg, Pa., 1973. xiv, 428 pp., illus. $20. Benchmark Papers in Electrical Engineering and Computer Science.

Tektites. Virgil E. and Mildred A. Barnes. Dowden, Hutchinson and Ross, Stroudsburg, Pa., 1973. xvi, 446 pp., illus. $20. Benchmark Papers in Geology.

Unit Processes of Extractive Metallurgy. Robert D. Pehlke. Elsevier, New York, 1973. xiv, 396 pp., illus. $19.95.

Les Vibrations Mécaniques. Vol. 1, Théories et Applications de Base. Francisque Salles and Claude Lesueur. Masson, Paris, 1972. xiv, 218 pp., illus. Paper, 88 F.

The Visible Migration of Birds at Ottenby, Sweden, Carl Edelstam, Ed. With drawings by Harald Wiberg. Swedish Ornithological Association, Stockholm, 1972. 360 pp. 95 Sw. cr. Var Fagelvärld, Supplementum 7. Ottenby Bird Station Report No. 58.

Water Supplies and Economic Growth in an Arid Environment. An Arizona Case Study. Maurice M. Kelso, William E. Martin, and Lawrence E. Mack, University of Arizona Press, Tucson, 1973. xxii, 328 pp., illus. Paper, $8.50.

Weed Control Handbook. Vol. 2, Recommendations. Including Plant Growth Regulators. J. D. Fryer and R. J. Makepeace, Ed. Blackwell, London, ed. 7, 1973. xviii, 424 pp. $16.

The Wilderness Route Finder. Calvin Rutstrum. Illustrations by Les Kouba. Collier, New York, and Collier-Macmillan, London, 1973. x, 214 pp. Paper, $1.50. Reprint of the 1967 edition.

Word Problems. Decision Problems and the Burnside Problem in Group Theory. W. W. Boone, F. B. Cannonito, and R. C. Lyndon, Eds. North-Holland, Amsterdam, 1973. xii, 646 pp. $42.10. Studies in Logic, vol. 71.