SCIENCE

13 July 1962

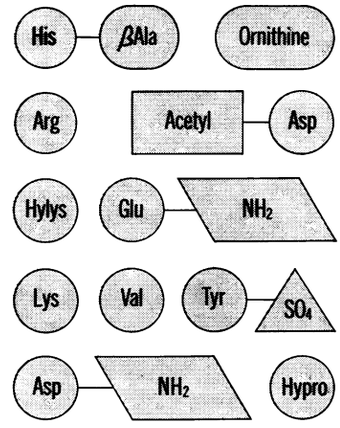
Vol. 137, No. 3524

AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

This one instrument can save 80% of your amino acid analysis time

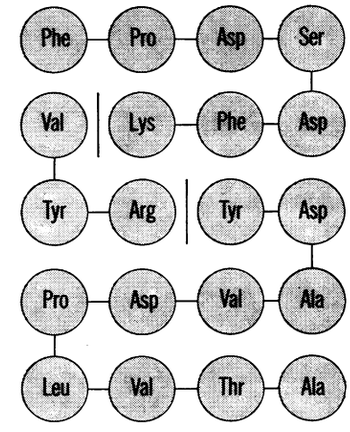
Amino acid analysis

...quantitative analysis in 24 hours for the twenty amino acids in protein hydrolyzates... in 50 hours for the free amino acids and related compounds in physiological fluids.



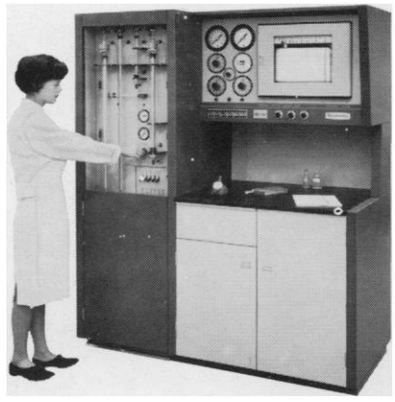
Amino acid isolation

...separation, collection, and identification of amino acids and related compounds in physiological fluids and tissue and plant extracts on both analytical and preparative scale.



Peptide isolation

...separation, collection, and identification of peptides on both analytical and preparative scale from culture media, or from enzymatic or partial acid hydrolysis of proteins.



Instrument operators learn the latest theory and techniques of amino acid analysis in a five-day training program included in the instrument price. Also included are installation and a year's service from nation-wide Beckman facilities.

Amino acid analyses are done virtually automatically by the Beckman 120B Analyzer, samples colorimetrically analyzed and the results permanently recorded. With this instrument, a typical amino acid analysis takes only 3½ to 4 hours of a technician's time, compared to two or more days for a manual chromatographic analysis.

The Beckman Analyzer has proved itself in hundreds of the world's leading research laboratories as an important time-saving instrument. Many laboratories have two or more Analyzers working around the clock, materially accelerating research programs.

If your work involves analyzing protein hydrolyzates, body fluids, tissue extracts, foods or pharmaceuticals, let the Beckman Analyzer take over your repetitive peptide and amino acid analyses. Write for Data File 120-5.

Beckman® INSTRUMENTS, INC.
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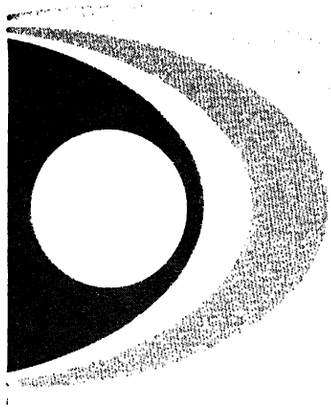
13 July 1962, Volume 137, Number 3524

SCIENCE

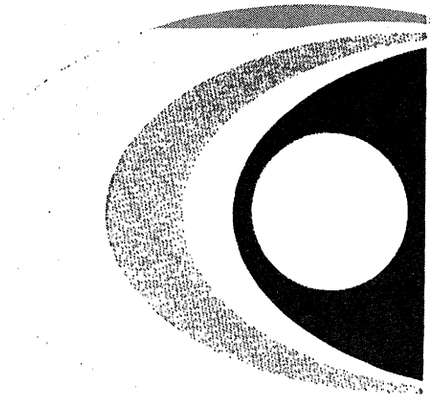
Cover

Portion of a developing oocyte of the fruit fly, *Drosophila melanogaster,* and its adjacent follicle cells (right). From a drawing, prepared by E. J. Pfiffner, based on a composite series of 40 electron micrographs. [Robert C. King, Northwestern University, Evanston, Ill.]



Physicists

PhD or equivalent



SPACE ENVIRONMENTS RESEARCH

As the outgrowth of recent accelerated programs Republic's Scientific Research Staff is now intensifying research in several areas of space environments. Currently, openings exist for theoretical or experimental physicists with PhD or equivalent, for investigations in the following areas:

SPACE RADIATION

Solar and galactic cosmic radiations and geomagnetically trapped radiations / Interaction of radiation with matter (protons, secondary neutron and gamma production, bremsstrahlung effects) / Space Radiation shielding (Physical protection for astronauts, Radiation safe corridor concept, IBM-7090 Space radiation shielding program, Magnetic shielding, Solar cell radiation damage).

SENSORS

Spark chamber spectrometer / Radiation detectors / Infrared spectrometer sensors / Planetary atmospheres sensors / Biological sensors.

ADSORPTION SYSTEMS

Physical Theory of adsorption / Carbon Dioxide adsorption experiment / Carbon Dioxide adsorption system research.

NEW RESEARCH DEVICES

Thin spark chamber plates (Chemically-milled Aluminum and Magnesium) / Thin-walled beryllium containers for liquid hydrogen / Ultra-thin foils (magnesium) for cross-section experiments.

NUCLEAR OR ELECTRON RESONANCE

To facilitate these studies, Research Staff members will have at their disposal the unique resources of Republic's Paul Moore Research & Development Center, the most advanced experimental complex in the East.

Work will be additionally supported by Republic's Computer Division with IBM 7090 and peripheral 1401 computers, as well as a 70,000 volume scientific library.

Physicists who have undertaken relevant research at the doctoral level are invited to write:

Mr. George R. Hickman, Technical Employment Manager, Dept. 35G-2

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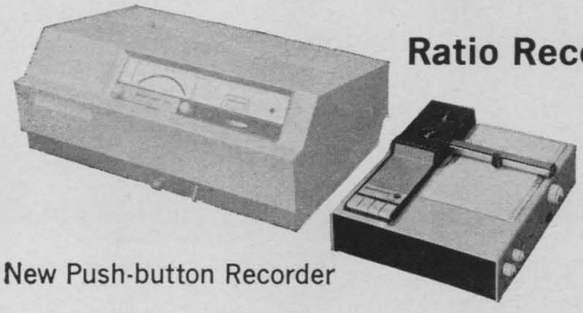
No. S4150—Beckman Model DB Spectrophotometer, for 320 to 770 mu wavelength range, with two silica rectangular cells. 115 volts, 50/60 cycle.....**$1,970.00**

To extend range to 205 mu the following are needed:

No. S4170—UV Accessory Set.....**$ 45.00**

No. S4173—Hydrogen Lamp Power Supply.....**$290.00**

Flame Attachment also available for use with Model DB.



New Push-button Recorder

Ratio Recording Available

Add a wavelength drive accessory and a Beckman Potentiometric Recorder to the Model DB and you have the lowest-priced true %T recording spectrophotometer available today! Features of the Beckman Potentiometric Strip Chart Recorder make it the ideal companion for the Model DB.

No. R3050—Beckman Potentiometric Recorder.....**$500.00**

No. S4180—Wavelength Drive Accessory.....**$ 83.00**

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ADDITIONAL FEATURES

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Zero point does not shift even when balance has been moved to a position that is out-of-level.

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Weight loading knobs are conveniently located on both sides of the balance for easy operation by either right or left hand. Weighing by substitution to 1000 grams is used in this New Torsion Laboratory Balance.

Unlimited Tare Range

Taring through a 125 gram range is accomplished with a built-in knob on the side of the balance. By adding weights to the second pan the balance can be made to tare throughout its 2 kilogram capacity.

In addition to these features, Torsion's Model PL-2 offers a sharp image with a high degree of illumination for easy reading and an oil damper to speed up weighing.

Ask your laboratory supply salesman for a demonstration or write us for Bulletin PL-2 which gives complete specifications.

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Torsion Balance
Company

Main Office and Factory: Clifton, New Jersey
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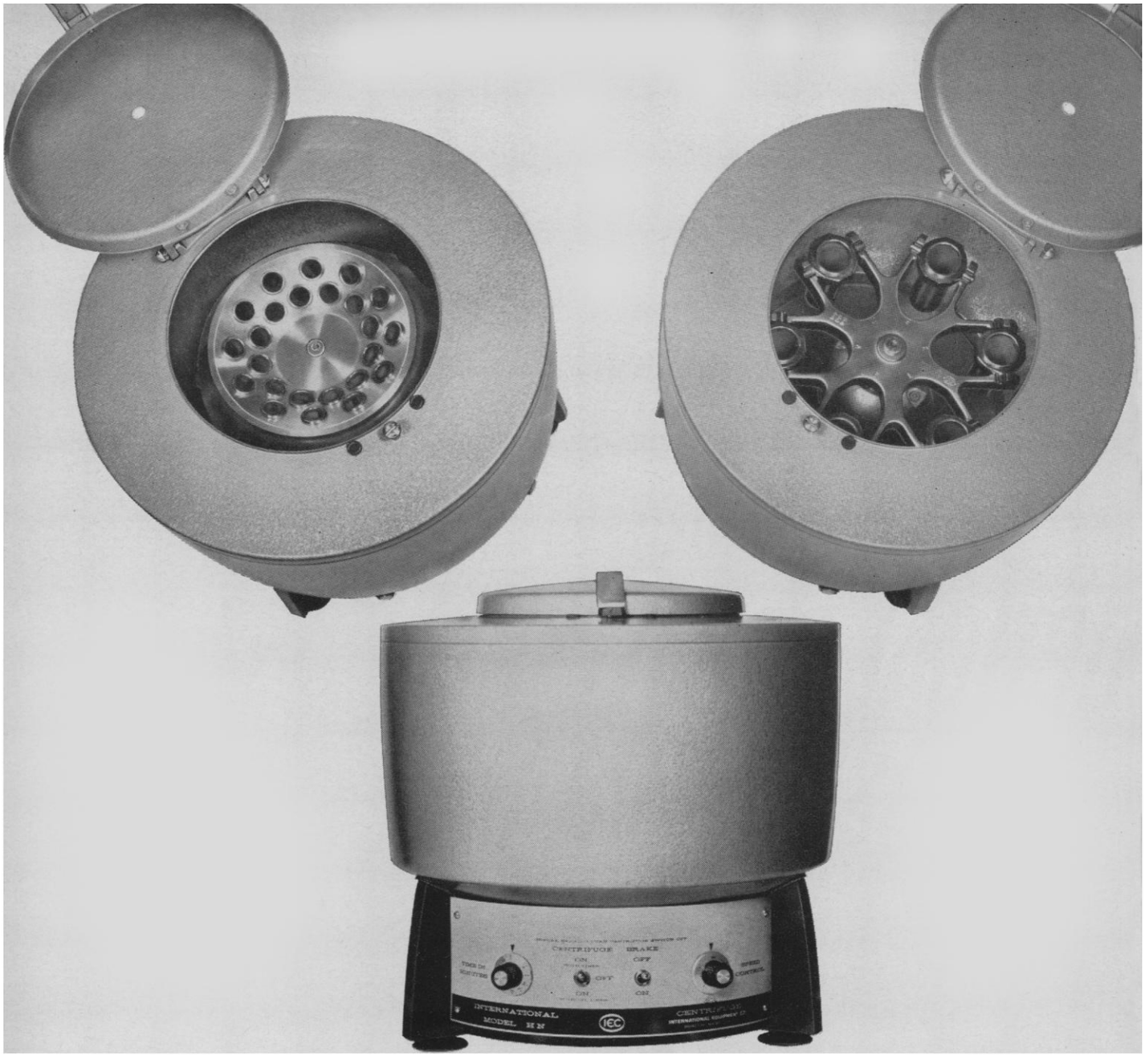

YOU REALLY OUGHT TO LOOK INTO THE NEW IEC HI ...A "COMPACT" WITH BIG CENTRIFUGE VERSATILITY

Examine this superb new instrument. You'll see that IEC has built extraordinary **versatility** into this modern, compact, quiet-running centrifuge.

