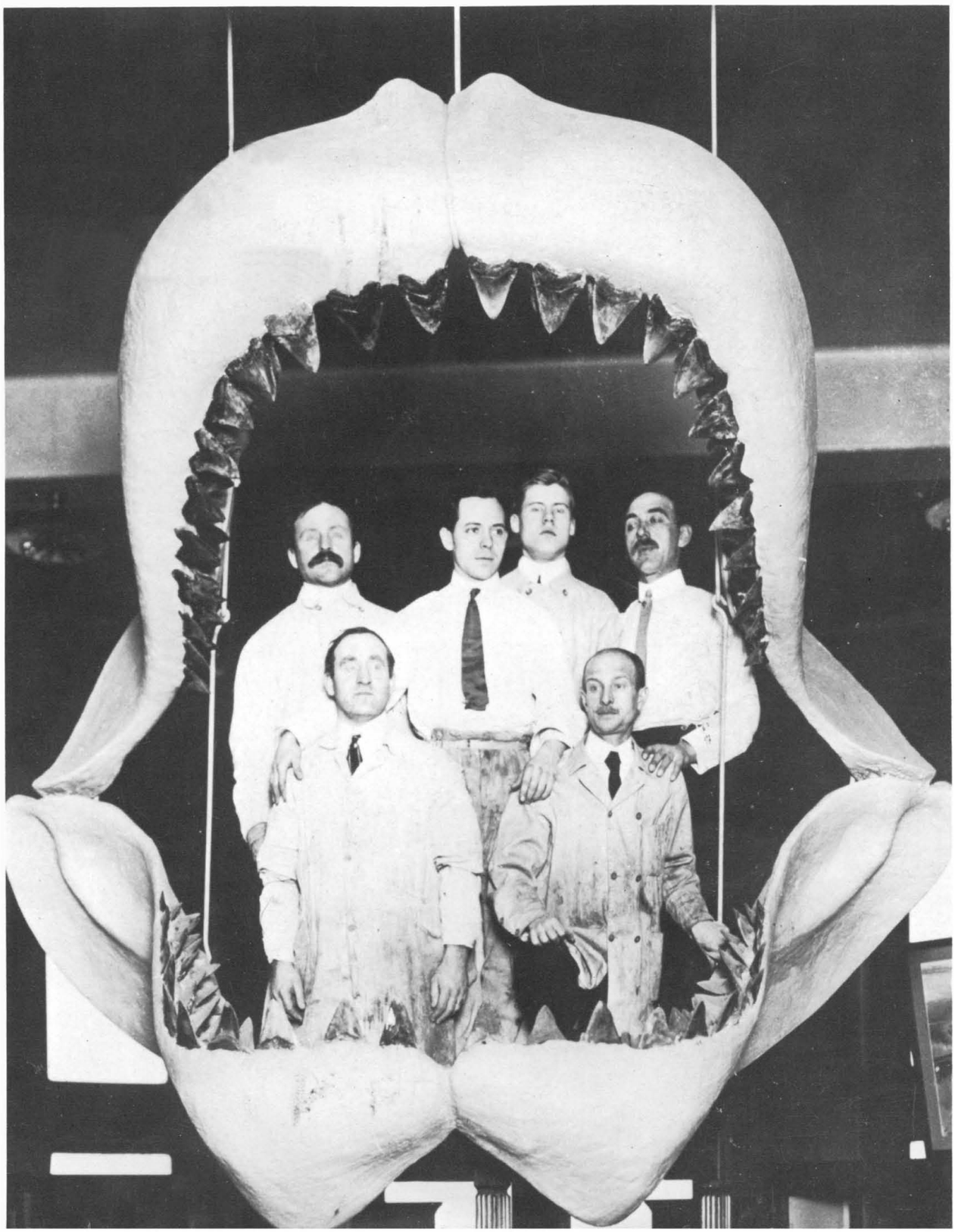
SCIENCE

8 October 1971

Vol. 174, No. 4005

AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE



Introducing a low-cost automatic amino acid analyzer with 30-sample capacity: the Model 119

If you want fully automatic amino acid analyses, and have a limited budget, buy the Model 119 from Beckman. It analyzes up to 30 samples in sequence, and you program it just by setting a few timers. It is an operator's delight.

But even if it weren't easy to program, the Model 119 would still be far and away the quality choice in low-cost automatics. The analyses, of course, are superb—as they are from all Beckman Analyzers. And all are backed by direct Beckman field service, with offices in principal cities in the U.S., Canada, and around the world.

Model 119: the unbeatable combination of economy, automation, and performance. Write for Brochure SB-333 to Spinco Division, Beckman Instruments, Inc., 1117 California Avenue, Palo Alto, California 94304.

Beckman® INSTRUMENTS, INC.

INTERNATIONAL SUBSIDIARIES. AMSTERDAM; CAPE TOWN; GENEVA; GLENROTHES, SCOTLAND; LONDON; MEXICO CITY; MUNICH; PARIS; STOCKHOLM; TOKYO; VIENNA

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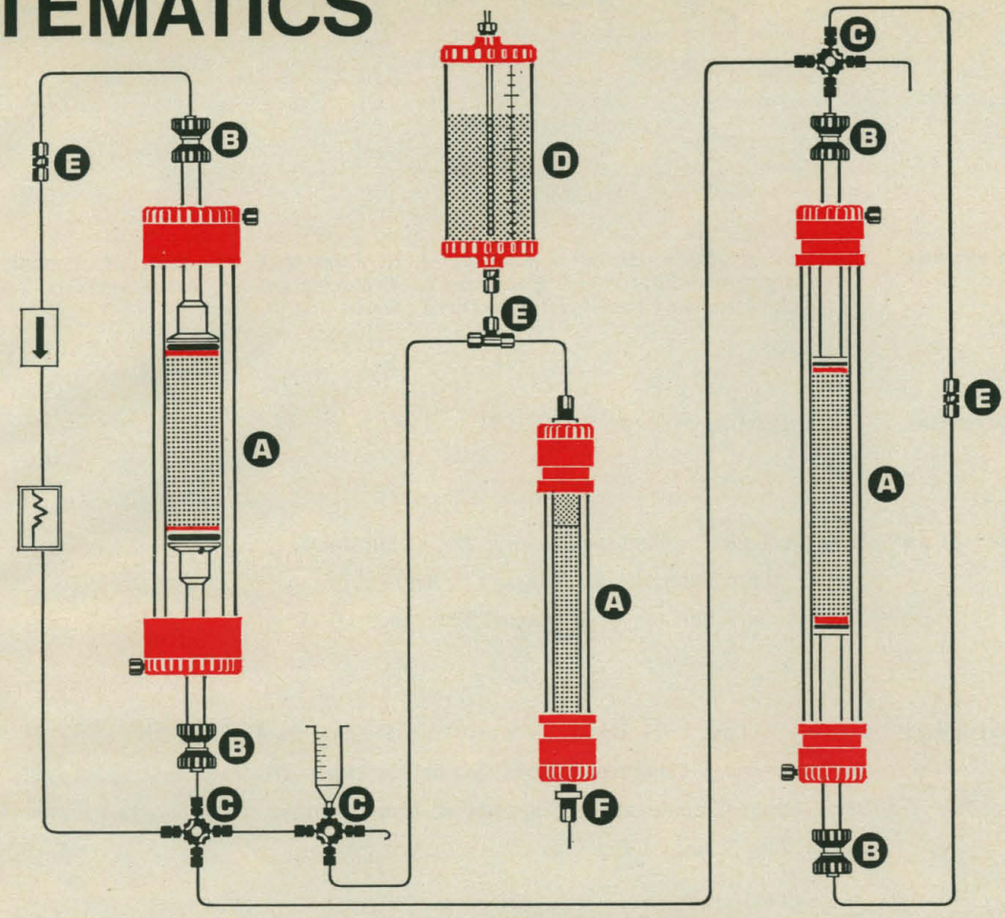
SYSTEMATICS



A Systematic approach to chromatography
All components for complete systems

Pharmacia Fine Chemicals offers a wide range of compatible components for a variety of gel filtration and ion exchange chromatographic systems.

A COLUMNS. A comprehensive range of jacketed and unjacketed columns available in diameters from 0.9 to 21.5 cm. Lengths from 15 to 100 cm. Special solvent resistant columns also available in diameter 2.5 cm. Lengths 45 and 100 cm.

B FLOW ADAPTORS. Permit upward flow elution, sample application, recycling, flow reversal, etc.

C VALVES. 3- and 4-way valves allow easy operation and flexibility for sample application, recycling, flow reversal, by-pass, etc.

D RESERVOIRS. Bi-functional gel and eluant reservoirs for column packing and elution at constant pressure.

E CONNECTORS. 2- and 3-port connectors for capillary tubing allow easy interconnection of chromatographic components without flanging or flaring.

F FLOW CONTROL VALVE. Designed for shut-off as well as flow control.

NEW

Jacketed columns with new design. Diameters 1.6 and 2.6 cm (K16 and K26).
Lengths 40, 70 and 100 cm. Special 1.6x20 cm column for ion exchange chromatography.
Flow adaptors for 1.6 and 2.6 cm columns (A16 and A26).
Flow control valve (FCV-1). Standard on 1.6 and 2.6 cm columns.

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Pharmacia Fine Chemicals

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(Inquiries outside U.S.A. and Canada should be directed to PHARMACIA FINE CHEMICALS, Uppsala, Sweden.)

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8 October 1971

Vol. 174, No. 4005

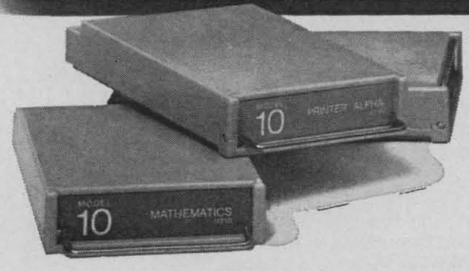
SCIENCE

SCIENCE is published weekly, except the last week in December, but with an extra issue on the third Tuesday in November, by the American Association for the Advancement of Science, 1515 Massachusetts Ave., NW, Washington, D.C. 20005. Now combined with **The Scientific Monthly®**. Second-class postage paid at Washington, D.C. Annual subscription $20; foreign postage: Americas $3; overseas $5; air freight to Europe, North America, Near East $16; single copies $1 (back issues, $2) except **Guide to Scientific Instruments** which is $4. School year subscription: 9 months, $15; 10 months, $16.75. Provide 4 weeks notice for change of address, giving new and old address and zip codes. Send a recent address label. SCIENCE is indexed in the **Reader's Guide to Periodical Literature.**

COVER

Reconstruction of the jaws of the giant fossil shark, *Carcharodon megalodon*. Persons in the photo were preparators in the Department of Vertebrate Paleontology at the American Museum of Natural History, New York City, in 1909. Back row (left to right): C. Falkenbach, Charles Lang, W. Cortes, and George Olsen. Front row (left to right): Otto Falkenbach and Fred Kessler. See review of *The Life of Sharks*, page 136. [Courtesy of the American Museum of Natural History]

Some things are changing for the better...



Whatever your job, here's a calculator that speaks your language. You can customize its keyboard, memory size, display, programs and peripherals to suit your number-crunching tasks.