Look at the angle head in the upper left picture, for example. It swings **twenty-four** 15 ml tubes at 3800 rpm — 2100 X G. Look at the horizontal head at the upper right. It swings **six** 50 ml tubes at 2670 rpm — 1120 X G. These are just samples. You can acquire over **fifty** heads and accessories which can be interchanged in hundreds of combinations to perform an exceptional variety of work.

You'll find the new model HN centrifuge convenient and efficient, too. It has an automatic time smooth, stepless speed controller; an electric bra and a heavy gauge steel guard bowl. In fact, you'll find the features and versatility of the HN put it well in the work range of larger, more expensive centrifuge It fills a universal need for an intermediate centrifuge with capacities formerly available only in larger centrifuges. It is priced well within the most conservation budget. Would you like complete literature? Write for 12-page Bulletin HN.

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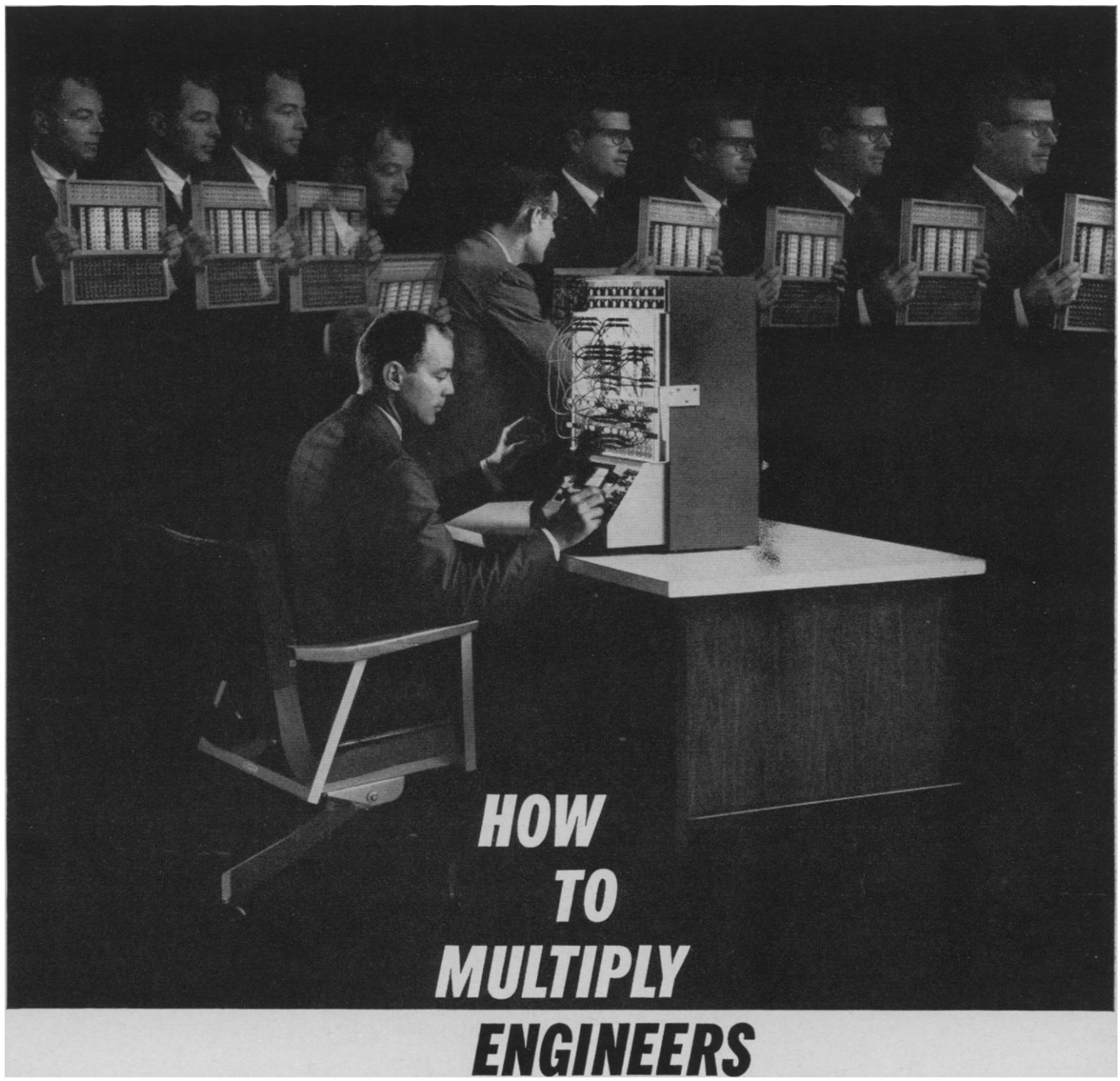

One engineer and an EAI PACE® TR-10 transistorized desktop analog computer can be the equal of several men limited to conventional design tools. The TR-10 multiplies the design capabilities of the most able engineer. One TR-10, equipped with a removable patch panel, will serve the needs of a roomful of engineers. This new patch panel permits pre-patching of programs away from the computer. It plugs into the computer instantly — valuable computation time is conserved. ■ *Versatility of the TR-10 is unequalled. Unique simplicity makes it excellent for students or engineers unfamiliar with analog techniques. Accurate to a tenth of one percent, the TR-10 performs admirably for the experienced user in 95% of routine engineering problems. And with High-Speed Repetitive Operation added, or with several units slaved to operate as one, the TR-10 meets the demands of many advanced applications.* ■ *For technical data on this almost infinitely versatile computer, write for Bulletin No. AC 934.*

EAI

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There is a growing demand by the researcher for programmable nuclear counting systems, with outputs suitable for automatic handling of data. To serve these demands, Hamner added specialists to their engineering staff and developed a line of instruments suitable for filling this need.

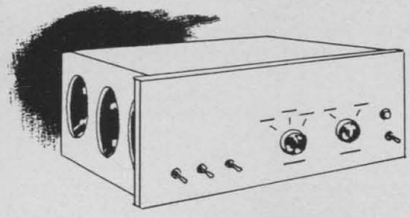
Requirements for systems of this type are individual in nature, and each system is custom-engineered, to some extent. Through the use of highly versatile "Building Block" instruments, some of which are described below, costs for this type of system are kept to an absolute minimum.

Input—Signals from any type nuclear detector(s)

Output

- Electric Typewriter
- Parallel Entry Printer
- Punched Tape
- Punched Cards
- Relay closure or electronic gate for actuation of auxiliary equipment
- Combinations of above

The S-4000 System is an example of the "Building Block" philosophy previously mentioned. This System consists of a high speed printing scaler, a crystal control printing timer and a high speed digital printer. Standard modes of operation include preset time, with 15 selectable preset times, preset count with a choice of 15 settings, or combined preset time-preset count with any combination of these two settings. Either counts or time or both may be printed out at the rate of 5 lines per second. Similar systems may be built up with typewriter, punched card or punched tape output and may involve many scaling and timing units, programmed as required.



N-930

This unit is designed to couple conventional electronic scalers or timers to a tape punch, typewriter or other serial entry type equipment. It accepts any binary coded decimal input (4 line) in parallel, converts this to serial form, translates to any other binary coded decimal form (4 line code), and also presents decimal code at the same time. It contains output circuitry suitable for actuating punch solenoids in any standard paper tape or card punch. A three position selector switch permits tape punch and typewriter to be operated simultaneously or separately. Units with 25 or 50 information point capacity are available. Hamner also has available an N-950 Parallel Binary/Decimal Register for use with 4 line coded equipment and a similar unit, the N-970, for use with Staircase coded equipment.

Inquire about solid state versions of these items.

Your Hamner representative is anxious to work with you in translating system requirements into instrument requirements. Hamner sales engineers will then offer proposals outlining possible methods of doing the job.

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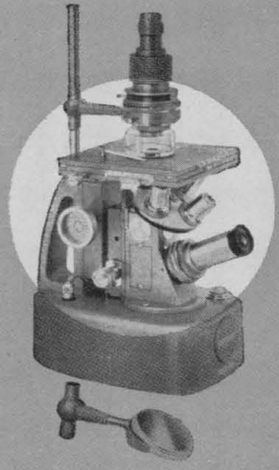
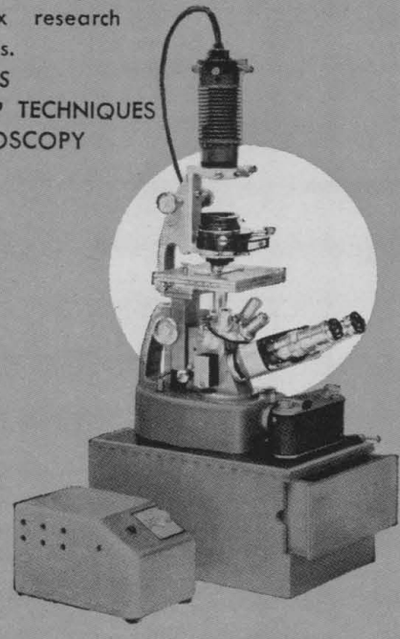
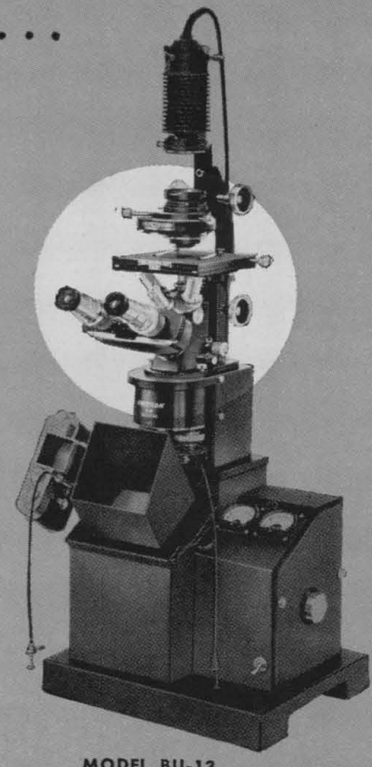


MODEL MIC



MODEL PH-BMIC



MODEL BU-13

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Brightfield Laboratory Models:

MONOCULAR MODEL MIC. Four brightfield objectives 5X, 10X, 40X, 100X (oil); eyepieces 5X, 10X, 15X; ample height adjustment of condenser-illuminator for even large culture bottles; built-in base transformer. **$409.**

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Prices include optics, cabinets, filters, special slides, petri dishes, and basic accessories. The built-in camera mechanism is standard with binocular models and available as an accessory for monoculars. Accommodates 35mm. camera back or Polaroid Land Camera Attachment. Both available at extra cost.

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The all-purpose microscope for visual examination, screen viewing and photomicrography. Built-in 3¼" X 4¼" camera with four flat field photo-eyepieces on revolving turret. Accessory attachments for 35mm., Polaroid, and movie cameras. Low-power (5X–40X) accessories available. Needs only 9" x 12" table space.

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Phase Research Models:

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A camera-back attachment is available for this purpose. The attachment interchanges with the comparator viewing screen assembly. It has its own ground glass panel for focusing and selecting the area to be photographed.