Many people know us as an instrument manufacturer: we make more than 2,000 products for measurement, test and analysis. Others know us as a computer company: more than 10,000 own our programmable calculators and computers. We prefer to think that our business is to serve measurement, analysis and computation needs . . . in science, industry, medicine and education. This is the rationale behind every new instrument, computer or system that we tell you about in these ads. This month:

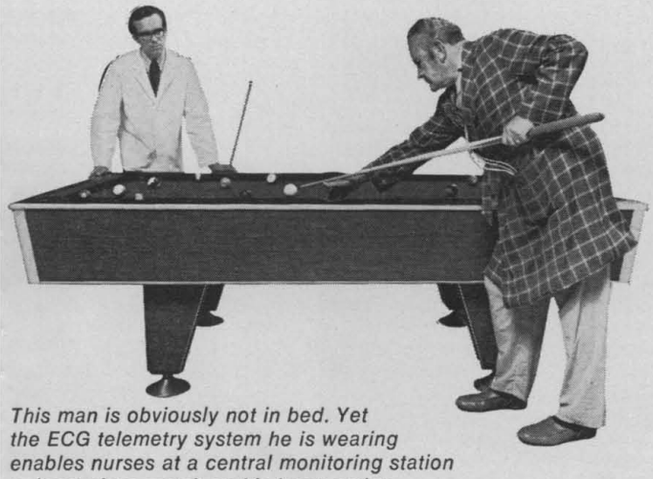
For picky people with particular problems: A design-your-own calculator

A user in virtually any discipline now can customize a powerful new programmable calculator to his specific computational needs.

An agronomist, for example, may want to examine the characteristics of a large plant population and determine the mean, standard deviation and standard error of their distribution. With the Model 10, he simply enters the raw data and hits a single key for the complete statistical analysis. A chromatographer can obtain per cent concentration and relative retention time of each component on his chromatogram . . . at a single keystroke. A physicist completes a sequence of acceleration, velocity, force and work . . . and a clinical pathologist computes a full blood gas analysis . . . at a single keystroke. Et cetera.

This is possible because the new Model 10 calculator has interchangeable function blocks which can define its keyboard to meet varying needs. One standard plug-in block emphasizes powerful statistical computations, another gives higher mathematics capability, and the third is completely user-definable. This block provides single keystroke solutions to multiple-step calculations commonly encountered by the user. Once programmed each key performs its customized function whenever he strikes it.

For more on tailoring the $2,975 Model 10 to your particular profession (full alphanumeric printing capability, expandable memory, a wide line of peripherals, etc.) write for our brochure.

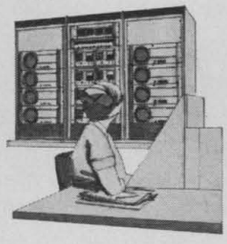


This man is obviously not in bed. Yet the ECG telemetry system he is wearing enables nurses at a central monitoring station to keep close watch on his heart action.

Freedom with protection for the post-coronary patient

Once the coronary patient is released from the intensive care unit, his recovery can often be aided by freedom to move about and mild exercise . . . provided his ECG can be continuously monitored.

With the new HP ECG Telemetry System, the post-coronary patient can be ambulatory. Wherever he goes, his heart action is transmitted to a receiver at the nursing station where it can be continuously observed. The transmitter is small enough to be carried comfortably in a bathrobe pocket, has a strong enough signal to reach the nursing station from 200 feet even through several masonry walls, and is rugged enough to operate reliably even if dropped.

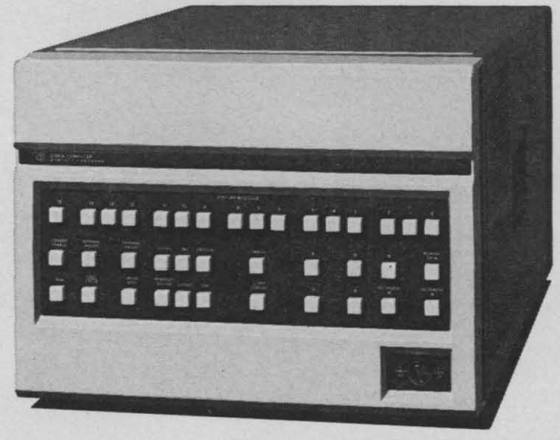


At the nursing station, the patient's ECG signal is monitored by a receiver that operates automatically, never requires tuning and accepts only valid signals, minimizing artifacts from patient motion. An automatic warning light alerts the nurse of such inoperative conditions as: patient out of range, dislodged electrode, low battery power. It is completely compatible with HP patient monitoring systems. Because it doesn't require new wiring, the ECG Telemetry System is easily introduced into existing facilities. Price is $1,800 for each patient unit. Write for our new illustrated brochure.

Want to wield more power? Use a computer that has connections

Adding the power of a computer to the laboratory can change the role of a technologist for the better. That's especially true with HP's new 2100, a small computer that grows with your needs.

Once it rolls through your door, the 2100 resists replacement by expanding as your needs increase. Starting with its smallest configuration for only $6,900, you get a powerful computer that understands your instruments. Fourteen input/output devices and peripherals, and dozens of instruments, can be plugged directly into the 2100. HP has a big advantage here because we probably made many of your instruments in the first place.



The 2100 is more than just a pretty face. This easily expandable mini can toil as a general purpose digital computer, be dedicated to specific applications, or work in modular automated systems.

When you need more capability, you merely plug in additional memory and hook on peripherals. Smaller and nearly twice as fast as preceding models, the 2100 can expand from 4K to 32K of core memory, all within its 12-inch high mainframe. The same 2100 you start with can be upgraded to a time-sharing, batch processing or automated measurement, test or analysis systems.

The 2100 also gives you a wider choice of operating software packages than any other small computer. One other point: our 2100, as its predecessors, brings HP "instrumentation reliability" to computers. More information is yours for the asking.

For more complete information, write Hewlett-Packard, 1507 Page Mill Road, Palo Alto, California 94304. In Europe: 1217 Meyrin-Geneva, Switzerland.

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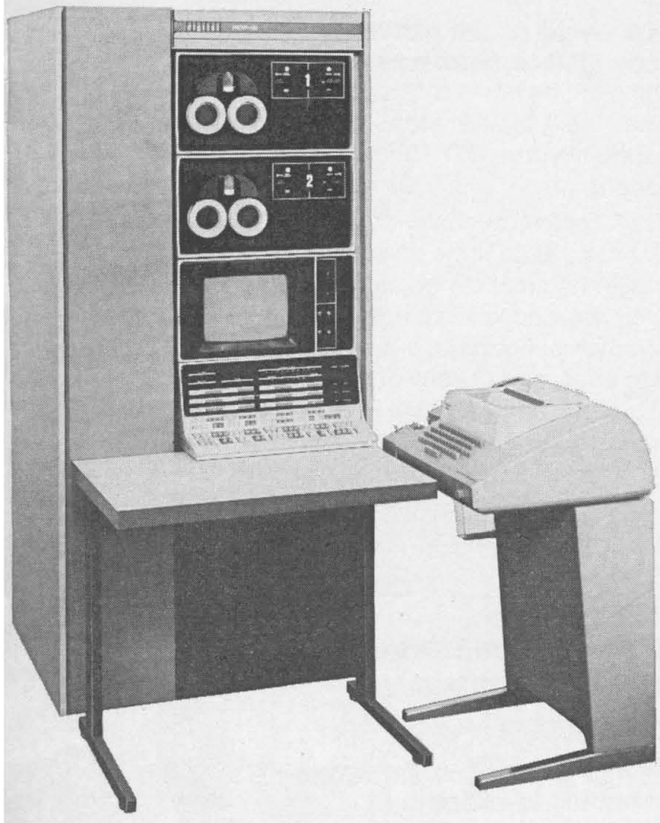
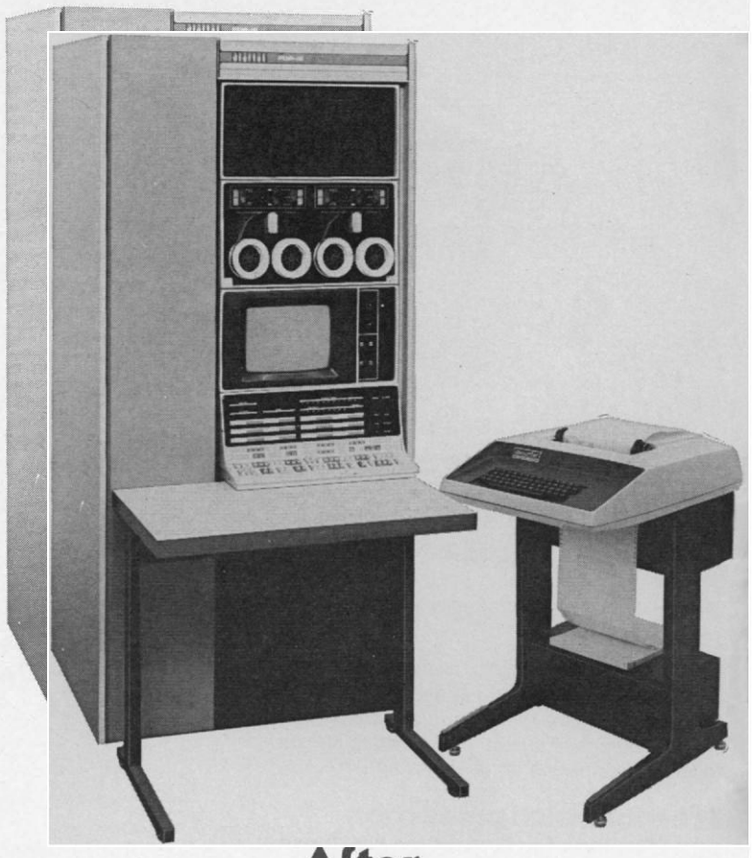


Before



After

You'd hardly recognize the new PDP-12.

PDP-12 always was a beautiful lab computer. Powerful. Versatile. Easy to use. With a huge library of software. And a history of reliability that just won't quit.

But the new PDP-12 is so much more of a computer that you'd hardly recognize it.

Now you can get FORTRAN IV. A full blown ASA Standard,Level G.

Also, a Floating Point Processor that does calculations 100 times faster than software.

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And 128 input channels. Twice as many as before.

And a faster, higher resolution A/D converter.

And a 36,000 CPS magnetic tape unit. The TU-10.

And a superfast, superquiet dot matrix printer. The LA-30.

Even a two-color display. Our VR-20.

It's all here. Ready to go. On the new PDP-12.

Get it all. But first get the literature. Write Laboratory Data Products Group, Digital Equipment Corporation, 146 Main Street, Maynard, Massachusetts 01754. (617) 897-5111.

digital

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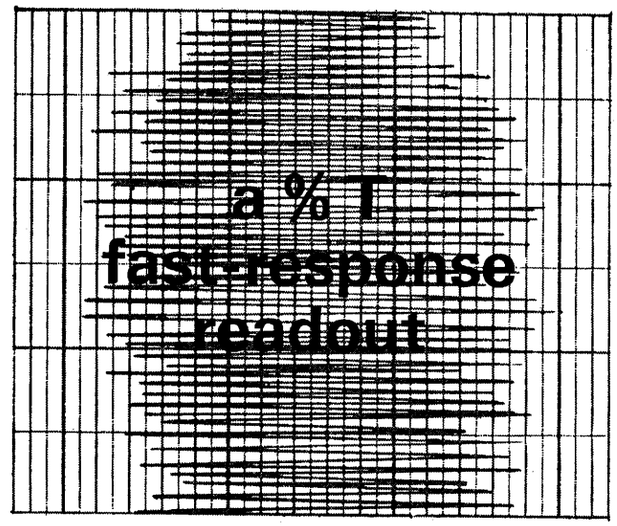
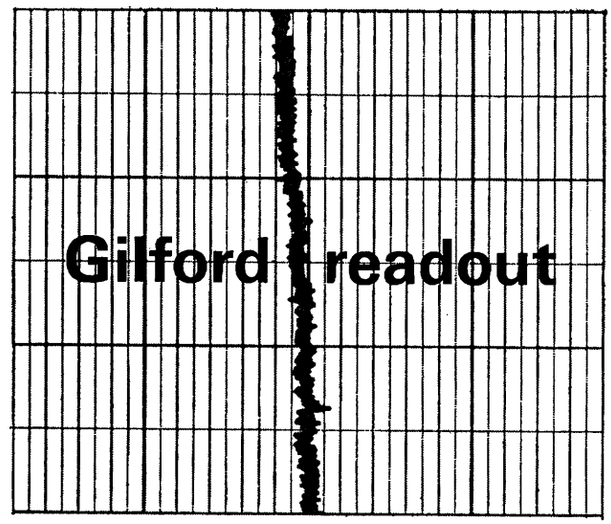
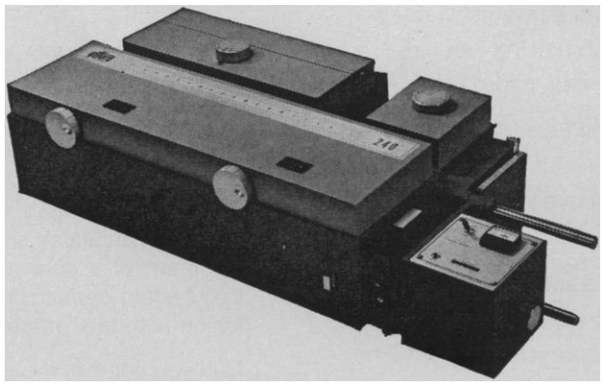
A gilford® spectrophotometer is different!



is not the same as a





Only Gilford reads with less noise over a wider range, with unmatched photometric accuracy and proven performance.

(AND wavelength scanning option is now available from Gilford.)

A Gilford Spectrophotometer does not have dampening controls, because of the inherent low noise performance of its unique linear absorbance photometer.

Don't let dampening incur a loss of resolution in the data you obtain. Insist on the performance only Gilford can give you. Ask us.

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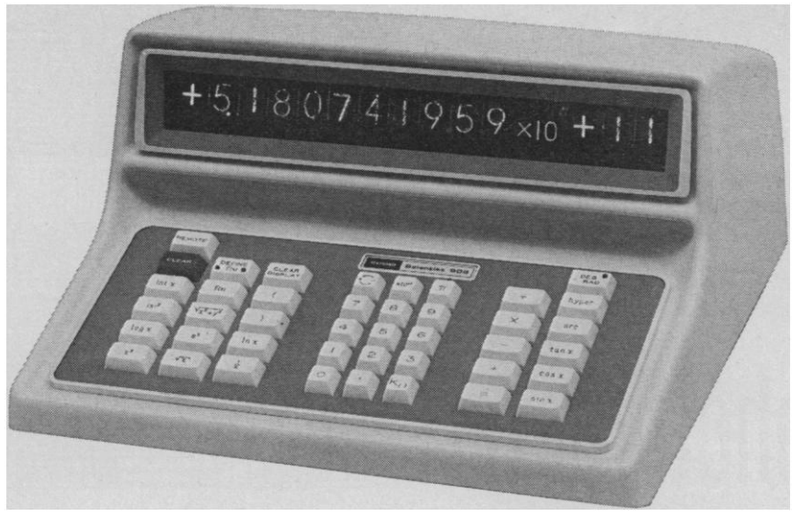

COMPARE CALCULATORS!

If you're looking for a programmable calculator, ask these questions:

YES NO

☐ ☐ Can you write equations directly on the keyboard in mathematical form, bypassing computer languages?

☐ ☐ Is correct algebraic hierarchy automatically observed in performing all functions? Press 2 X 3 + 4 X 5 =. Do you get the correct result (26) instead of 50?

☐ ☐ Will it solve complicated problems and still be easy enough to operate without special training?

☐ ☐ Is every function and program clearly and uniquely defined by the key sequence (without modification by toggle or rotary switches)?

☐ ☐ Does it have individual left and right parentheses keys that allow you to solve directly expressions such as: $((a+b) - c \div d) \times (f-g) = ?$

YES NO

☐ ☐ Does it have a true *equals* key to display partial sums or total results immediately?

☐ ☐ After a questionable procedure, does operation continue using the best available data? (With an unmistakable indicator showing an assumption was made?)

☐ ☐ Is 10 significant-figure accuracy maintained after repetitive sequences such as $\ln x - e^x - \ln x - e^x \ldots .$?

☐ ☐ Are there a sufficient number of stored constants (26 or 100) that are separate and independent from the program steps?

☐ ☐ When data such as $6378.388125 \times 10^{-13}$ are entered, does the data appear correctly, or as $6.378388125 \times 10^{-13}$?

YES NO

☐ ☐ Does it have hard-wired x^y, $\sqrt{x^2 + y^2 + z^2 + \ldots}$, trigonometric, hyperbolic and other functions?

☐ ☐ Can you write, store and recall constants and equalities through direct and indirect addressing?

☐ ☐ Does it have simple key access to a wide range of peripherals including a 5120-step programmer, printer, X-Y plotter and TTY interface?

☐ ☐ Will the calculator serve as the heart of a data acquisition system or minicomputer for on-line data processing?

☐ ☐ Can you get prompt, reliable factory service?

☐ ☐ Is the basic calculator priced at no more than $3200?

☐ ☐ Is it still a money-saver if you add on the "cost of learning" for the people who will operate it?

Every answer is yes for one calculator...

The TEKTRONIX Scientist 909

For more information, call your local TEKTRONIX Field Office or write Tektronix, Inc., P.O. Box 500, Beaverton, Oregon 97005

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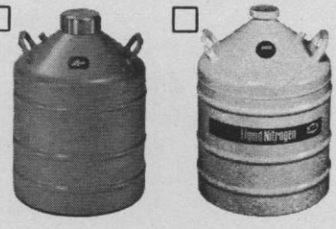
The Portable Cryogenic Container you need is here.

Check appropriate ☐ for more information.

LABORATORY DEWARS:
two complete lines from Union Carbide.

One line provides a considerably lower evaporation rate than the other. Select the one that's best for your lab job; they're priced accordingly. Rugged, lightweight, made to quality specifications.

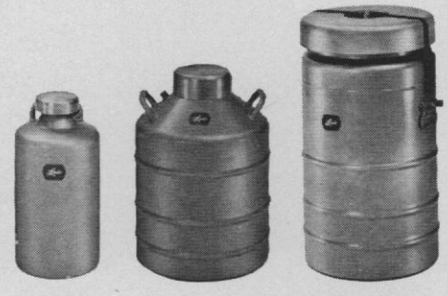
☐ ☐



Evaporation rate (liters per day)	0.42	1.24
Capacity (liters)	30	30
	Circle No. 13	Circle No. 14

CRYOGENIC REFRIGERATORS:
for dependable storage

There are LINDE refrigerators for every need, including portable ones ranging in size from 10 to 50 liters. Specimens can be refrigerated up to 60 days without a liquid nitrogen refill. Also available: larger stationary units for immersion storage or vapor-phase refrigeration. ☐



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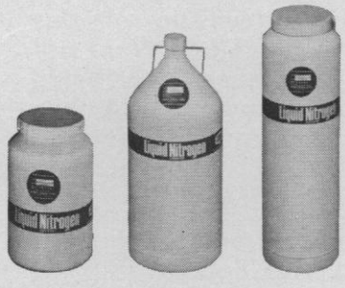
HEAVY DUTY LABORATORY VACUUM VESSELS:
won't break or explode

These ruggedly constructed, metal-walled vessels are ideal for handling small quantities of liquid nitrogen in the lab. Unlike glass-walled dewars, they cannot explode during use. No need to wrap them with cloth to protect against flying glass. Cost? No more than comparable glass dewars.

☐



Capacity (liters)	2	4	4

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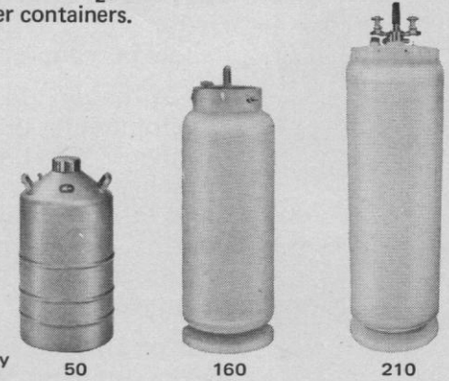
STORAGE AND TRANSFER CONTAINERS:
large, portable

Available in three convenient sizes for storing, transporting, refilling, or dispensing liquid nitrogen. All can be easily moved by one person with dolly or cylinder truck. Two larger containers equipped for withdrawal of LN_2; withdrawal accessories available for smaller containers.

☐



Capacity (liters)	50	160	210
Filled Weight (pounds)	130	503	625

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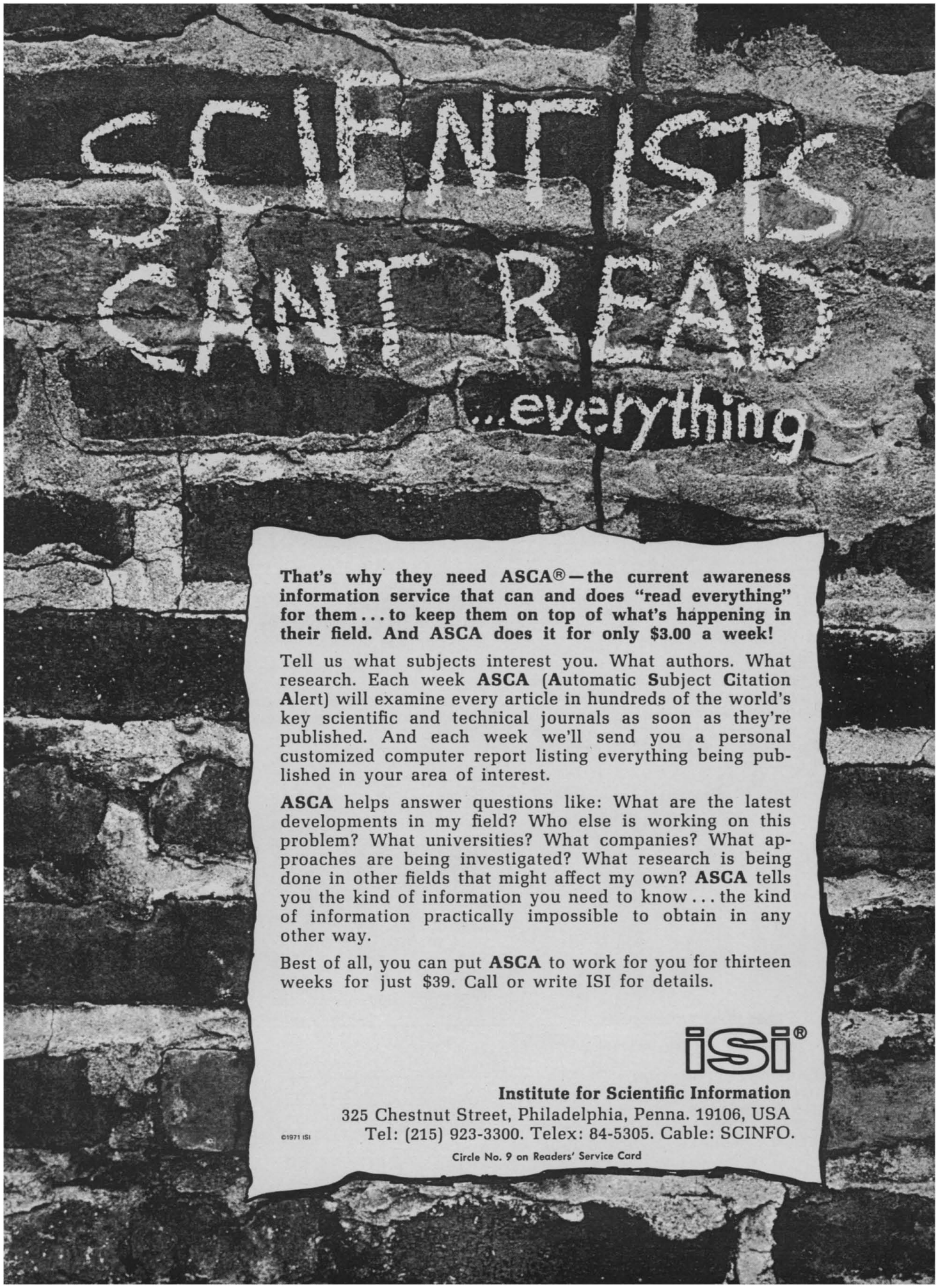
CRYOGENIC PRODUCTS