The camera-back attachment is utterly simple to use. It utilizes the optical system and illumination of the comparator. No darkened room is required. It is available for standard film and plates in sizes up to 5x7 inches. The 4x5 size can be used with the Polaroid #500 holder.

Essentially the Nikon 6 Optical Comparator is a projection microscope. Any object, substance or specimen placed on its stage appears as a bright, magnified image on its 12″ screen, where it can be studied and observed by several people simultaneously in the comfort of a normally lit room.

The Nikon 6 provides incident as well as transmitted illumination. Opaque as well as translucent substances and specimens can be inspected at magnifications from 10X to 100X — extendable to 500X. The Nikon 6 is being used for measuring and evaluating ultracentrifuge and electrophoresis patterns. It is being used in chromotography, and in the study of electron photomicrographs. It has even been used for examining specimens in petri dishes and in a wide variety of applications requiring fast, accurate inspection of visual data or images. Its measurement accuracy is within 2 microns.

For complete details, write to Dept. S-7.

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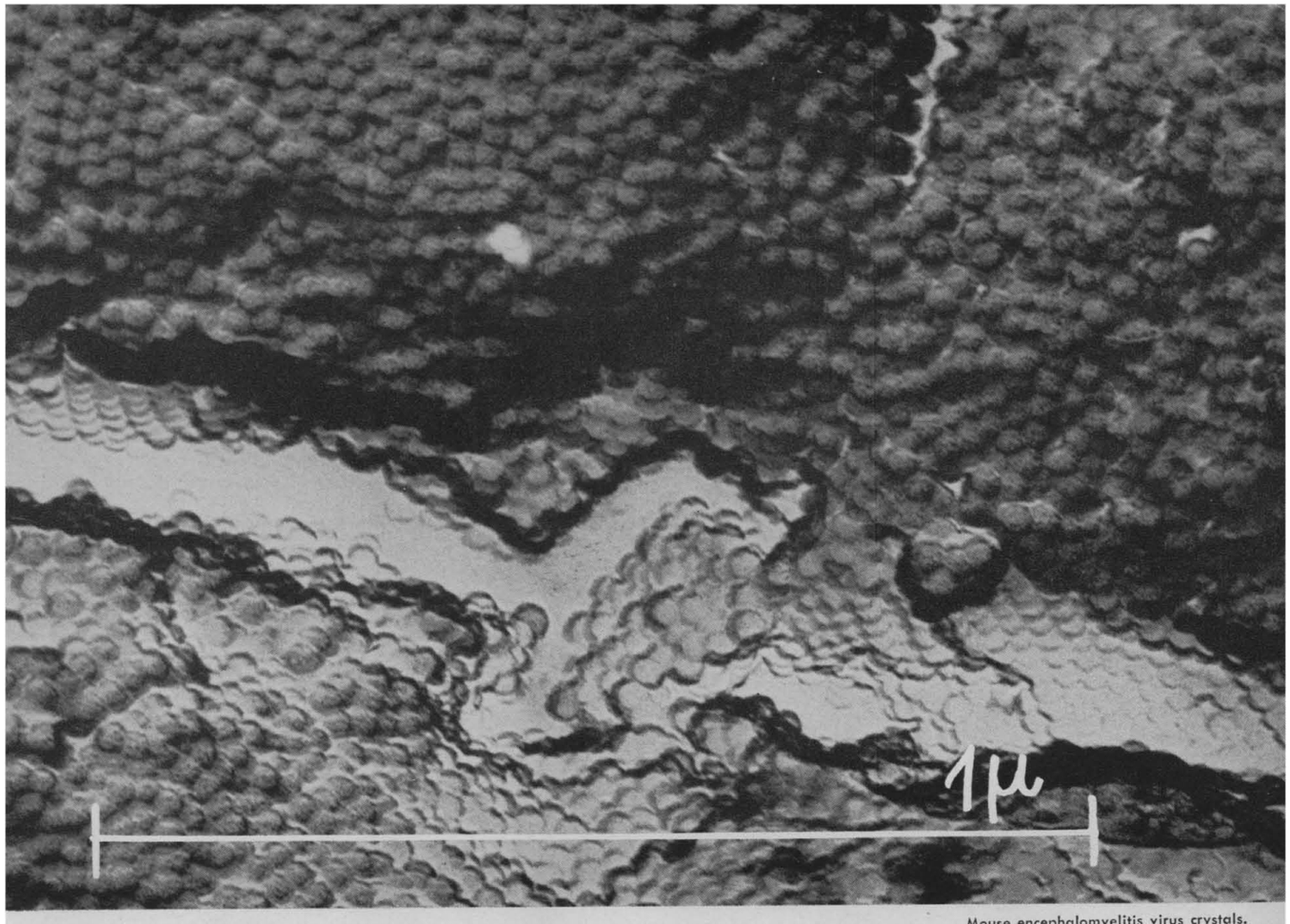
NIKON MODEL 6 OPTICAL COMPARATOR



Mouse encephalomyelitis virus crystals.

You can achieve images like this routinely

The new Carl Zeiss Electron Microscope EM-9 can easily be operated by the scientist or the technician. Everything has been done to safeguard against operational errors. The entire control system is set up so that every essential control for manipulating the instrument is right at hand. Two operators can sit comfortably and observe the image on the luminescent screen through any one of three windows. The screen image can also be viewed through a microscope having a magnification of 10x.

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The image-forming system uses three electromagnetic-type electron lenses: the objective, intermediate lens and projector. The objective is equipped with an electrostatic correction system known as the "Stigmator." Distortion-free electron micrographs can be made in four fixed steps. 1500x, 5000x, 16,000x and 35,000x. Continuous magnification from 0 to 35,000x is also possible.

A novel principle for adjusting image brightness simplifies the electronics in the EM-9 considerably. The tele-focus cathode delivers a *constant* beam current of 40μA at a *constant* beam voltage of 60kV. The beam is oscillated across a central aperture at high frequency. Varying the amplitude of frequency varies the length of time the beam remains over the aperture and hence the total energy of the beam.

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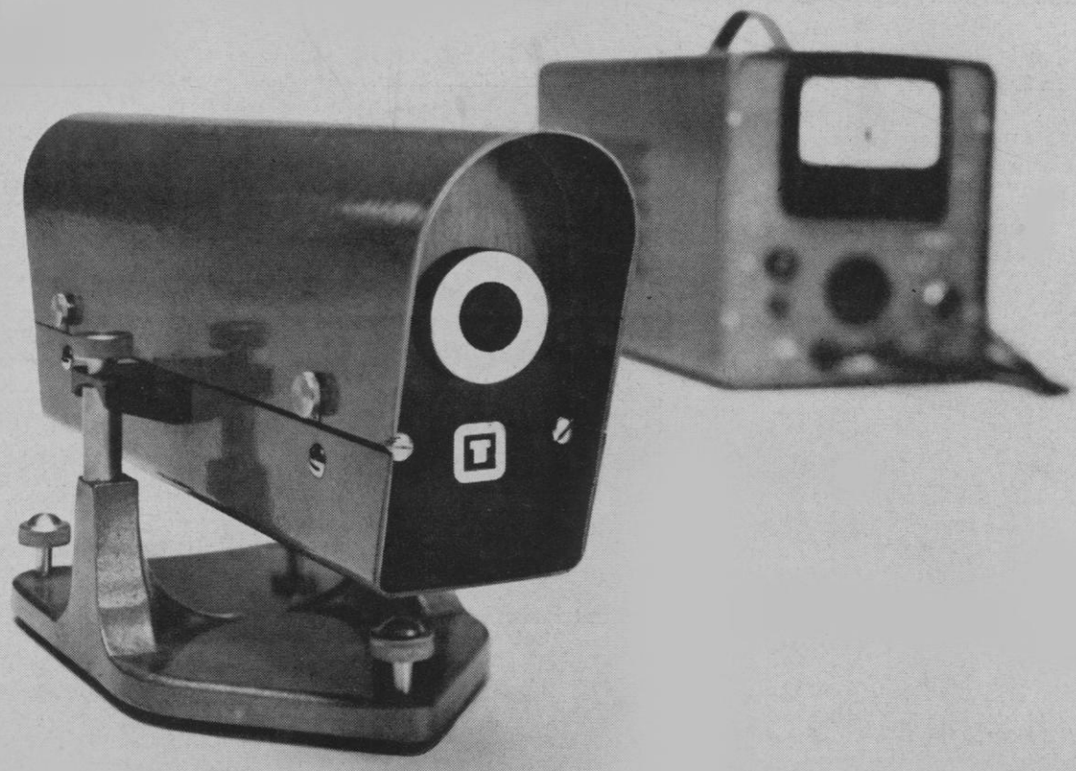

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OPTICAL CALORIMETER/$650 Entirely new, measures CW or pulsed LASER energy from .05-200 joules, through the visible and infrared spectrum, independent of pulse length.

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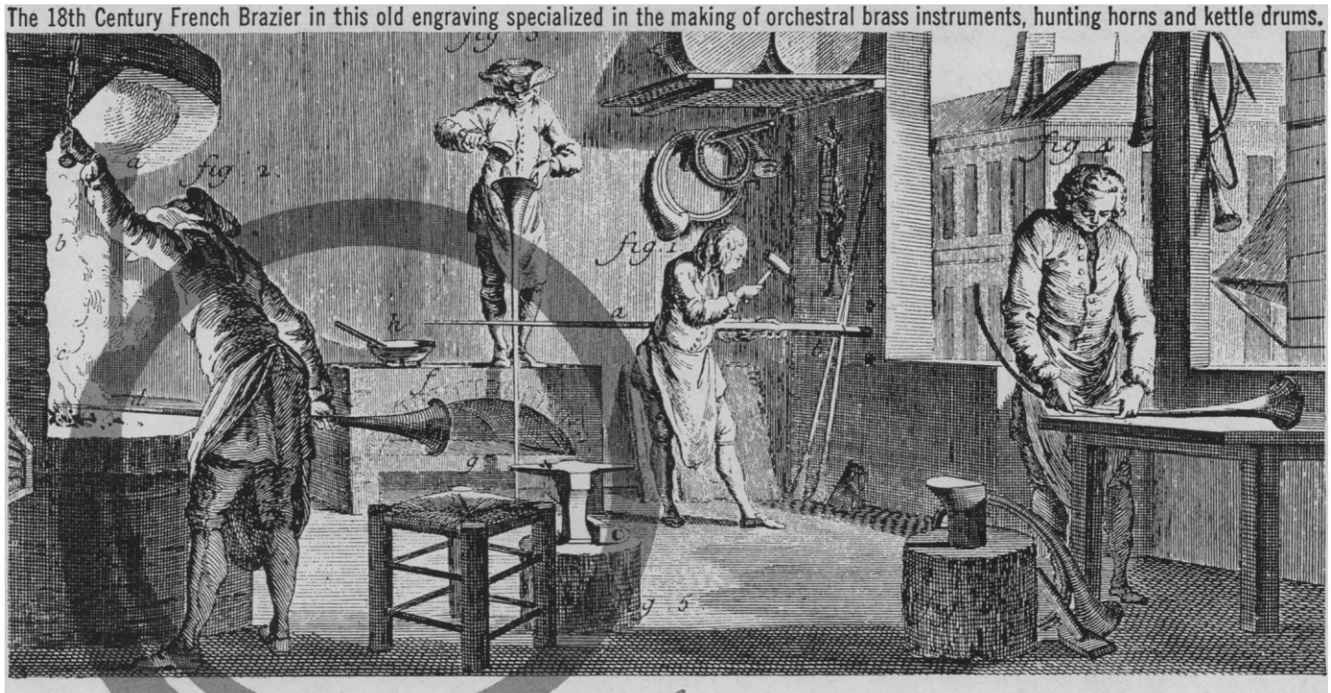

HOW MANY TUNES FROM ONE HORN?