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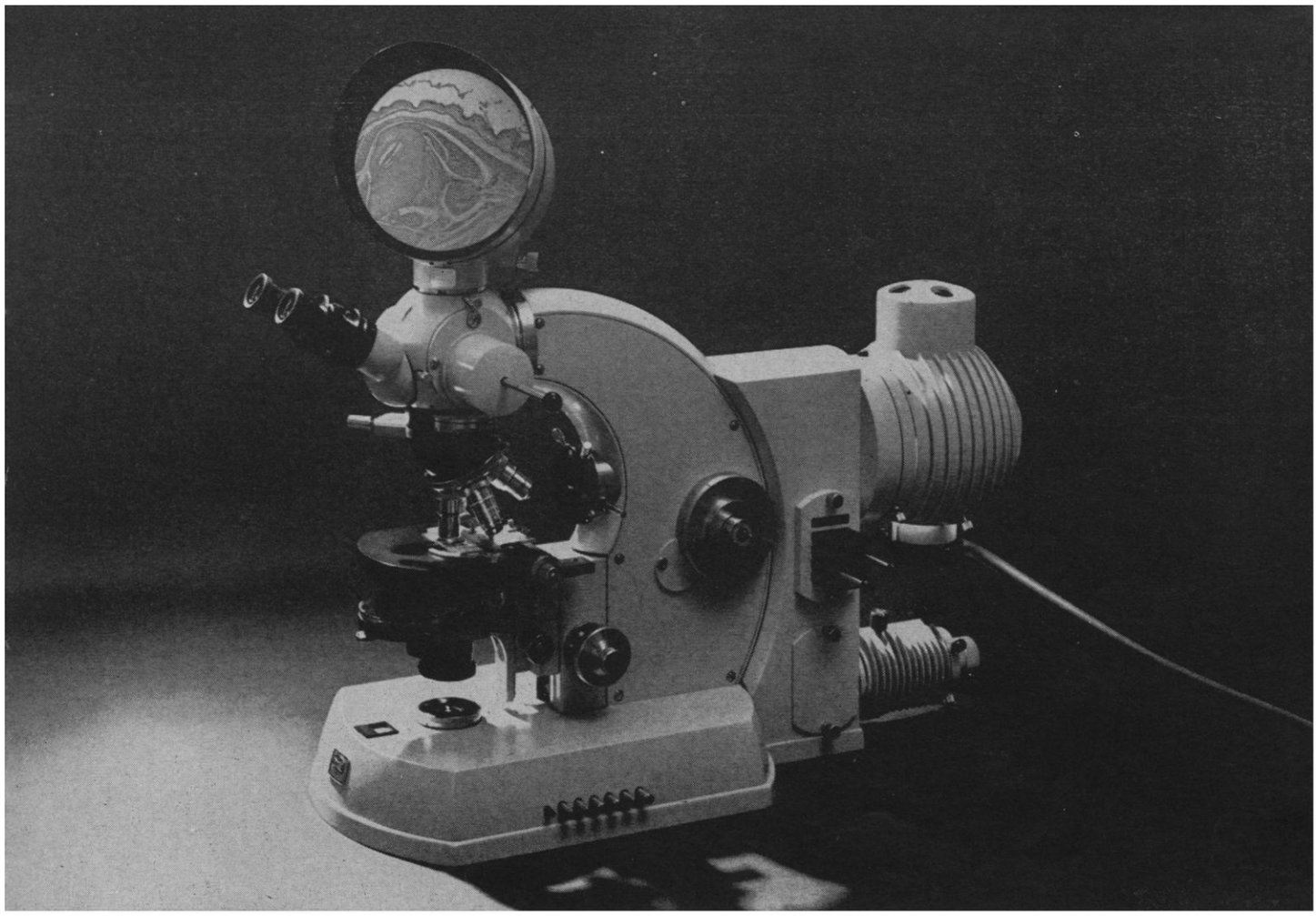

The Zeiss Photomicroscope II equipped with optional viewing screen.

The Zeiss Photomicroscope in NASA's lunar histology lab was set up like this.

A Zeiss Photomicroscope, equipped with Planapochromat and Neofluar objectives and a projection screen (one of the many optional attachments), was used at the Lunar Receiving Laboratory for the first histological studies on the mice and Japanese quail that had been injected with moon dust. This time-critical operation had to be completed before the end of the quarantine period. Never before had the classic techniques been applied to such an exotic end.

The optical quality and the automatic photographic capability of the Photomicroscope insured the reliability and time-saving the circumstances dictated. And the operator's colleagues could observe everything simultaneously on the large, bright viewing screen.

Since both exposure control and camera are fully automatic, and camera-focusing is accomplished simply by focusing the microscope, everything is easy. The stability of the Photomicroscope is another factor. The sturdiness of the stand, with its built-in 35 mm camera and anti-vibration elements, eliminates chances of blurred photography.

And, of course, with the Photomicroscope, all light-microscope techniques are possible and convenient to employ: brightfield, darkfield, fluorescence, polarization, phase contrast, and Nomarski interference contrast—for both reflected and transmitted light.

Where rapid-succession, perfectly exposed photomicrographs are required and highest performance is demanded, the Zeiss Photomicroscope is called for.

Special Free Offer—We have reproduced six of the most spectacular Apollo 11 photographs in full color on a high quality paper. If you would like copies of these, or more information on the Zeiss Photomicroscope II, write Carl Zeiss, Inc., 444 Fifth Avenue, New York, N.Y. 10018.

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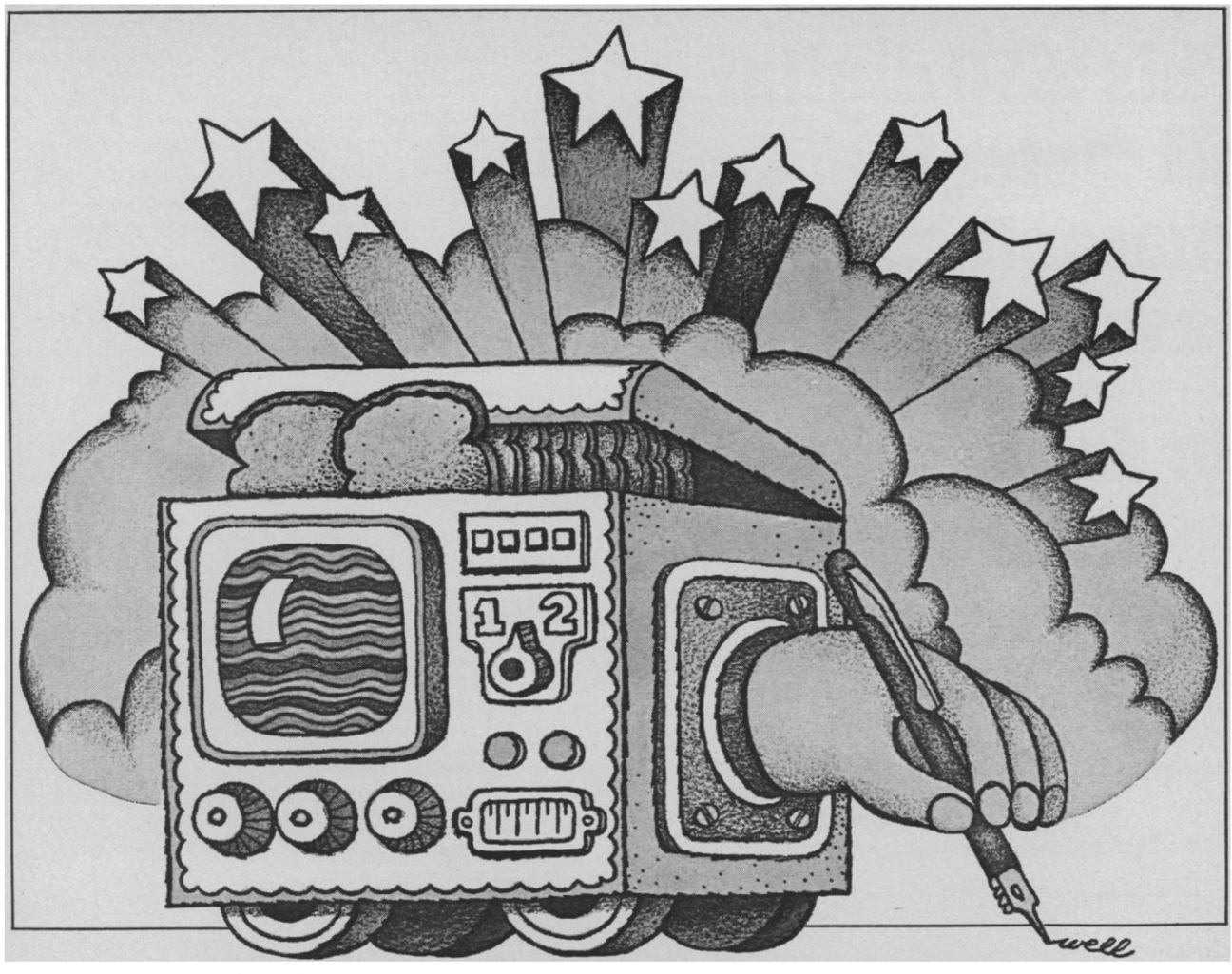
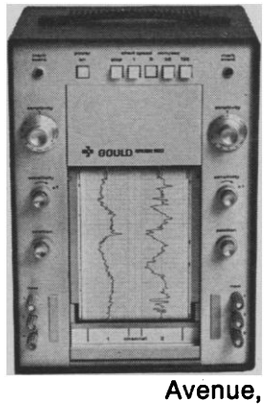


What's smaller than a breadbox, has two channels and built-in preamps, and writes well under pressure? Answer: the Brush 220.



The Brush 220. A rugged, two-channel recorder that's little to the tune of 25 pounds, accurate to 99½% linearity.

Just plug it in. And then let Brush performance take over.

It starts with our pressurized ink system. A system that forces ink into the paper, instead of just laying it on. So you get traces that are clear, clean, and crisp. And a disposable ink cartridge holds a year's supply of ink.

Built-in preamps give you a measurement range of 1 millivolt per chart division to 500 volts full scale. And a choice of 20 signal conditioners give you an even wider range. Four chart speeds are push-button controlled. And two event markers are standard.

The Brush 220. It just may solve your recording riddles. To see the Brush 220 in action, call your Brush Sales Engineer. Or write for more information to Gould Inc., Instrument Systems Division, 3631 Perkins Avenue, Cleveland, Ohio 44114 or Rue Van Boeckel 38 Brussels 1140, Belgium.

BRUSH INSTRUMENTS

GOULD

This $650 digital pH meter is guaranteed to pass the acid test.

No drift, no blinking, no fluctuation.

Our digital pH meter Model pH-101 costs only $650, yet it incorporates the very same 0.001 pH sensitivity amplifier used in our famous $4,000 recording titrators. In our meter, the third decimal place is suppressed to provide a locked-in 0.01 pH readout that we guarantee will be absolutely stable. It won't drift. It won't blink. It won't fluctuate. In fact, the reading will not change at all during the course of any normal procedure, even if observed for as long as half an hour.

Should you require readings to a third decimal place or work with specific ion electrodes, there is our Model pH-102. It has a range switch that permits readings to 0.001 pH/0.1 mV, and costs $850. Both models give you solid-state circuitry with BCD and recorder output, manual and automatic temperature control, shock-resistant combination glass electrode (which reads accurately with TRIS buffers and requires no alkali correction up to pH 12), stainless-steel rod and mounting hardware, buffers and KCl.

If your pH meter doesn't meet the acid test, why not check ours. For complete literature on both models, just write: Brinkmann Instruments, Cantiague Road, Westbury, New York 11590. In Canada, write: Brinkmann Instruments (Canada) Limited, 50 Galaxy Blvd., Rexdale (Toronto), Ontario.

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of scientific purity, is not only spurious reasoning, but reveals a view of social science that is by no means uniformly shared.

Etzioni trots out familiar arguments about an educational system that for the first time, in part at least, has started applying the canons of social research to people who inhabit this country. The arguments that he adduces are no more, no less than those used in recent years by those who have opposed, on the basis of a Platonic theory of educational verities, the special programs that have enabled blacks to enter college. The penetration of racial minorities has not ruined the higher educational system in America. It might be argued that thus far it has not helped much and that special interest politicking is scientifically irrelevant. But I doubt that there is evidence that would show any actual measure of deterioration as a result of minority entrance into the higher educational sphere. If the alternative to benign neglect is an occasional serious injustice, this must be weighed against injustices committed on the side of neglect. Even if in this particular case there has been a possible injustice committed to Etzioni's graduate student, we can at least empathize with the reasons for this slight. In the past, the same kind of injustices have been committed for quite other reasons—not nearly as noble in purpose. If this was simply an isolated case, Etzioni had an obligation to engage in quiet diplomacy, or, in other words, not to transform an individual case into a universal condemnation. A personal grievance is not a social problem, and a unique example is not a law of nature.

IRVING LOUIS HOROWITZ
Department of Sociology,
Rutgers University,
New Brunswick, New Jersey 08903

Irony seems to be a dangerous way of making a point; both Preer and Horowitz seem not to address the issue I sought to raise (which naturally makes me grateful to Singh).

First, the Chicano's qualifications were compared to those of others, but the reason he was hired was the need to balance the color chart. That is the whole point of hiring by genes.

Second, the issue I raised was not protection of academic purity, which was never free of pecuniary and status considerations; surely it deserves to be diluted somewhat for greater social justice. What I fear is its destruction, as master color charts, or quota systems, replace other hiring criteria. This tends to happen when "exceptions" made for one group (initially, chiefly blacks), are extended to many others. It is a sad truth that the academic system can live with concessions to one minority group but cannot survive the bending of standards for blacks and Chicanos and Indians and women and others.

As to how widespread the tendency to hire by race is, the reader can judge himself—is it an isolated incidence or a spreading practice?

AMITAI ETZIONI
Center for Policy Research,
New York 10027

Margin of Safety

The manner in which Swenerton and Hurley (2 July, p. 62) carried out their recent investigation into the teratogenic effects of ethylenediaminetetraacetic acid (EDTA) appears to be a well-executed, if uninspired, classical toxicological investigation. I do, however, question its applicability to reality. I would appreciate being advised of the circumstances under which a human being could ever be exposed, during pregnancy, to a chronic dietary intake of 2 to 3 percent (by weight) of EDTA, or its equivalent in strong chelators. Even if one includes nonchelating antagonists, the possibility appears to be exceedingly remote.

I am aware that a large margin of safety (a factor of around 100) is commonly employed in the certification of chemicals designed for human use. It seems to me that there is a large uninvestigated gap in this report between intake of 2 percent and intake of 0.02 percent. Indeed, to one used to dealing in microgram quantities of material, the range between 0 and 2 percent is simply enormous. If, as I suspect, this study represents the testing of "safety" factors far in excess of those commonly in use, then it serves little purpose save to alarm the uniformed. I believe that toxicologists have some responsibility to design their experiments to approximate reality. Should they fail to do so they must inevitably undermine their credibility not only with other scientists but, far more importantly, with the public at large.

R. D. HAMILTON
Freshwater Institute,
Fisheries Research Board of Canada,
Winnipeg 19, Manitoba

As Hamilton has pointed out so obviously, the chances are remote that a pregnant woman could receive an intake of EDTA equivalent to 2 to 3 percent of her diet. However, Hamilton has apparently missed the point of our report. We did not undertake the study in order to test the toxicological effects of EDTA. Indeed, as we mentioned, it was already known that EDTA would produce congenital malformations in pregnant rats. Rather, the purpose of our experiments was to elucidate the mechanism by which this disturbance of embryonic development occurred. Because of our previous work with zinc deficiency, we suspected that EDTA might act to produce a deficiency of this element in the embryo. It seems to us that this information is of scientific interest, even if not of direct practical application.

Certainly more experiments need to be carried out with respect to the effects of lower levels of EDTA, but Hamilton surely does not mean to imply that research should not be published unless it is directly translatable into practical terms.

LUCILLE S. HURLEY
HELENE SWENERTON
Department of Nutrition, Agricultural Experiment Station, University of California, Davis 95616

Committee on Chemotaxonomy

An ad hoc committee on chemotaxonomy sponsored jointly by the International Union of Pure and Applied Chemistry (IUPAC) and the International Association for Plant Taxonomy (IAPT) has been formed to look into the organization of international collaboration in chemosystematics. The committee consists of W. F. Grant (IAPT), chairman; T. Swain (IUPAC), secretary; J. B. Harborne (IUPAC); A. Löve (IAPT); T. J. Mabry (IUPAC); and B. L. Turner (IAPT).

The committee solicits comments from interested persons in biological sciences, biochemistry, chemistry, and the pharmaceutical sciences. These comments may be sent to the undersigned.

W. F. GRANT
Genetics Laboratory, Macdonald Campus of McGill University, Quebec, Canada

T. SWAIN
Royal Botanic Gardens, Kew, Richmond, Surrey, England

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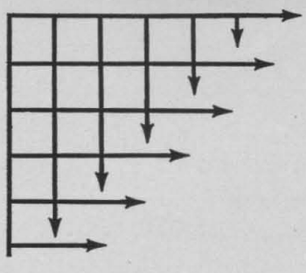

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8 October 1971, Volume 174, Number 4005

SCIENCE

The Evaluation of Basic Science

Attendance at several recent confrontations between laboratory scientists and economists has suggested to this writer that the basic conflict is, in large part, semantic. Some economists would have us believe that the words "price" and "value" are essentially identical, that the value of any object or service is determined by its price in the free marketplace, and even that a man's value is measured accurately by the wages he earns in the job market.

To most scientists, "value" and "price" have quite different connotations. We often find that even material objects are overpriced or underpriced, which points up the discrepancy between price and true value. A man's wage would approximate his value only in the event that he selected his employment on the basis of wage and wage alone. Whereas this may be approximately true in some lines of endeavor, the scientist typically is influenced in his choice of job by a host of other factors, such as freedom of operation, availability of laboratory and library facilities, the nature of his colleagues and students, and institutional and titular prestige. We measure the value of our colleagues in terms of their contributions to the progress of their science, and ignorance of their salaries in no way precludes such judgments.

Price may be a useful means of estimating the value of defined material objects, such as cars or apples. It gives at best a very inaccurate assessment of the value of a man, as the scientist uses the phrase. Where price completely fails as a measure of value is in the realm of ideas, and basic science, in contrast to invention, deals largely in ideas. Consider for the moment Archimedes' demonstration of the relationship of the radius of a sphere to its volume, Mendel's conclusions concerning genetic transmission, or Gibbs's discovery of phase rule. The cost of each of these was doubtless trivial (the cash benefits are not susceptible of ready estimate), yet the value of each of these discoveries to the world of science has been enormous. In this context, there appears to be a complete dissociation between value and price.

There are several consequences of this dissociation. Prominent among them is the futility of the cost-benefit type of analysis in the area of basic sciences. Ideas are not like apples, which may be counted and sold, hopefully before they rot. Ideas, if sound, are among the most enduring of our assets and may continue to yield benefits for very long periods of time. This fact alone severely limits the usefulness of cost-benefit studies.

If, indeed, the economist is unable to divorce price from value, then it must follow that economics is an inappropriate instrument with which to measure basic science. A new and distinct discipline must then be invented, one that is concerned with "value" as the scientist sees it. When we can more accurately define this quantity we can hope to measure the value of the scientist and of his product. Until and unless this is done, the basic scientist will remain dissatisfied with outside evaluations of his work.—DEWITT STETTEN, JR., Director, *National Institute of General Medical Sciences, Bethesda, Md. 20014*

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the protein component of the pigment is coded for by the host plant genome. The location of the genetic information for the nitrogenase components is not known.

The presence of effective nitrogen-fixing root nodules in nonlegumes, including some 12 genera of woody dicots scattered among a number of families, involves symbioses between unidentified actinomycete-like microorganisms and the roots of the host plants. Analogies to the legume symbiosis are striking: specialized root structures are involved, nitrate inhibits nodule development, and ineffective nodules have been described. In *Alnus*, which is the most studied nonlegume nodular symbiosis, the infective microorganism is still unknown, cannot be grown in pure culture, yet can be transferred by inoculation with crushed nodules. Infection is apparently via root hairs and involves proliferation of root cortical tissues and the formation of a thick periderm.

Although nodule-like growths have been reported on roots of monocots, including some grasses and sedges, and an occasional report has appeared on nitrogen fixation by grasses, no carefully documented occurrence of symbiotic nitrogen fixation by root nodules in cereals or monocots is known. Rather, evidence is increasing that grasses and cereals establish a close relationship with free-living microorganisms in the soil around the roots and on the mucilaginous covering of the roots themselves, where they are effective in fixing atmospheric nitrogen in respectable amounts. These organisms include, under different circumstances, anaerobic bacteria such as *Clostridium*, aerobes such as *Azotobacter*, many different species of blue-green algae, and facultative anaerobes such as *Klebsiella*. That these intimate interdependencies are important in the overall nitrogen economy of the monocots seems well established and might well be exploited by means which foster the relationship. The importance of maintaining beneficial associations between rhizosphere and plant during plant introduction was emphasized.

Discussions of the possible evolutionary origin of the *Rhizobium*-legume symbiotic association raised questions concerning the existence of other still unidentified symbioses or of the potentialities of genetic manipulation of both the host and the bacterial symbiont to increase the occurrence of the nitrogen-fixing capacity. Little optimism was expressed for success on this

front until more basic knowledge is achieved about the steps involved in the infection process, nodule formation, and bacteroid formation. The need for more basic research in these areas was emphasized. Also, a wide-ranging search should be made for monocots that show evidence of nitrogen fixation capacity, by way of either nodulated structures or rhizosphere relationships. Discoveries in this area could open up new avenues for extending the capacity to fix nitrogen to the major food crops.