HOW MANY JOBS FOR ONE RECORDER?

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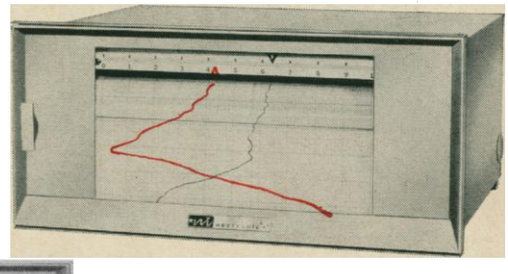

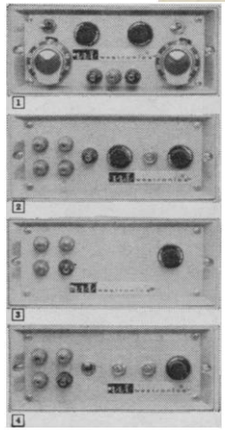

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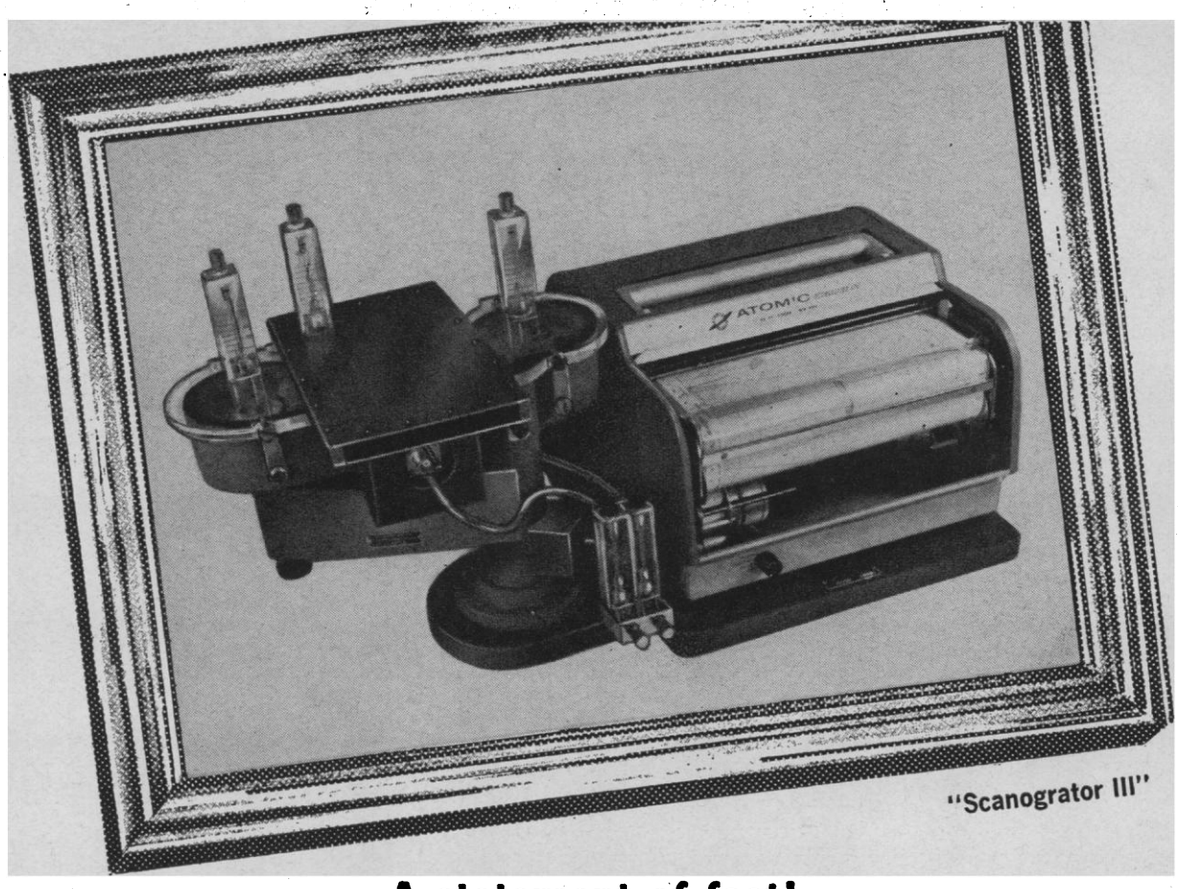

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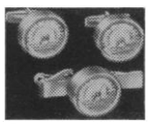

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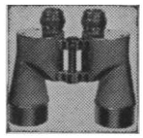

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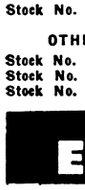

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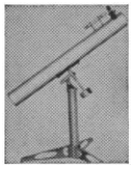

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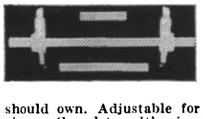

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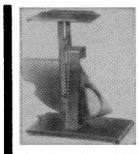

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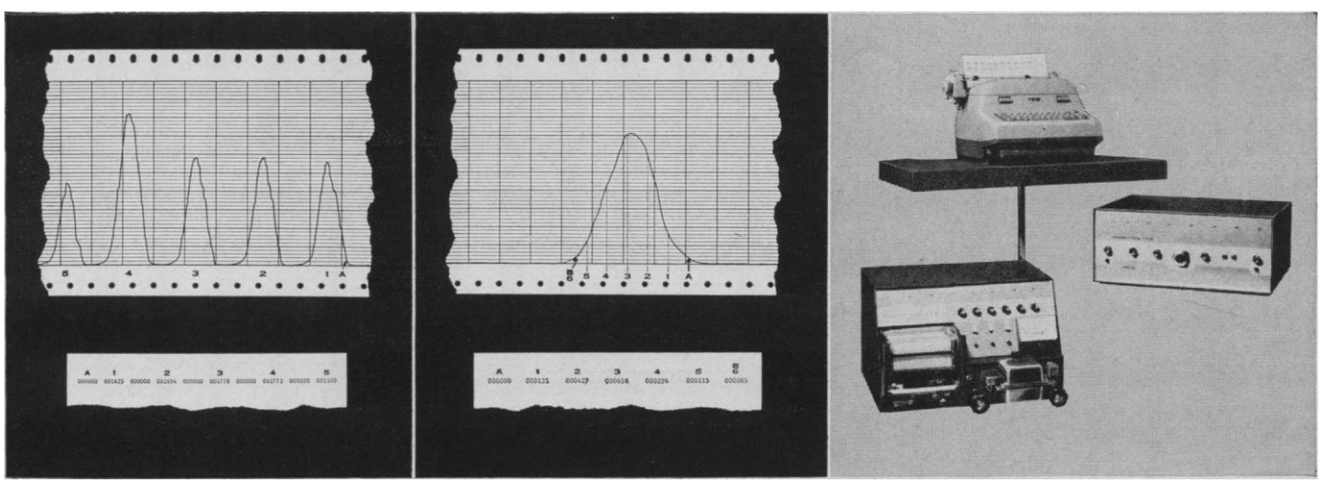
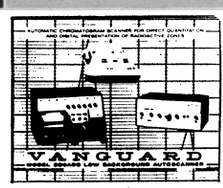
Now both qualitative and quantitative assays of chromatograms can be performed automatically *on the intact strip* with greater accuracy and efficiency than ever thought possible. The exclusive, ultra-sensitive Vanguard Model 880ADS Low Background AUTOSCANNER with Automatic Data System scans, detects and presents radioactivity in direct digital form, eliminating the need for mechanical integration, planimetry and triangulation. Designed for scanning of tritium, carbon-14, sulphur-35 and other low-energy, beta-emitting radioisotopes, the AUTOSCANNER features windowless, 4 pi detection with a total background of less than 10 cpm. Two mode Logic Function Control permits programming to present various parameters of entire scan while eliminating unwanted data. Digital information, therefore, may be utilized through all phases of the quantitating procedure.

Investigate today! See how the designed-in versatility of the Model 880ADS can meet your scanning applications with clear, precise data presentations in a minimum of time with little or no operator supervision.



Shown above are the two modes of Data Presentation available with the model 880ADS. Digital information obtained in the Peak Print mode (left) and the Interval Print mode (right) is utilized through all phases of the quantitating procedure.



WRITE FOR THIS BOOKLET . . . Outlines distinctive features and operational characteristics of the Vanguard Model 880ADS Low Background AUTOSCANNER.

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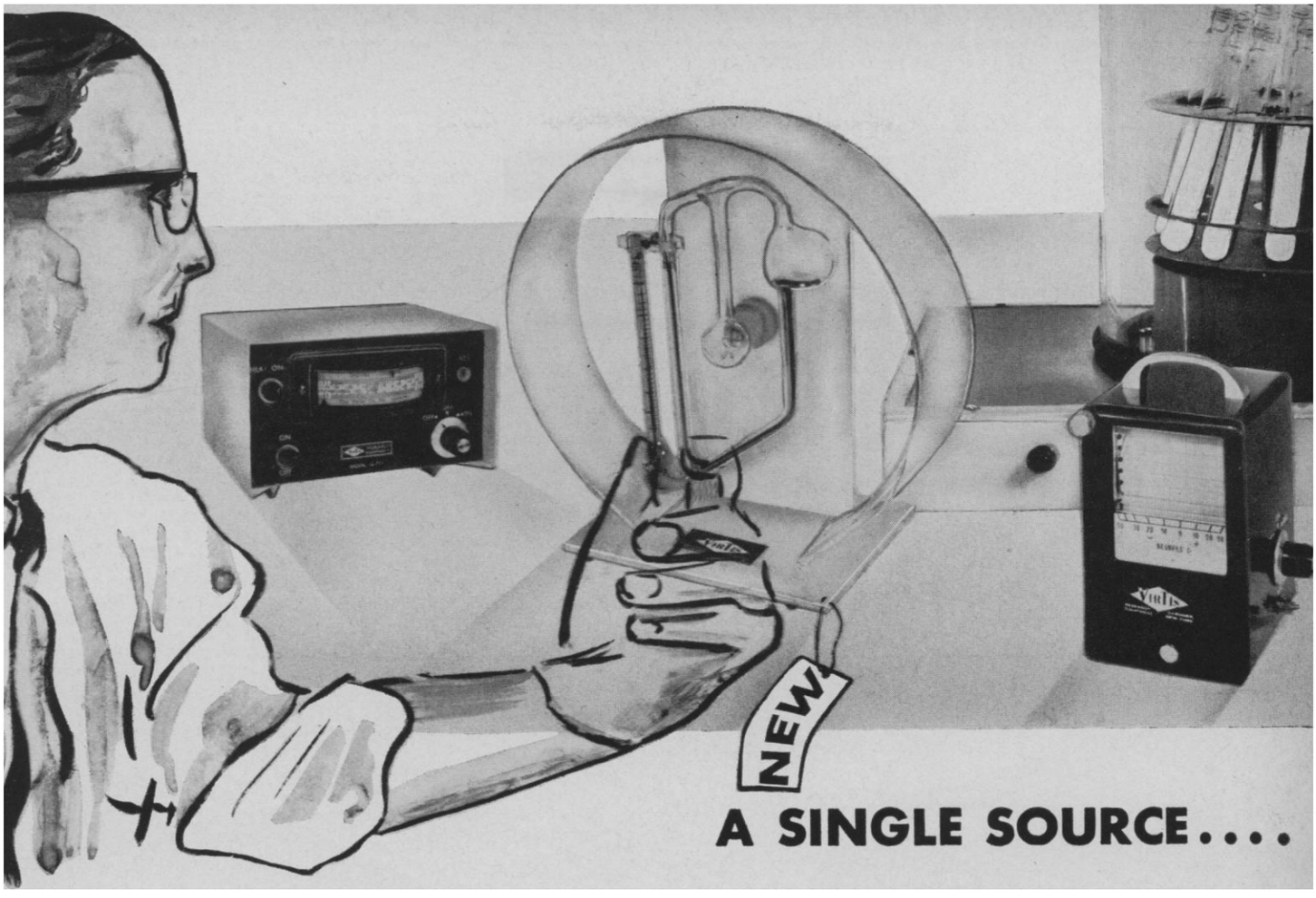

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THE NEW CENTRIFUGAL BIO-DRYER is a remarkably convenient instrument for freeze-drying small volumes of heat sensitive biologicals. No dry ice or mechanical refrigeration is required.