D. A. PHILLIPS
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R. H. BURRIS
Department of Biochemistry, University of Wisconsin, Madison 53706

Note

1. The conference was organized and supported by the Rockefeller Foundation. The conferees from nine countries included university scientists in plant physiology and biochemistry, plant breeders, bacterial geneticists, and agricultural specialists in soil and agronomy. Participants, in addition to the Rockefeller staff, included: C. A. Appleby, New York; F. J. Bergersen, Australia; G. Bond, Scotland; R. H. Burris (chairman of the conference), Wisconsin; G. W. Burton, Georgia; J. C. Burton, Wisconsin; P. J. Dart, England; C. C. Delwiche, California; M. J. Dilworth, Western Australia; H. J. Evans, Oregon; M. Fried, Austria; B. O. Gillberg, Sweden; R. W. Hardy, Delaware; J. D. Menzies, Maryland; F. N. Ponnamperuma, Philippines; A. Quispel, Netherlands; J. G. Torrey, Massachusetts; J. Totter, Maryland. The recorder of the meeting was D. A. Phillips, Massachusetts.

Forthcoming Events

October

18–20. **Soil Microcommunities** Conf., Syracuse, N.Y. (D. Dindal, Dept. of Forest Zoology, State Univ. College of Forestry at Syracuse Univ., Syracuse 13210)

19–22. **Acoustical** Soc. of America, Denver, Colo. (Miss B. H. Goodfriend, ASA, 335 E. 45 St., New York 10017)

19–22. American Soc. for **Microbiology**, Atlantic City, N.J. (R. W. Sarber, ASM, 1913 Eye St., NW, Washington, D.C. 20006)

20–21. **Chemurgic** Council, 33rd annual, Washington, D.C. (J. W. Ticknor, CC, 350 Fifth Ave., New York 10001)

20–22. **Transplutonium** Symp., 3rd, Argonne, Ill. (D. C. Stewart, Chemistry Div., Argonne National Lab., 9700 Cass Ave., Argonne 60439)

21–23. American Acad. of **Clinical Toxicology**, Philadelphia, Pa. (E. G. Comstock, P.O. Box 2565, Houston, Tex. 77001)

21–24. Society for **Psychophysiological Research**, Clayton, Mo. (K. M. Kleinman, Dept. of Psychology, Southern Illinois Univ., Edwardsville 62025)

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22–24. **Concept of a National Botanical Gardens for Canada**, Hamilton, Ont., Canada. (L. Laking, Royal Botanical Gardens, Box 399, Station "A," Hamilton 20)

23–26. American Inst. of **Biological Sciences**, 2nd natl., Miami Beach, Fla. (Miss A. Barker, National Biological Congr., 3900 Wisconsin Ave., NW, Washington, D.C. 20016)

25–27. National **Acad. of Sciences**, Washington, D.C. (B. Byers, Office of Information, National Acad. of Sciences, 2101 Constitution Ave., NW, Washington, D.C. 20418)

25–29. **Water Resources** Conf., 7th, Washington, D.C. (S. C. Csallany, American Water Resources Assoc., Illinois State Water Survey, Univ. of Illinois, Urbana 61801)

27–30. **Gerontological** Soc., Houston, Tex. (E. Kaskowitz, Suite 520, 1 Dupont Circle, Washington, D.C. 20036)

27–30. Society for **Neuroscience**, Washington, D.C. (Miss M. G. Wilson, SN, 2101 Constitution Ave., NW, Washington, D.C. 20418)

29–30. **Theoretical Physics** Conf., Schenectady, N.Y. (J. B. Comly, General Electric Research & Development Center, P.O. Box 8, Schenectady)

29–1. Association of American **Medical Colleges**, 82nd annual, Washington, D.C. (J. B. Erdmann, 1 Dupont Circle, NW, Washington, D.C. 20036)

29–3. American Soc. of **Agronomy**, Miami Beach, Fla. (M. Stelly, ASA, 677 S. Segoe Rd., Madison, Wis. 53711)

31–3. Academy of **Psychosomatic Medicine**, Sarasota, Fla. (A. J. Krakowski, 202A Cornelia St., Plattsburgh, N.Y. 12901)

November

1–2. National **Acad. of Engineering**, Washington, D.C. (B. Byers, Office of Information, National Acad. of Sciences, 2101 Constitution Ave., NW, Washington, D.C. 20418)

1–3. **Electrical Insulation and Dielectric Phenomena** Conf., National Acad. of Sciences–National Research Council, Williamsburg, Va. (R. A. Cliffe, National Acad. of Sciences, 2101 Constitution Ave., NW, Washington, D.C. 20418)

1–3. **Geological** Soc. of America (with Paleontological Soc., Mineralogical Soc. of America, Soc. of Economic Geologists, Soc. of Vertebrate Paleontology, Geochemical Soc., National Assoc. of Geology Teachers, and Geoscience Information Soc.), Washington, D.C. (W. L. Newman, Nontechnical Reports, U.S. Geological Survey, Washington, D.C. 20242, or W. Cochran, Managing Editor, *Geotimes*, 2201 M St., NW, Washington, D.C. 20037)

1–3. **Paleontological** Soc., Washington, D.C. (R. L. Langenheim, Dept. of Geology, Univ. of Illinois, Urbana 61801)

1–4. **Arctic Logistics Support Technology**, Hershey, Pa. (Arctic Inst. of North America, 1619 New Hampshire Ave., NW, Washington, D. C. 20009)

3–5. Pittsburgh **Diffraction** Conf., 29th annual, Pittsburgh, Pa. (J. E. Gragg, Dept. of Metallurgy and Materials Science, Carnegie-Mellon Univ., Schenley Park, Pittsburgh 15213)

3–5. **Nuclear Science** Symp. (IEEE Nuclear Science Group, AEC, and NASA), San Francisco, Calif. (K. A. More, Bendix Corp., Aerospace Systems Div., 3300 Plymouth Rd., Ann Arbor, Mich. 48107)

3–6. American Soc. of **Cytology**, 19th annual scientific mtg., Washington, D.C. (W. R. Lang, ASC, 7112 Lincoln Dr., Philadelphia, Pa. 19119)

4–5. **Energy** Conf., Albany, N.Y. (R. I. Brown, Environmental Studies, ULB 35, State Univ. of New York at Albany, 1400 Washington Ave., Albany)

4–6. **Nuclear Physics**, American Physical Soc., Tucson, Ariz. (W. W. Havens, Jr., APS, 335 E. 45 St., New York 10017)

6. **Earth Science Education** Symp., 2nd annual, La Salle, Ill. (T. Brehman, Maine Township High School North, Des Plaines, Ill.)

7–10. American Assoc. for **Clinical Immunology and Allergy**, New Orleans, La. (S. H. Jaros, P.O. Box 965, D.T.S., Omaha, Neb. 68101)

7–11. **Exploration Today—Energy Tomorrow**, Soc. of Exploration Geophysicists, 41st annual intern. mtg., Houston, Tex. (SEG, P.O. Box 3098, Tulsa, Okla. 74101)

7–11. American Soc. for **Information Science**, 34th annual, Denver, Colo. (Miss S. Wormley, Suite 804, ASIS, 1140 Connecticut Ave., NW, Washington, D.C. 20036)

8. **Conversion of Wastes to Profit** Symp., Toronto, Ont., Canada. (R. G. W. Laughlin, Canadian Soc. for Chemical Engineering, 151 Slater St., Ottawa 4, Ont.)

8–9. **LAMPF Users** Group, 5th mtg., Los Alamos, N.M. (L. Agnew, Liaison Officer, LAMPF Users Group, P.O. Box 1663, Los Alamos 87544)

8–10. **Biochemistry of Complex Carbohydrate Polymers**, an Integrated View, International Union of Biochemistry, Barlioche, Argentina. (H. G. Pontis, Casilla de Correo 138, San Carlos de Variloche, Province de Rio Negro, Argentina)

8–10. Interaction Phenomena in **Engineering Science**, 9th annual, Soc. of Engineering Science, Troy, N.Y. (H. F. Tiersten, Mechanics Div., Rensselaer Polytechnic Inst., Troy 12181)

8–10. International Soc. for the **Study of Biological Rhythms**, Little Rock, Ark. (J. E. Pauly or L. E. Scheving, Dept. of Anatomy, Univ. of Arkansas Medical Center, Little Rock 72201)

8–10. Joint Conf. on **Sensing of Environmental Pollutants** (AIAA, ISA, ACS, IEEE, EPA, NASA, and NOAA), Palo Alto, Calif. (Instrument Soc. of America, 400 Stanwix St., Pittsburgh, Pa.)

9–16. American **Heart** Assoc., Anaheim, Calif. (J. M. Hundley, AHA, 44 E. 23 St., New York 10010)

10. **Use of On-Line Computers in Psychology**, St. Louis, Mo. (D. I. Tepas, Dept. of Psychology, Saint Louis Univ., St. Louis 63103)

10–12. Eastern **Analytical** Symp. (American Chemical Soc., Soc. for Applied Spectroscopy, and American Microchemical Soc.), New York, N.Y. (I. L. Simmons, M&T Chemicals, Inc., P.O. Box 1104, Rahway, N.J. 07605)

11–12. **Endocrine and Nonendocrine Hormone Producing Tumors,** 16th annual clinical conf., Houston, Tex. (Mrs. J. Brandenberger, Information Coordinator, Univ. of Texas M.D. Anderson Hospital and Tumor Inst., Texas Medical Center, Houston 77025)

12–14. Association of **Clinical Scientists,** 40th mtg., Washington, D.C. (F. W. Sunderman, Hahnemann Medical College and Hospital, 230 N. Broad St., Philadelphia, Pa. 19102)

12–16. **Atomic Industrial** Forum, American Nuclear Soc., Washington, D.C. (ANS, 850 Third Ave., New York 10022)

14–15. **Cerebral Function** Symp. on Hemisphere Disconnection and Cerebral Function, Coronado, Calif. (W. L. Smith, Porter Memorial Hospital, 2525 S. Downing, Denver, Colo. 80210)

15–17. American **Petroleum** Inst., San Francisco, Calif. (API, 1271 Ave. of the Americas, New York 10020)

15–18. Joint **Computer** Conf., Las Vegas, Nev. (American Federation of Information Processing Societies, 210 Summit Ave., Montvale, N.J. 07645)

15–19. **Clinical Uses of Radionuclides:** Critical Comparison with Other Techniques, 13th symp., Oak Ridge, Tenn. (E. C. Rosenow, American College of Psysicians, 4200 Pine St., Philadelphia, Pa. 19104)

16. **Noise as a Community Problem,** Columbia, Mo. (R. H. Luebbers, Engineering Extension, 130 Engineering Bldg., University of Missouri, Columbia 65201)

16–18. Conference on the **Quality of the Environment,** Columbus, Ohio. (R. A. Tybout, Ohio State Univ., 166 Denny Hall, 164 W. 17 Ave., Columbus 43210)

16–19. **Magnetism and Magnetic Materials,** 17th annual conf., Chicago, Ill. (H. C. Wolfe, American Inst. of Physics, 335 E. 45 St., New York 10017)

17–20. American **Speech and Hearing** Assoc., Chicago, Ill. (K. O. Johnson, 9030 Old Georgetown Rd., Washington, D.C. 20014)

18–19. **Sickle Cell Disease** Symp., New York, N.Y. (H. Abramson, National Foundation, 315 Park Ave. South, New York 10010)

18–20. **School Science and Mathematics** Assoc., Detroit, Mich. (D. R. Winslow, P.O. Box 246, Bloomington, Ind. 47401)

18–21. American **Anthropological** Assoc., New York, N.Y. (E. J. Lehman, 1703 New Hampshire Ave., NW, Washington, D.C. 20009)

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

19–20. Tennessee **Acad. of Science,** Murfreesboro. (J. D. Caponetti, Dept. of Botany, Univ. of Tennessee, Knoxville 37916)

20. **Resources of the World's Oceans** Symp., New York, N.Y. (H. R. Frey, New York Inst. of Ocean Resources, Inc., South Street Seaport Museum, 16 Fulton St., New York 10038)

21–23. Seventy-five Years of Progress in **Psychiatric Research and Teaching,** New York State Psychiatric Inst., New York, N.Y. (L. C. Kolb, Dept. of Mental Hygiene, New York State Psychiatric Inst., 722 W. 168 St., New York 10032)

22–23. **Bioavailability of Drugs,** Washington, D.C. (R. H. Henry, United States Pharmacopeia, 12601 Twinbrook Parkway, Rockville, Md. 20852)

22–26. Symposium on the **Assessment of Radioactive Organ and Body Burdens,** Stockholm, Sweden. (J. H. Kane, Div. of Technical Information, U.S. Atomic Energy Commission, Washington, D.C.)

24–26. World Federation for **Mental Health,** Hong Kong. (C. L. Wong, Hong Kong Assoc. for Mental Health, Hong Kong)

25–27. Central Assoc. of **Science and Mathematics Teachers,** Detroit, Mich. (D. R. Winslow, P.O. Box 246, Bloomington, Ind. 47401)

25–27. National Council for **Geographic Education,** Atlanta, Ga. (L. S. Mitchell, NCGE, Room 1226, 111 W. Washington St., Chicago, Ill. 60602)

28–1. American **Medical** Assoc., clinical conv., New Orleans, La. (E. B. Howard, AMA, 535 N. Dearborn St., Chicago, Ill. 60610)

28–2. American Inst. of **Chemical Engineers,** San Francisco, Calif. (F. J. Van Antwerpen, AICE, 345 E. 47 St., New York 10017)

28–2. American History of **Mechanical Engineers,** 92nd annual, Washington, D.C. (M. Jones, Information Services, ASME, 345 E. 47 St., New York 10017)

28–3. **Radiological** Soc. of North America, Chicago, Ill. (M. D. Frazer, RSNA, 713 East Genesee St., Syracuse, N.Y. 13210)

28–4. World Congr. of **Psychiatry,** 5th, Mexico City, Mexico. (Secretariado del "V" Congreso Mundial de Psiquiatría, Apartado Postal No. 20-123/24, Mexico D.F., Mexico)

29–2. **Entomological** Soc. of America, Los Angeles, Calif. (W. P. Murdoch, ESA, 4603 Calvert Rd., College Park, Md. 20740)

29–3. Symposium on **Analytical Methods in the Nuclear Fuel Cycle,** International Atomic Energy Agency, Vienna, Austria. (J. H. Kane, Div. of Technical Information, U.S. Atomic Energy Commission, Washington, D.C. 20545)

29–4. International College of **Surgeons,** 4th Western Hemisphere congr., Panama City, Panama. (Office of the President, ICS, 1516 N. Lake Shore Dr., Chicago, Ill. 60610)

30. **Nutritional Requirements of Vitamin K,** Assoc. of Vitamin Chemists, Rosemont, Ill. (J. McGillivrey, International Minerals and Chemicals, Route 45 and Winchester Rd., Libertyville, Ill. 60048)

30–3. American Soc. of **Tropical Medicine and Hygiene,** Boston, Mass. (G. R. Healy, P.O. Box 15208, Emory Univ. Branch, Atlanta, Ga. 30333)

December

1–3. **Electron and Atomic Physics,** American Physical Soc., Atlanta, Ga. (W. W. Havens, Jr., APS, 335 E. 45 St., New York 10017)

1–4. **American Medical Women's** Assoc., New Orleans, La. (Mrs. G. Conroy, AMWA, 1740 Broadway, New York 10019)

2. Oklahoma **Acad. of Science,** Norman.

(J. T. Self, Dept. of Zoology, Oklahoma Univ., Norman 73069)

2–3. **Mechanisms of Enzyme Action**, Santa Monica, Calif. (N. Kharasch, Intra-Science Research Foundation, P.O. Box 430, Santa Monica 90406)

3. Conference on **Statistics and Quality Control**, Princeton, N.J. (W. Young, Lederle Laboratories, Pearl River, N.Y. 10965)

3–5. American **Acad. of Psychoanalysis**, New York, N.Y. (Miss J. B. Miller, 510 E. 86 St., New York 10028)

4. American **Alpine** Club, Portland, Ore. (Miss M. McKee, AAC, 113 E. 90 St., New York 10028)

5–7. American **Astronomical** Soc., San Juan, Puerto Rico. (H. M. Gurin, AAS, 211 FitzRandolph Rd., Princeton, N.J. 08540)

5–7. American Soc. of **Hematology**, San Francisco, Calif. (F. H. Gardner, ASH, 51 N. 39 St., Philadelphia, Pa.)

5–8. **Chemical Specialties** Manufacturers Assoc., Washington, D.C. (E. E. Wilson, CSMA, 50 E. 41 St., New York 10017)

5–8. Association of **Military Surgeons** of the United States, 78th annual, Washington, D.C. (W. Welham, AMSUS, 8502 Connecticut Ave., Chevy Chase, Md. 20015)

5–8. International College of **Psychosomatic Medicine**, 1st congr., Guadalajara, Mexico. (A. J. Krakowski, 202A Cornelia St., Plattsburgh, N.Y. 12901)

6–7. **Vitamin E and Its Role in Cellular Metabolism**, New York, N.Y. (P. P. Nair, Biochemistry Research Div., Dept. of Medicine, Sinai Hospital of Baltimore, Baltimore, Md.)

6–9. American **Geophysical** Union, San Francisco, Calif. (A. F. Spilhaus, Jr., AGU, 2100 Pennsylvania Ave., NW, Washington, D.C. 20037)

6–9. **Ultrasonics** Symp., Inst. of Electrical and Electronics Engineers, Inc., Miami Beach, Fla. (J. E. May, Bell Laboratories, 555 Union Blvd., Allentown, Pa. 18103)

6–9. Symposium on **Underground Waste Management and Environmental Implications**, American Assoc. of Petroleum Geologists, Houston, Tex. (W. H. Curry, P.O. Box 572, Casper, Wyo. 82601)

7–10. American Soc. of **Agricultural Engineers**, Chicago, Ill. (J. L. Butt, ASAE, P.O. Box 229, St. Joseph, Mich. 49085)

8–11. American **Rheumatism** Assoc., San Diego, Calif. (Miss M. M. Walsh, Arthritis Foundation, 1212 Ave. of the Americas, New York 10036)

9–14. American **Acad. of Optometry**, Toronto, Ont., Canada. (C. C. Koch, AAO, 214-215 Foshay Tower, Minneapolis, Minn. 55402)

13–14. Society of **Cosmetic Chemists**, New York, N.Y. (Miss S. A. Ragon, Amerchol Park, Talmadge Rd., Edison, N.J. 08817)

13–14. **Liquid Crystals** Symp., London, England. (Faraday Soc., 6 Gray's Inn Sq., Gray's Inn, London, W.C.1)

13–17. Use of **Isotopes and Radiation in Research on Soil-Plant Relationships Including Applications in Forestry**, International Atomic Energy Agency, Vienna, Austria. (J. H. Kane, Div. of Technical Information, U.S. Atomic Energy Commission, Washington, D.C. 20545)

15–16. **Mechanical Properties of Ceramics, Fibres and Composites**, London, England. (Meeting Officer, Inst. of Physics and Physical Soc., 47 Belgrave Sq., London, S.W.1)

16–19. **Psychoanalysis**, American Psychoanalytic Assoc., New York, N.Y. (Mrs. H. Fischer, APA, 1 E. 57 St., New York 10022)

18–22. Interamerican Congr. of **Psychology**, Panama City, Panama. (L. F. S. Natalicio, SIP, 1801 Lavaca, Suite 11-E, Austin, Tex. 78701)

26–31. American Assoc. for the **Advancement of Science**, Philadelphia, Pa. (D. W. Thornhill, AAAS, 1515 Massachusetts Ave., NW, Washington, D.C. 20005)

26–31. **Metric** Assoc., Philadelphia, Pa. (R. W. Mattoon, Chemical Physics, Dept. 408, Abbott Laboratories, North Chicago, Ill. 60064)

26–31. American Soc. of **Naturalists**, Philadelphia, Pa. (Miss J. Spofford, Dept. of Zoology, Univ. of Chicago, Chicago, Ill. 60637)

26–31. American Soc. of **Zoologists**, Philadelphia, Pa. (D. Sprugel, Jr., Illinois Natural History Survey, 179 Natural Resources Bldg., Urbana 61801)

27–29. American **Economic** Assoc., New Orleans, La. (H. F. Williamson, 629 Noyes St., Evanston, Ill. 60201)

27–29. Society for the **History of Technology**, New York, N.Y. (M. Kranzberg, Crawford Hall, Case Western Reserve Univ., Cleveland, Ohio 44106)

27–29. American **Philosophical** Assoc., New York, N.Y. (A. Pasch, APA, 117 Lehigh Rd., College Park, Md. 20742)

27–30. **Archaeological** Inst. of America, Cincinnati, Ohio. (Miss E. A. Whitehead, AIA, 260 W. Broadway, New York 10013)

27–30. Society for **General Systems Research**, Philadelphia, Pa. (R. E. Ericson, 12613 Bunting Lane, Bowie, Md. 20715)

28. National Assoc. of **Science Writers**, Philadelphia, Pa. (Mrs. R. Arctander, Box H, Seacliffs, N.Y. 11579)

28–30. **Linguistic** Soc. of America, St. Louis, Mo. (T. A. Sebeok, Research Center for the Language Sciences, Indiana Univ., Bloomington)

28–30. **History of Science** Soc., New York, N.Y. (J. C. Greene, Dept. of History, Univ. of Connecticut, Storrs 06268)

January

4–6. **Solid State Physics** Conf., 9th annual, Manchester, England. (Inst. of Physics, 47 Belgrave Sq., London, S.W.1, England)

9–11. Association of **American Colleges**, Washington, D.C. (AAC, 1818 R St., NW, Washington, D.C. 20009)

10–11. **Molecular Basis of Biological Transport**, Biochemistry–Papanicolaou Cancer Research Inst., 4th annual, Miami Beach, Fla. (Biochemistry–PCRI Winter Symposia, P.O. Box 906, Biscayne Annex, Miami, Fla. 33152)

10–12. **Surface Physics of Semiconductors**, Southampton, England. (Inst. of Physics, 47 Belgrave Sq., London, S.W.1, England)

10–13. American **Meteorological** Soc., New Orleans, La. (K. C. Spengler, AMS, 45 Beacon St., Boston, Mass. 02108)

10–13. **Radioactive Isotopes in Clinical Medicine and Research,** intern. conf., Badgastein, Austria. (R. Hofer, Second Medical University Clinic, Isotopes Lab., A 1090, Wien, Garnisongasse 13, Austria)

11–15. National Soc. of **Professional Engineers,** Dallas, Tex. (P. H. Robbins, NSPE, 2029 K St., NW, Washington, D.C. 20006)

13–14. **Molecular Basis of Electron Transport,** Biochemistry–Papanicolaou Cancer Research Inst., 4th annual, Miami Beach, Fla. (Biochemistry–PCRI Winter Symposia, P.O. Box 906, Biscayne Annex, Miami, Fla. 33152)

16. **Human Factors in the Design and Operation of the Highway Transportation System,** 5th annual workshop, Washington, D.C. (A. J. McKnight, 300 N. Washington St., Alexandria, Va. 22314)

17–19. American College of **Surgeons,** sectional mtg., Miami, Fla. (Communications Div., ACS, 55 Erie St., Chicago, Ill. 60611)

17–21. **Numerical Reactor Calculations** Symp., Intern. Atomic Energy Agency, Vienna, Austria. (J. H. Kane, Div. of Technical Information, U.S. Atomic Energy Commission, Washington, D.C. 20545)