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NEW VirTis McLEOD GAUGE — The two major problems encountered with the traditional tilting McLeod Gauge —difficulty in cleaning and splashing of mercury with sudden vacuum release— are eliminated in the new VirTis McLeod Gauge. Splashing of mercury—which can damage a McLeod gauge when vacuum is suddenly released—is prevented by a Pyrex Brand glass ball check valve incorporated in the polypropylene vacuum connection.

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The VirTis McLeod Gauge Plexiglas housing combines complete circumferential protection with direct operation of the gauge.

SAMPLE TEMPERATURE RECORDER — The quality of a freeze-dried product is directly related to the temperature at which the material is dried. Too high a temperature results in partial or total destruction of heat sensitive biologicals. Too low a drying temperature, although not harmful to the product, results in excessively long drying times. This invaluable information for research investigations or quality control can now be obtained at a fraction of the cost of traditional recording equipment.

The VirTis Sample Temperature Recorder provides a continuous, permanent written record of the product temperature during the entire freeze-drying process. To use this recorder, simply freeze the temperature thermistor probe (which measures only 1" long x ⅛" in diameter with 3' Teflon coated wire and phono plug) in a representative sample. Sample temperature may be recorded for either bulk or manifold freeze-drying procedures.

SAMPLE TEMPERATURE CONTROLLER—Precise bulk freeze-drying studies require samples to be dried at or below their eutectic temperatures during removal of most of the water content of the material and control over the final dried product temperature. The VirTis Sample Temperature Controller performs this function automatically. Sample temperature is continuously indicated and controlled between —50° C and +30° C — the complete range of interest in freeze-drying procedures.

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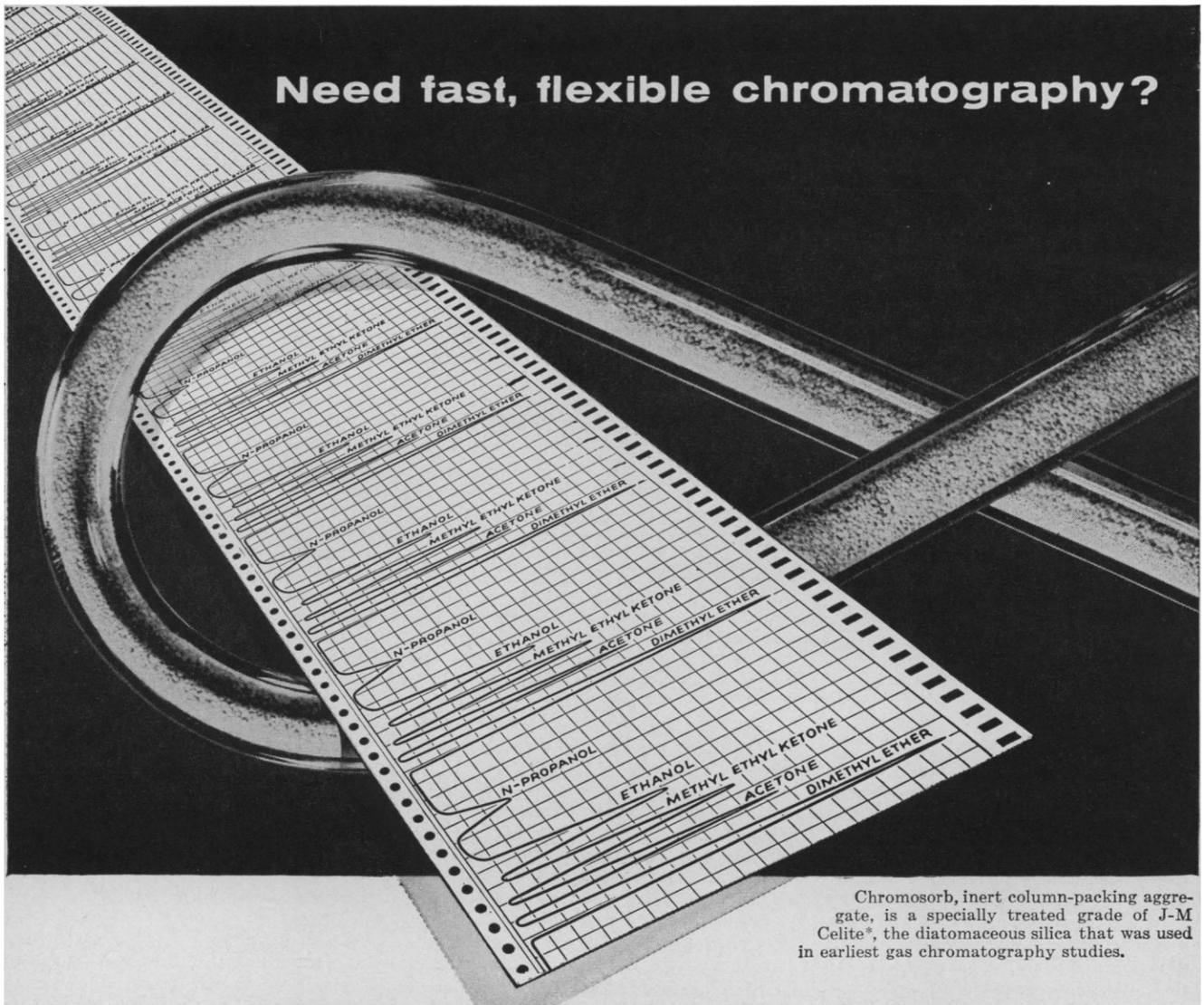

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Moisture—% by weight, maximum	1.0
pH (avg.)	6-7
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For chromatographic studies . . . Chromosorb W

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Flux calcined diatomaceous earth aggregate.

Color	white
Free Fall Density—lbs./cu. ft. (avg.)	15-16
Specific Gravity—true	2.30
Water Absorption—cc./gr. (avg.)	4.0-5.0
Moisture—% by weight, maximum	1.0
pH (avg.)	8-10
Surface Area (BET Method)—sq. m./gr. (avg.)	3-4

For fine filtration of liquids in laboratory application . . . Celite Analytical Filter Aid

Quality diatomite, calcined at high temperatures and acid-washed to remove organic and inorganic impurities. Filters out all types of precipitates, including the difficult-to-handle gelatinous and semi-colloidal materials, and produces brilliantly clear filtrates at high flow rates.

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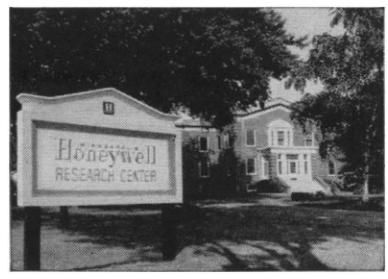


Magnetic Remanence at Cryogenic Temperatures

Many of the properties of metals are still little understood. Studies of the magnetic properties of dilute metal alloys in the cryogenic temperature range are providing new insights into magnetic characteristics as well as permitting observation of behavior heretofore expressed only in theory.

Conventional magnetism in such metals as iron, cobalt and nickel results from atoms which have magnetic moments and act as individual magnets. At the Curie temperature (iron 770° C) these moments commence spontaneous alignment with each other.

In a ferromagnetic state all the atomic magnetic moments are aligned in the same direction and set up a magnetic field. In the antiferromagnetic state the atomic magnetic moments prefer to align themselves in opposition to each other. This results in long range order in which alternate moments are aligned in opposition thus cancelling out any total magnetism.

It is not clearly understood why, in certain magnetic materials, the atoms are arranged in a ferromagnetic or antiferromagnetic state. This choice appears to depend upon the separation or distance between atoms. In a simple system (for example two atoms) the force that aligns the atomic magnetic moments is called an exchange force. When orbits overlap, electrons tend to be exchanged between atoms. This tends to split electron states. Individual electron states identical for each atom now become multiple states. One state corresponds to spin alignment, the other to an alignment of opposition. Whichever state has the lower energy level will determine whether the resulting magnetic state will be ferromagnetic or antiferromagnetic. When moving from a two atom system to a lattice, simplicity is lost and the problem becomes complex.

Honeywell's approach to understanding such phenomena is to study the magnetic properties of dilute alloys where small amounts of magnetic metals are introduced into a noble non-magnetic metal. By this method degree of orbital overlap can be controlled and average distance between orbits determined.

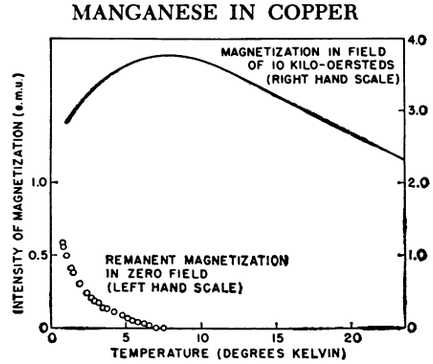
Cryogenic temperatures enter here because the Curie temperature is expected to be lowered by dilution; at this temperature or below the strength of interaction of the magnetic moments can be observed.

Honeywell scientists are working with copper manganese.

Above the Curie temperature, the alloy has conventional magnetic properties. While lowering the temperature in a constant field, measurements of the magnetic susceptibility are taken (a measure of magnetic moment induced in the alloy by a magnetic field).

Measurements show that the susceptibility goes through a maximum. The temperature at which this occurs and the susceptibility are determined by the amount of dilution.

INTENSITY OF MAGNETIZATION vs TEMPERATURE: 1 ATOMIC % MANGANESE IN COPPER



Honeywell scientists are also working with copper manganese alloys from 0.47 to 10.0% manganese at temperatures of 0.6° to 40° Kelvin using a liquid helium refrigerator. Typical results are shown at left. When the magnetic field is removed a small amount of remanent magnetism remains. This remanent magnetism is temperature dependent. If the specimen were ferromagnetic its temperature dependence curve would be different.

The internal magnetism cannot be accounted for by the direct exchange interaction of manganese atoms. It is more likely that the solvent, in this case copper, is not inert but furnishes a medium for transmittal of magnetic forces between the solute manganese atoms.

In all probability the conduction electrons of the solvent metal provide the medium of communication between magnetic atoms.

Honeywell scientists have estimated the magnitude of this internal field and calculated domain sizes. Indications are that the inner field effect continues in a systematic fashion to the lowest dilution. Work is continuing with several other alloys.

Observation and measurement of these magnetic phenomena can lead to further understanding and use of the thermal, magnetic and electrical properties of metals.

Coupled with other work in the cryogenic areas this information can aid scientists in a more complete and fundamental understanding of materials in general. This in turn can assist in overcoming the intrinsic limitations of materials in practical engineering applications.

If you are engaged in scientific work involving magnetism in the cryogenic range and would like to know more about Honeywell's research in this area you are invited to correspond with Dr. Olin Lutes, Honeywell Research Center, Hopkins, Minnesota.