19–21. American **Mathematical** Soc. and Mathematical Assoc. of America, Las Vegas, Nev. (A. B. Willcox, MAA, 1225 Connecticut Ave., NW, Washington, D.C. 20036)

23–27. American Soc. of **Heating, Refrigerating, and Air-Conditioning Engineers,** New Orleans, La. (A. T. Boggs III, ASHRACE, 345 E. 47 St., New York 10017)

24–26. **Aerospace Sciences,** 10th mtg., New York, N.Y. (American Inst. of Aeronautics and Astronautics, 1290 Ave. of the Americas, New York 10019)

24–27. **Environmental Design Research** Assoc., 3rd annual, Los Angeles, Calif. (W. J. Mitchell, School of Architecture and Urban Planning, Univ. of California, 405 Hilgard Ave., Los Angeles 90024)

27–29. American College of **Surgeons,** sectional mtg., Sydney, Australia. (Communications Div., ACS, 55 E. Erie St., Chicago, Ill. 60611)

27–30. American College of **Psychiatrists,** Coronado, Calif. (P. A. Martin, ACP, 857 Fisher Bldg., Detroit, Mich. 48202)

30–4. **Power Engineering** Soc., New York, N.Y. (J. W. Beam, Inst. of Electrical and Electronics Engineers, Inc., 345 E. 47 St., New York 10017)

30–7. Role of **Surface Properties in Dosage Form Design and Development,** 7th annual Arden House Conf. on Industrial Pharmacy, Harriman, N.Y. (S. M. Gross, College of Pharmaceutical Sciences, Columbia Univ., 115 W. 68 St., New York 10023)

31–3. American Assoc. of **Physics Teachers,** San Francisco, Calif. (W. F. Johnson, AAPT, 1785 Massachusetts Ave., NW, Washington, D.C. 20036)

31–4. International Symp. on **Information Theory,** Pacific Grove, Calif. (T. Kailath, Dept. of Electrical Engineering, Stanford Univ., Stanford, Calif. 94035)

February

1–3. **Computer-Aided Design and Computer-Aided Manufacturing** Conf. and Exhibit, Soc. of Manufacturing Engineers, Atlanta, Ga. (T. C. Akas, SME, 20501 Ford Rd., Dearborn, Mich. 48128)

3–5. Association for **Hospital Medical Education,** Chicago, Ill. (T. G. Kummer, AHME, 2001 Jefferson Davis Hwy., Arlington, Va. 22202)

4–5. Problems of the **Female Breast as Related to Neoplasms and Reconstruction,** New York, N.Y. (R. K. Snyderman, Memorial Sloan-Kettering Cancer Center, 444 E. 68 St., New York 10021)

5–6. **Medical Education,** 68th annual congr., American Medical Assoc., Chicago, Ill. (C. H. W. Ruhe, AMA Council on Medical Education, 535 N. Dearborn St., Chicago 60610)

5–9. American Acad. of **Allergy,** San Francisco, Calif. (J. O. Kelly, AAA, 225 E. Michigan St., Milwaukee, Wis. 53202)

5–12. Asian and Pacific Congr. of **Gastroenterology,** Manila, Philippines. (Philippine Soc. of Gastroenterology, P.O. Box 2598, Manila)

6–11. American Soc. of **Range Management,** Washington, D.C. (F. T. Colbert, ASRM, 2120 S. Birch St., Denver, Colo. 80222)

6–12. **Chemistry of Natural Products,** 8th intern. symp., New Delhi, India. (S. Rangaswami, Indian National Science Acad., Bahadur Shah Zafar Marg, New Delhi-1)

7–9. **Integrated Optics-Guided Waves Materials Devices,** Optical Soc. of America, Las Vegas, Nev. (OSA, 2100 Pennsylvania Ave., NW, Washington, D.C. 20037)

8–12. American **Group Psychotherapy** Assoc., New York, N.Y. (L. Kane, AGPA, 1790 Broadway, New York 10019)

9–11. American Acad. of **Occupational Medicine,** Pittsburgh, Pa., (D. Minard, Dept. of Occupational Health, AAOM, 130 DeSoto St., Pittsburgh 15213)

14–15. **Psychology of Technical Communication,** Philadelphia, Pa. (Inst. of Electrical and Electronics Engineers, Inc., 345 E. 47 St., New York 10017)

14–16. Use of **Enzymes in Agricultural and Food Industries,** 13th intern. symp., Paris, France. (Sécretariat, XIIIème Symp. International, Commission Internationale des Industries Agricoles et Alimentaires–Bureau International Permanent de Chimie Analytique, 24, rue Téhéran, Paris 8e)

14–16. American College of **Surgeons,** sectional mtg., St. Louis, Mo. (Communications Div., ACS, 55 E. Erie St., Chicago, Ill. 60611)

16–18. Australian **Electrochemistry** Conf., 3rd, Terrigal, New South Wales. (D. A. J. Swinkels, B. H. P. Central Research Labs., Shortland, N.S.W. 2307, Australia)

16–18. **Solid-State Circuits** Conf., Philadelphia, Pa. (Inst. of Electrical and Electronics Engineers, Inc., 345 E. 47 St., New York 10017)

20–24. American Inst. of **Mining, Metallurgical and Petroleum Engineers,** San Francisco, Calif. (J. B. Alford, AIMMPE, 345 E. 47 St., New York 10017)

BOOKS RECEIVED

(*Continued from page 137*)

Behavior Modification in Child Treatment. An Experimental and Clinical Approach. Robert M. Browning and Donald O. Stover. Aldine-Atherton, Chicago, 1971. viii, 422 pp., illus. $11.95.

The Corporate Economy. Growth, Competition, and Innovative Potential. Robin Marris and Adrian Wood, Eds. Harvard University Press, Cambridge, Mass., 1971. xxvi, 554 pp. $15. Harvard Studies in Technology and Society.

Crop Production. Cereals and Legumes. Brian F. Bland. Academic Press, New York, 1971. xii, 466 pp., illus. $14.50.

Data Processing and Computer Programming. A Modular Approach. Thomas J. Cashman and William J. Keys. Canfield, San Francisco, 1971. xiv, 498 pp., illus. $10.95.

Exploring the Universe. American Foundation for Continuing Education. Louise B. Young, Ed. Oxford University Press, New York, ed. 2, 1971. xiv, 732 pp., illus. Cloth, $12.50; paper, $6.50.

Fluid Flow. A First Course in Fluid Mechanics. Rolf H. Sabersky, Allan J. Acosta, and Edward G. Hauptmann. Macmillan, New York, ed. 2, 1971. xx, 520 pp., illus. $12.95.

The Fourth State of Matter. Plasma Dynamics and Tomorrow's Technology. Ben Bova. Saint Martin, New York, 1971. x, 182 pp., illus. $5.95.

Immunobiology. Current Knowledge of Basic Concepts in Immunology and Their Clinical Applications. Robert A. Good and David W. Fisher, Eds. Sinauer, Stamford, Conn., 1971. xii, 306 pp., illus. $10.95.

Kinetic Equations. Richard L. Liboff and Norman Rostoker, Eds. Gordon and Breach, New York, 1971. xvi, 346 pp., illus. $19.50.

Laminar Wakes. Stanley A. Berger. Elsevier, New York, 1971. xxii, 296 pp., illus. $16.

Leaders of American Conservation. Henry Clepper, Ed. Ronald Press, New York, 1971. x, 354 pp. $10.

Litton's Problematical Recreations. James F. Hurley, Ed. Van Nostrand Reinhold, New York, 1971. viii, 338 pp., illus. $7.95.

Management, Innovation, and System Design. Ira G. and Marthann E. Wilson. Auerbach, Princeton, N.J., 1971. xiv, 176 pp., $7.95.

Mathematical Methods in Nuclear Reactor Dynamics. Ziya Akcasu, Gerald S. Lellouche, and Louis M. Shotkin. Academic Press, New York, 1971. xii, 460 pp., illus. $22. Nuclear Science and Technology, vol. 7.

Mathematics. Concrete Behavorial Foundations. Joseph M. Scandura, with the assistance of John Durnin and George Lowerre. Harper and Row, New York, 1971. xx, 460 pp., illus. $11.95.

Mechanical Performance and Design in Polymers. Applied Polymer Symposium No. 17, Melbourne, Australia, May 1970. Oskar Delatycki, Ed. Wiley-Interscience, New York, 1971. vi, 246 pp., illus. Paper, $12.

Methods in Enzymology. Vol. 22, Enzyme Purification and Related Techniques. William B. Jakoby, Ed. Academic Press, New York, 1971. xvi, 648 pp., illus. $29.50.

Migration and Anthropology. Proceedings of a meeting, Ottawa, May 1970. Robert F. Spencer, Ed. American Ethnological Society, Smithsonian Institution, Washington, D.C., 1971 (distributed by University of Washington Press, Seattle). vi, 190 pp. Paper, $5.

Modern Aspects of Electrochemistry. No. 6. J. O'M. Bockris and B. E. Conway, Eds. Plenum, New York, 1971. xiv, 382 pp., illus. $19.50.

Modern Theory of Polymer Solutions. Hiromi Yamakawa. Harper and Row, New York, 1971. xvi, 420 pp., illus. $19.95.

The Modified Nucleosides in Nucleic Acids. Ross H. Hall. Columbia University Press, New York, 1971. xvi, 452 pp., illus. $20.

Museums and the Environment. A Handbook for Education. Environmental Committee of the American Association of Museums, Washington, D.C., 1971. xviii, 262 pp., illus. $12.50.

Natural Selection in Human Populations. The Measurement of Ongoing Genetic Evolution in Contemporary Societies. Carl Jay Bajema, Ed. Wiley, New York, 1971. x, 406 pp., illus. Cloth, $9.95; paper, $4.95.

Neurotransmitter-Receptor Interactions. D. J. Triggle. Academic Press, New York, 1971. x, 610 pp., illus. $26.

The New Scientists. David Fishlock, Ed. Oxford University Press, New York, 1971. vi, 98 pp. Paper, $3. Science and Engineering Policy Series.

Old Age, the Last Segregation. Ralph Nader's Study Group Report on Nursing Homes. Claire Townsend. Grossman, New York, 1971. xx, 230 pp. $6.95.

Organized Complexity. Empirical Theories of Political Development. Ronald D. Brunner and Garry D. Brewer. Free Press, New York, 1971. xviii, 190 pp., illus. $7.

The Ovarian Cycle of Mammals. John S. Perry. Oliver and Boyd, Edinburgh, 1971. viii, 218 pp., illus. Cloth, $7.20; paper, $3.60. University Reviews in Biology.

Parasitic Insects. R. R. Askew. Elsevier, New York, 1971. xx, 316 pp., illus. $11.50.

Pathology of the Nervous System. Vol. 2. Jeff Minckler, Orville T. Bailey, Irwin Feigin, George Jervis, Richard Lindenberg, and Karl T. Neubuerger, Eds. McGraw-Hill, New York, 1971. xx + pp. 1267–2240, illus. + index. $65.

Petroleum Conservation in the United States. An Economic Analysis. Stephen L. McDonald. Published for Resources for the Future, Inc., by Johns Hopkins Press, Baltimore, Md., 1971. xvi, 280 pp., illus. $10.

Phase and Frequency Instabilities in Electromagnetic Wave Propagation. Proceedings of the 33rd Advisory Group for Aerospace Research and Development of NATO Conference, Leicester, England. Kenneth Davies, Ed. Technivision, Slough, England, 1971. 806 pp., illus.

Physical Biochemistry. Kensal Edward Van Holde. Prentice-Hall, Englewood Cliffs, N.J., 1971. x, 246 pp., illus. Cloth, $9.75; paper, $4. Foundations of Modern Biochemistry Series.