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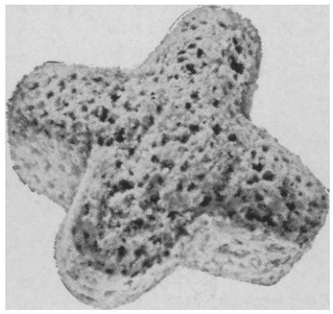
The Rx Rockland Forum

ANNOUNCING... NEW Rx ROCKLAND LABORATORY PRIMATE DIET

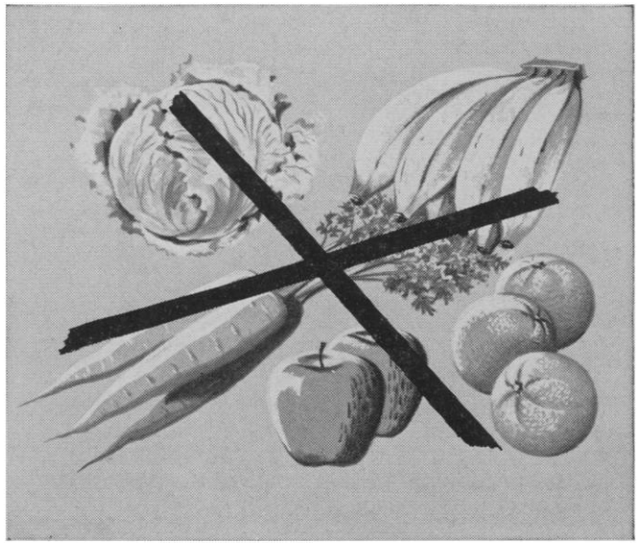


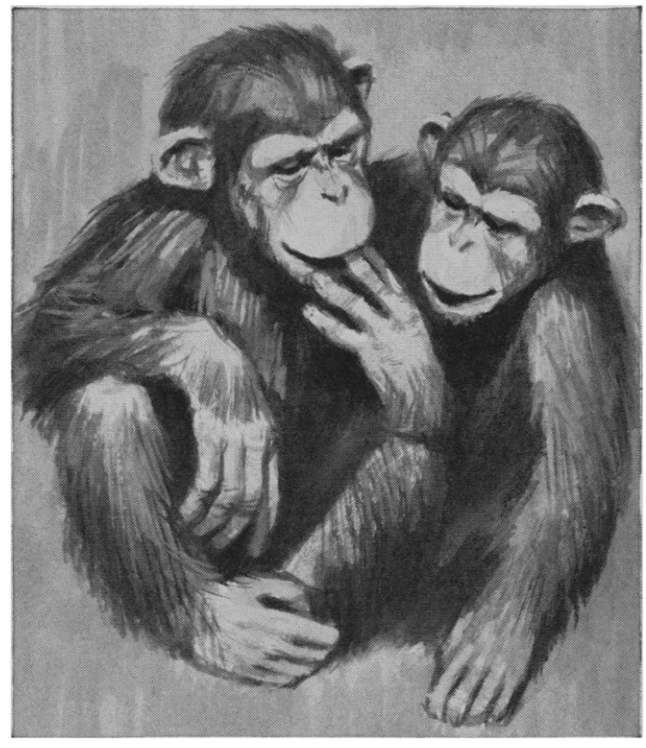
new star shape

A "New Star" in Primate Nutrition... feeding economy... palatability... process and shape

Investigators agree that laboratory primates, especially during the process of their acclimation, exhibit their natural traits and characteristics in their eating habits and become suspicious, choosy and selective eaters. Every feeding, especially during this initial period, becomes a challenge for the investigator.

To meet this challenge and insure ready response at feeding time, Staley research has developed NEW ROCKLAND Laboratory Primate Diet—a *highly palatable, nutritionally complete* formulation. No supplementation of fruits and vegetables as sources of Vitamin C is necessary when fed within the dating period indicated on the tag affixed to the bag.





Another *extremely valuable* advantage incorporated into this product is its shape. Best described as STAR SHAPE, its measurements between points are 2 inches —with a length of 1½ inches and a thickness of ¾ inch.

After considerable feed testing and research, the new star shape was selected over several other physical forms. The star shape and proportions of Rockland Laboratory Primate Diet not only provide the primates with greater biting surface, but also affect feeding economies as food will not fall through the cage floor.

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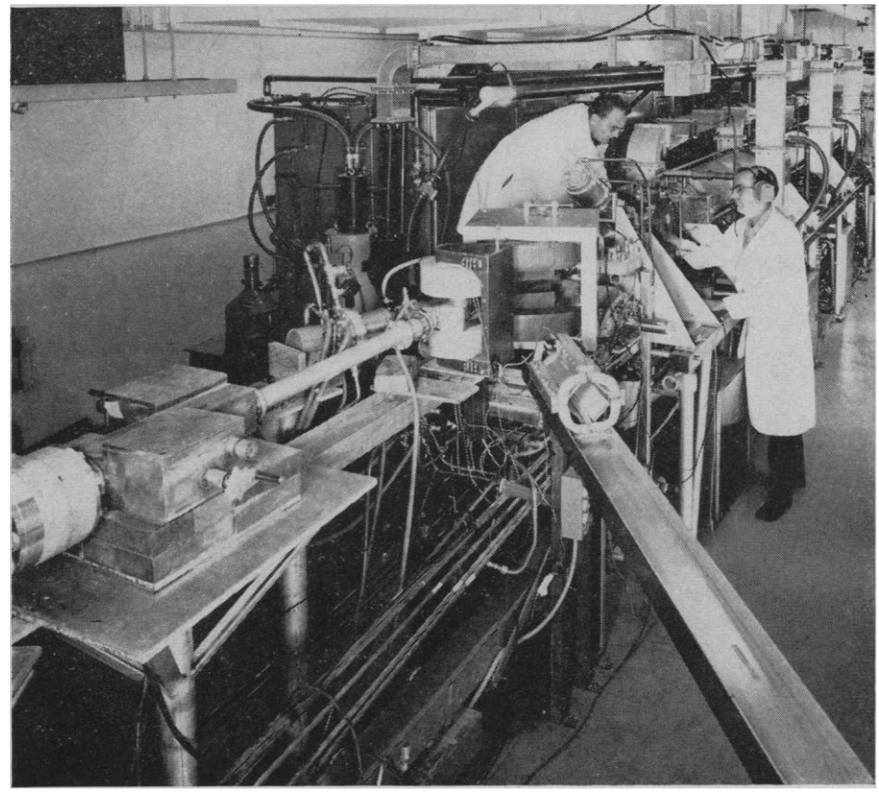
Rx ROCKLAND™ DIETS

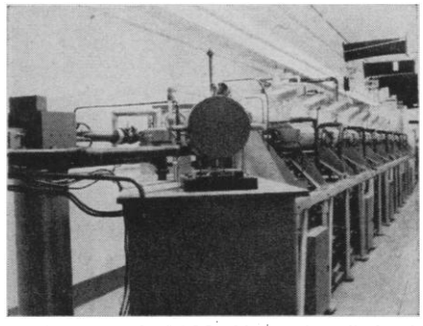
New Research Linac Delivers 10 Nanosecond Electron Bursts



An ARCO 45 Mev linear accelerator — delivering electron bursts as short as ten one-billionths of a second has recently been installed for advanced research at the General Atomic Division of General Dynamics Corporation.

This Linac, the first of its kind intended for broad range basic and applied research, has the following performance characteristics:

Energy range . . . 3-45 Mev
Peak beam current . . . 700 ma
Average power at 30 Mev . . . 12 kw
Repetition rate . . . 720 pps max
Frequency L Band . . . 1300 mc/sec
Pulse Length . . . 10 ns to 10 μ sec



High powered ARCO Linac, installed at Rensselaer Polytechnic Institute, Troy, N. Y., for research in physics, chemistry and biology, recently exceeded its guaranteed specifications by accelerating 55 kilowatts (average power) of pulsed electrons at 48 million electron volts. At 66 Mev, the machine produced 2 amperes in 0.3 microsecond pulses.

The electrons are accelerated by synchronized, high-power traveling radio microwaves in three 1.5 meter waveguide sections. With proper converter targets, the beam of electrons can be used to produce pulses of neutrons, positrons and gamma rays for a variety of experiments.

Experiments to be performed with the accelerator will range from basic exploration of the atomic nucleus to improved methods of food sterilization. With its very short pulse capability, studies of transient phenomena can be made before other effects which might interfere with the experiment have time to occur. The Linac will be used to simulate radiation effects associated with nuclear explosions and space travel.

Programs planned or under way at General Atomic include investigations of neutron thermalization in typical reactor materials / neutron capture cross section measurements/ photonuclear studies with monoenergetic gamma rays produced by positron in-flight annihilation / studies of the behavior of transistors and other electronic components when subjected to sudden bursts of radiation / investigations of accelerator-pulsed multiplying assemblies / sterilization of food / and weapon effects simulation.

Among the important features of the installation is a pulsed directional magnet which will permit deflection of alternate beam pulses down different beam tubes, allowing simultaneous experiments. The facility has six flight paths and fifteen beam ports — an ARCO beam handling system which greatly increases the research efficiency of the system.

In the new Linac, increased versatility and precision have been made available to the user in energy and pulse parameters; and in daily operation a degree of reliability has been attained unheard of a few years ago. Unmatched performance is the result of a continuous and sophisticated R &D program at the Applied Radiation Corporation.

Write for a comprehensive 44 page brochure describing the capabilities of, and applications for ARCO Linacs, or contact Technical Sales for specific performance information.

Reliability from experience with more than 300 particle accelerators in the field.

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HIGH VOLTAGE ENGINEERING (EUROPA) N.V.

13 July 1962, Volume 137, Number 3524

SCIENCE

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You Can't Go Home Again

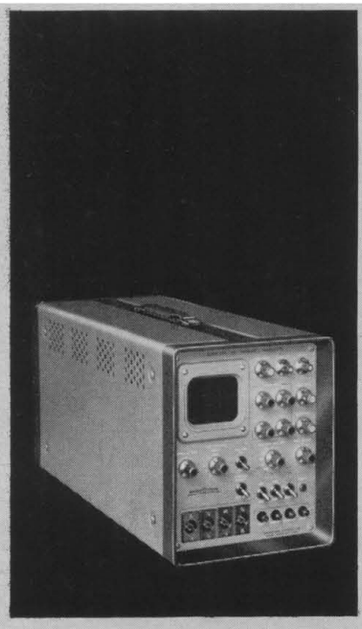
Thousands of scientists serve government as full-time employees, and other thousands serve as consultants on a temporary or intermittent basis. The current statutes governing conflicts of interest were designed mainly to prevent bribery and the prosecution of claims against government by employees or former employees in the days before the government required so many consultants and temporary employees. Thus, it is a criminal offense for any employee of government to receive pay from a source other than the government. Rulings of the attorney general make it possible for part-time consultants to continue on the payroll of outside institutions and to participate in pension or stock-sharing plans while working for the government. A bill (H.R. 8140) to bring order into the whole field has been passed by the House and is now being considered by the Senate Judiciary Committee. Although the bill has one major defect, discussed below, it will go a long way toward bringing the conflict-of-interest laws up to date and, if properly modified, will help the government to recruit part-time and full-time scientists.

An important feature of the bill is the section that creates a new class of government employees called "special government employees." This category will include those employees—consultants, panel members, and so on—who serve no longer than 130 days in any 365-day period. A special government employee will be partially exempted from the provision that prevents a government employee from receiving compensation for performing services for others in a matter in which the government is interested. He will be subject to the prohibition (i) in a matter in which he had taken part "substantially and personally" as a government employee; (ii) in a matter which within 2 years has been a part of his official responsibility; or (iii) in a matter pending in the agency in which he serves for more than 15 days per year. According to testimony by Nicholas Katzenbach, deputy attorney general, government scientific agencies think that the second and third restrictions are unnecessary; the Administration agrees about the second but thinks the third should be retained and modified to apply to periods up to 60 days.

Another section of the bill exempts special government employees from the restriction on receiving compensation from a private source for services to the government. This would give a statutory base for present practice and would permit special employees to continue to take part in pension or other welfare plans of their former employers.

These sections of the bill are in tune with the needs of the day. But there is one section that has aroused serious concern on the part of the government scientific agencies. This section [207 (b)] would bar a former employee—regular or special—from appearing as an agent or attorney in connection with any matter for which he had had official responsibility within a 2-year period prior to his leaving the government. Strictly interpreted, this would mean that men in the higher-ranking positions would be barred from taking executive jobs with such private agencies as universities and industries which have government grants or contracts. Since the prohibition applies to both special and regular employees, recruitment for government jobs at higher levels would become almost impossible, since those who would be willing to serve for a few years would have no job to return to after their government stint was over.

Unless the government is willing to settle for mediocrity in high posts, this section should be eliminated or greatly modified.—G. DuS.



New approaches to problems in technical measurement...

Minute electrical impulses previously unstudied or undependable as information because they were buried in high amplitude background noise take on new significance when they are put through the CAT computer. A four-input, digital computer of average transients, the CAT picks repetitive signals out of noise (even when ratios are as low as 1:100), stores them in its memory, averages them and displays the averaged signal for analysis — or sends them on to readout devices. This singular research instrument is the development of Mnemotron Corporation, a subsidiary of Technical Measurement Corporation.

The CAT computer shows promise in many applications in biological and physical research. For instance, it is used to measure and compare simultaneously evoked responses from different regions of the brain . . . to obtain time histograms of nerve action potentials . . . to single out faint communication signals for identification. The CAT can be used virtually anywhere that "signal-in-a-haystack" conditions exist.

As with the CAT, all Technical Measurement Corporation instruments represent progress in the realm of technical measurement. In nuclear research, for instance, the TMC family of pulse analyzers include the only 256-channel system with a choice of seven plug-in logic circuits; the most portable 400-channel pulse height analyzer available, and the world's first production 4096-channel time-of-flight analysis system. In telemetry, another TMC subsidiary, Telemetrics, Inc., provides reliable ground station equipment for military and space exploration installations.

If you are interested in the remarkably wide application possibilities of the CAT, write the Mnemotron Corporation, Pearl River, N.Y. If your problems are in the realm of nuclear research or telemetry, contact Technical Measurement Corporation, North Haven, Connecticut.

TMC

TECHNICAL MEASUREMENT CORPORATION
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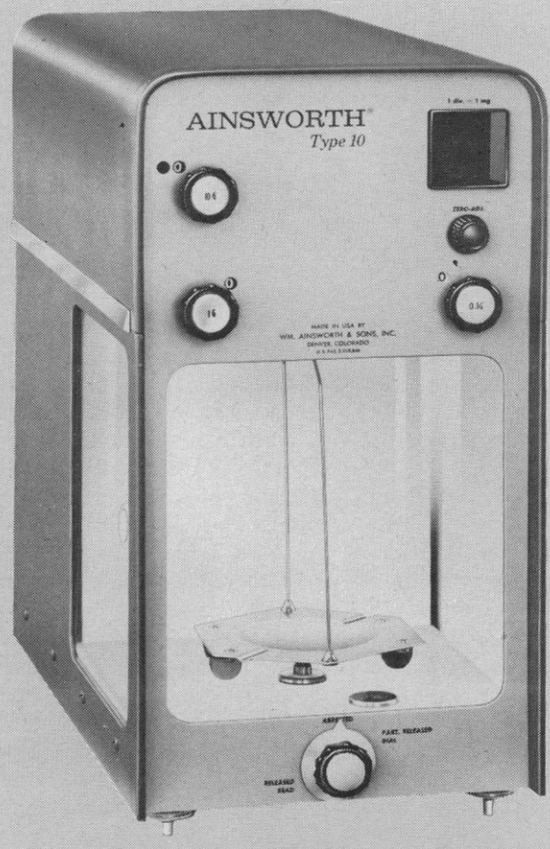
Salvation for small signals lost in high background noise

NEW COMPACT



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discussion of the possible untoward effects of preservation practices upon humans, heightened and sharpened discussion after each of the lectures in this session.

F. E. Deatherage (Ohio State) described the reluctance of regulatory agencies around the world, particularly in meat-deficient areas, to accept clear-cut data which seemed to show that the health hazards originally predicted have not to this time been substantiated.

Deatherage has, since 1953, studied the preservation of red meat with antibiotics and has reported repeatedly the effective suppression of spoilage bacteria with antibiotics, particularly with the tetracycline antibiotics. Spoilage in the lymphal system, referred to as "deep spoilage," has been significantly delayed in unrefrigerated meat with tetracycline (1 to 2 parts per million), with concomitant twofold and even threefold increases in keeping time.

The use of antibiotics in canned foods was discussed by H. B. Hawley (Somerset, England). It was pointed out that the major consideration in canning foods was the requirement for absolute elimination of spores of *Clostridium botulinum*. Hence, the canning industry is unable to consider treatment with antibiotics a substitute for heat treatment (treatment at 250°F for 3 minutes) but considers it an adjunct to heat treatment.

It has been shown that with the minimum heat treatment a number of thermophyllic bacterial spores persist and cause spoilage. For this reason, combinations of antibiotics and heat treatments have been evaluated. Heat treatments supplemented by treatment with the antibiotic subtilin delayed spoilage by the thermophile *Bacillus stereothermophilus*. Other studies have revealed that subtilin, penicillin, and a macrolide antibiotic, tylosin, sensitized spores of thermophiles with respect to heat so that they were killed either by lower temperatures or by shorter exposures to heat. There is some evidence to suggest that these compounds, as well as nisin, are only effective against heat-injured cells. Of further interest is the fact that tylosin and nisin have a low order of mammalian toxicity and may yet be cleared for use in canning.

J. M. Shewan (Torry Research Station, Aberdeen) outlined the British experience with antibiotics in fish preservation. On the basis of accumulated data on preservation, residues, and spoilage flora, parliamentary approval of the use of the tetracyclines (at levels not to exceed 5 parts per million) for preserving whole and filleted fish has been recommended.

A novel attempt to use antibiotics in bacterial classification was reported by A. Seaman and M. Woodbine (University of Nottingham). They concluded that such a technique was useful epidemiologically with organisms from similar environments.

E. H. Kampelmacher (Utrecht) reported on the nonmedical uses of antibiotics around the world, on the basis of a survey he made for the United Nations. He emphasized the proven value of antibiotics in food preservation and the potential value to developing nations of these techniques. Allusions to the theoretical public health hazards which might be precipitated arose and set the stage for the concluding session.

The final session was chaired by Sir Howard W. Florey, Nobel laureate and president of the Royal Society. H. Williams-Smith (Animal Health Trust, Essex) spoke on the emergence of antibiotic-resistant disease-producing organisms, and H. S. Goldberg (University of Missouri) discussed studies on humans exposed to antibiotics nonmedically. Williams-Smith concluded that although antibiotics in feeds did cause the emergence of antibiotic-resistant pathogens, the advantages of such use outweighed the disadvantages. Alterations of accepted chemotherapeutic techniques were often required, he said, but no public health hazard exists, since the emerging resistant animal pathogens are not pathogenic for man.

Goldberg discussed hypersensitivity studies on field workers spraying streptomycin for plant-disease control. In addition, he reported on antibiotic-resistant bacteria from humans given oxytetracyclin for 14 months at food-residue levels (5 to 10 parts per million). Streptomycin appeared to present no hazard in the amounts used in plant sprays. Long-term, low-level administration of oxytetracycline resulted in transient bacterial resistance. It was concluded that, in general, the public is not endangered by nonmedical uses of antibiotics.

The entire proceedings of the conference, including a summary of the discussions, will be published by Butterworths of London.

R. N. GOODMAN
H. S. GOLDBERG
University of Missouri, Columbia

Forthcoming Events

August

17–24. International Soc. for Human and Animal Mycology, congr., Montreal, Canada. (R. Vanbreuseghem, Institut de Médecine Tropicale, 155 rue Nationale, Antwerp, Belgium)

19–25. Microbiology, intern. congr., Montreal, Canada. (N. E. Gibbons, Natl. Research Council, Ottawa 2, Ont., Canada)

20–22. Progress in Nuclear Science and Engineering Education, conf., Gatlinburg, Tenn. (University Relations Div., Oak Ridge Inst. of Nuclear Studies, P.O. Box 117, Oak Ridge, Tenn.)

20–23. American Soc. of Agronomy, annual, Ithaca, N.Y. (ASA, 2702 Monroe St., Madison 5, Wis.)

20–23. Problems of Gyroscopy, symp., Celerina, Upper Engadine, Switzerland. (H. Ziegler, Comité Scientifique, UITAM, École Polytechnique Fédérale, Zurich, Switzerland)

20–24. Chemistry Congr., Abo, Finland. (E Wänninen, Turun Yliopiston Kemian Laitos Vattenborgsvägen 5, Abo 2)

20-24. Fracture, intern. conf., Seattle, Wash. (E. C. Roberts, Univ. of Washington, Seattle)

20–24. International Inst. of Refrigeration, Washington, D.C. (W. Pentzer, National Research Council, 2101 Constitution Ave., Washington 25)

20–24. Scientific Committee on Antarctic Research, mtg., Boulder, Colo. (by invitation). (Natl. Acad. of Sciences-Natl. Research Council, 2101 Constitution Ave., NW, Washington 25, D.C.)

20–24. Soil Science Soc. of America, annual, Ithaca, N.Y. (M. Stelly, American Soc. of Agronomy, 2702 Monroe St., Madison 5, Wis.)

20–24. Structural Design of Asphalt Pavements, intern. conf., Ann Arbor, Mich. (W. K. Parr, Box 619, Univ. of Michigan, Ann Arbor)

20–25. American Soc. of Limnology and Oceanography, Madison, Wis. (G. H. Lauff, Dept. of Zoology, Univ. of Michigan, Ann Arbor)

20-25. Hydraulics and Fluid Mechanics, intern. seminar, Santiago, Chile. (F. J. Dominguez Hydraulics Laboratory, Univ. of Chile, Santiago)

20–25. Limnology, intern, congr., Madison, Wis. (J. C. Wright, Birge Hall, Univ. of Wisconsin, Madison 6)

21–24. Electronics, exhibit and convention, Los Angeles, Calif. (Technical Program Chairman, WESCON Business Office, 1435 S. La Cienega Blvd., Los Angeles 35)

21–24. Far Infrared Spectroscopy, intern. symp., Cincinnati, Ohio. (Office of Information, Wright Air Development Div., Wright-Patterson Air Force Base, Ohio)

21–24. Fracture in Crystalline Solids, intern. conf., Maple Valley, Wash. (E. C. Roberts, Metallurgical Engineering Dept., Univ. of Washington, Seattle 5)

21–25. International Scientific Committee for Trypanosomiasis Research, mtg., Dalaba, Guinea, Africa. (Commission for Technical Cooperation in Africa South of the Sahara, Private Mail Bag 2359, Lagos, Nigeria, Africa)

21–28. Acoustics, intern. congr., Copenhagen, Denmark. (F. H. B. Interslav, Tekniske Højskole, Østervoldgade 10, Copenhagen)

21–6. Pan American Sanitary Conf., Minneapolis, Minn. (Pan American Sanitary Bureau, 1501 New Hampshire Ave., NW, Washington 6, D.C.)

22–23. International Commission on Radiological Units and Measurements, mtg., Montreal, Canada (members only). (H. O. Wyckoff, X-ray Section, Natl. Bureau of Standards, Washington 25, D.C.)

22–24. Calorimetry, annual conf., Berkeley, Calif. (J. A. Morrison, Div. of Pure Chemistry, Natl. Research Council, Ottawa, Ont., Canada)

22–24. X-ray Optics and Microanalysis, intern. conf., Stanford, Calif. (L. Zeitz, Biophysics Laboratory, Stanford Univ., Stanford)

22–25. Cytology, intern. congr., Rio de Janeiro, Brazil. (G. Carvalho, Rua S. Clemente, 443 Ap. 102 Botafogo, Rio de Janeiro)

22–25. Neurology Congr., Oslo, Norway. (S. Rufsum, Rikshospitalet, Oslo)

22–26. American Assoc. for the Advancement of Science, Alaska Div., Juneau, Alaska. (A. Sosnkowski, Alaska State Museum, Box 2051, Juneau)

23–24. Thin Films Conf., Denver, Colo. (R. B. Feagin, Univ. of Denver Research Inst., Denver 10)

23–25. Obstetrics and Gynecology, congr., Copenhagen, Denmark. (P. Lange, Eivindsvej 36 Chl., Copenhagen)

23–26. International Union of the History and Philosophy of Science, Philosophy Div., genl. assembly, Helsinki, Finland. (R. Taton, 64 rue Gay-Lussac, Paris 5e, France)

24–25. Friends of the Pleistocene, Rocky Mountain section, annual field trip, Twin Falls, Idaho. (H. E. Malde, U.S. Geological Survey, Federal Center, Denver, Colo.)

24–31. Child Psychiatry, intern. congr., Scheveningen, Netherlands. (Secretary, c/o Holland Organizing Center, Lange Voorhout 16, The Hague, Netherlands)

24–25. Plant Phenolics Group of North America, annual, Corvallis, Ore. (V. C. Runeckles, Imperial Tobacco Co. of Canada, P.O. Box 6500, Montreal, Quebec)

24–31. Analytical Psychology, intern. congr., Zurich, Switzerland. (G. S. Fegerl, Staefa, Kanton Zurich)

24–2. International Pharmaceutical Students' Federation, congr., Barcelona, Spain. (A. Damen, IPSF, Spaargarenstraat 26, Oegstegeest-Leiden, Netherlands)

25–26. International Chiropractors Assoc., annual, Davenport, Iowa. (G. R. Price, 741 Brady St., Davenport)

25–31. Environmental Control of Plant Growth, intern. symp., Canberra, Australia. (L. T. Evans, C.S.I.R.O., Div. of Plant Industry, P.O. Box 109, Canberra City, A.C.T., Australia)

26. American Assoc. of Electromyography and Electrodiagnosis, annual, New York, N.Y. (M. K. Newman, 16861 Wyoming Ave., Detroit 21, Mich.)

26–29. American Inst. of Chemical Engineers, natl. mtg., Denver, Colo. (F. H. Poettmann, Ohio Oil Co., P.O. Box 269, Littleton, Colo.)

26–29. Soil Conservation Soc. of America, Washington, D.C. (H. W. Pritchard, 838 Fifth Ave., Des Moines 14, Iowa)

26–31. American Inst. of Biological Sciences–American Assoc. for the Advancement of Science, Pacific Div., Corvallis, Ore. (AIBS, 2000 P St., NW, Washington 6, D.C.)

The following 27 meetings are being held under AIBS auspices during the annual meeting in Corvallis:

American Bryological Soc. (R. O. Belkengren, Dept. of Botany & Plant Pathology, Oregon State Univ., Corvallis)

American Fern Soc. (L. Dennis, Dept. of Botany & Plant Pathology, Oregon State Univ., Corvallis)

American Fisheries Soc. (J. H. Wales, Fish & Game Management, Oregon State Univ., Corvallis)

American Microscopical Soc. (H. K. Phinney, Dept. of Botany & Plant Pathology, Oregon State Univ., Corvallis)

American Phytopathological Soc. (E. K. Vaughan, Dept. of Botany & Plant Pathology, Oregon State Univ., Corvallis)

American Soc. for Horticultural Science. (S. B. Apple, Jr., Dept. of Horticulture, Oregon State Univ., Corvallis)

American Soc. of Human Genetics. (J. D. Mohler, Dept. of Zoology, Oregon State Univ., Corvallis)

American Soc. of Limnology & Oceanography. (J. Pattullo, Dept. of Oceanography, Oregon State Univ., Corvallis)

American Soc. of Plant Physiologists. (H. J. Evans, Dept. of Botany & Plant Pathology, Oregon State Univ., Corvallis)

American Soc. of Plant Taxonomists. (K. L. Chambers, Dept. of Botany & Plant Pathology, Oregon State Univ., Corvallis)

American Soc. of Zoologists. (A. W. Pritchard, Dept. of Zoology, Oregon State Univ., Corvallis)

Biometric Soc. (L. D. Calvin, Statistical Laboratory, Oregon State Univ., Corvallis)

Botanical Soc. of America. (L. E. Jones, Dept. of Botany and Plant Pathology, Oregon State Univ., Corvallis)

Ecological Soc. of America. (W. W. Chilcote, Dept. of Botany & Plant Pathology, Oregon State Univ., Corvallis)

Genetics Soc. of America. (R. Bogart, Dept. of Dairy & Animal Husbandry, Oregon State Univ., Corvallis)

Mycological Soc. of America. (C. M. Leach, Dept. of Botany & Plant Pathology, Oregon State Univ., Corvallis)

National Assoc. of Biology Teachers. (S. E. Williamson, Dept. of Science Education, Oregon State Univ., Corvallis)

Nature Conservancy. (R. M. Storm, Dept. of Zoology, Oregon State Univ., Corvallis)

Phi Sigma Soc. (W. H. Brandt, Dept. of Botany & Plant Pathology, Oregon State Univ., Corvallis)

Phycological Soc. of America. (H. K. Phinney, Dept. of Botany & Plant Pathology, Oregon State Univ., Corvallis)

Plant Phenolics Group of America. (H. Aft, Forest Products Laboratory, Oregon State Univ., Corvallis)

Society for Industrial Microbiology. (R. Bogart, Dept. of Dairy and Animal Husbandry, Oregon State Univ., Corvallis)

Society for the Study of Evolution, (W. F. Stephen, Dept. of Entomology, Oregon State Univ., Corvallis)

Society for the Study of Development and Growth. (A. W. Pritchard, Dept. of Zoology, Oregon State Univ., Corvallis)

Society of General Physiologists. (E. J. Dornfeld, Dept. of Zoology, Oregon State Univ., Corvallis)

Society of Protozoologists. (S. E. Knapp, Dept. of Veterinary Medicine, Oregon State Univ., Corvallis)

Tomato Genetics Cooperative. (W. A. Frazier, Dept. of Horticulture, Oregon State Univ., Corvallis)

The following nine meetings are being held under AAAS auspices during the annual meeting of the Pacific Division:

American Meteorological Soc. (L. D. Calvin, Statistical Laboratory, Oregon State Univ., Corvallis)

American Nature Study Soc. (R. E. Storm, Dept. of Zoology, Oregon State Univ., Corvallis)

American Soc. of Ichthyologists & Herpetologists, Western Div. (R. E. Storm, Dept. of Zoology, Oregon State Univ., Corvallis)

American Soc. of Limnology & Oceanography, Pacific Div. (J. Pattullo, Dept. of Oceanography, Oregon State Univ., Corvallis)

Institute of Food Technologists. (C. E. Samuels, Dept. of Food & Dairy Technology, Oregon State Univ., Corvallis)

Oregon Acad. of Science. (F. A. Gilfillan, Dean of Sciences, Oregon State Univ., Corvallis)

Oregon Marine Biological Soc. (J. H.

Wilson, Public Health Service, Portland, Ore.)

Society of Systematic Zoology. (J. D. Lattin, Dept. of Entomology, Oregon State Univ., Corvallis)

Western Soc. of Soil Science. (T. L. Jackson, Dept. of Soils, Oregon State Univ., Corvallis)

26–31. International Commission for Uniform Methods of Sugar Analysis, session, Berlin, Germany. (F. Schneider, Langer Kamp 5, Braunschweig, Germany)

26–1. International Federation of Information Processing Societies, annual, Munich, Germany. (I. L. Auerbach, Auerbach Electronics Corp., 1634 Arch St., Philadelphia 3, Pa.)

26–1. Radiology, intern. congr., Montreal, Canada. (C. B. Peirce, Suite 204, 1555 Summerhill Ave., Montreal 25)

26–2. History of Science, intern. congr., Ithaca, N.Y. (26–31 Aug.), and Philadelphia, Pa. (31 Aug.–2 Sept.). (Secretary, Intern. Congr. of the History of Science, Cornell Univ., Ithaca)

27–28. Culture Collections, conf., Ottawa, Ont., Canada (by invitation). (S. M. Martin, Div. of Applied Biology, Natl. Research Council, Ottawa 2)

27–28. Scandinavian Neurosurgical Soc., annual, Odense, Denmark. (B. Broager, Neurokirurgisk Afdeling, Bispebjerg Hospital, Copenhagen, Denmark)

27–29. American Physical Soc., Seattle, Wash. (H. A. Shugart, Univ. of California, Berkeley 4)

27–29. Ballistic Missile and Space Technology, symp., Los Angeles, Calif. (C. T. Morrow, Aerospace Corp., P.O. Box 95085, Los Angeles 45)

27–29. Mathematical Assoc. of America, summer mtg., Vancouver, B.C. (H. L. Alder, MAA, Dept. of Mathematics, Univ. of California, Davis)

27–29. Metallurgy of Semiconductor Materials, conf., Philadelphia, Pa. (Amer. Inst. of Mining, Metallurgical, and Petroleum Engineers, 345 E. 47 St., New York 17, N.Y.)

27–30. American Assoc. of Clinical Chemists, Santa Monica, Calif. (G. F. Lanchantin, Cedars of Lebanon Hosp., Los Angeles, Calif.)

27–30. American Astronomical Soc., New Haven, Conn. (H. J. Smith, Yale Observatory, 135 Prospect St., New Haven)

27–30. American Soc. for Pharmacology and Experimental Therapeutics, Nashville, Tenn. (H. G. Mandel, George Washington Univ. School of Medicine, 1337 H St., NW, Washington 5, D.C.)

27–30. British Orthopaedic Assoc.–Scandinavian Orthopedic Assoc., Copenhagen, Denmark. (A. Monberg, Orthopedic Service, St. Joseph Hospital, Copenhagen)

27–31. American Congr. of Physical Medicine and Rehabilitation, annual, New York, N.Y. (G. Gullickson, Jr., 30 N. Michigan Ave., Chicago 2, Ill.)

27–31. Space Technology and Science, intern. symp., Tokyo, Japan. (F. Tamaki, Inst. of Industrial Science, Univ. of Tokyo, Shin-Ryudo-cho 10, Minato-ku, Tokyo)

27–1. Application of Automatic Control in Prosthetics Design, intern. symp., Opatija, Yugoslavia. (Yugoslav Committee for Electronics and Automation, Terazije 23, Belgrade)

27–1. Combustion, intern. symp., Ithaca, N.Y. (Combustion Symp. Office, Upson Hall, Sibley School of Mechanical Engineering, Cornell Univ., Ithaca)

27–1. International Council of the Aeronautical Sciences, congr., Stockholm, Sweden. (Mr. Bergquist, Flugtechniska Föreningen, Bromma 11, Stockholm, Sweden)

27–1. Quantum Chemistry and Solid-State Physics, intern. symp., Rättvik, Dalarna, Sweden. (Director, Symmer Inst., Quantum Chemistry Group, Rundelsgränd 2A, Uppsala, Sweden)

27–2. Chemistry of Natural Products, intern. symp., Prague, Czechoslovakia. (Symposium Secretariat, P.O. Box 159, Prague 6, Dejvice)

27–8. International Dairy Federation, annual, Copenhagen, Denmark. (IDF, 10 rue Ortélius, Brussels 4, Belgium)

28–31. American Mathematical Soc., summer meeting, Vancouver, B.C. (AMS, 190 Hope St., Providence 6, R.I.)

28–31. American Physiological Soc., Buffalo, N.Y. (R. G. Daggs, APS, 9650 Wisconsin Ave., Washington 14, D.C.)

28–31. Catholic Intern. Federation of Hospital Institutions, congr., Evian, France. (A. A. M. Sanders, Carel van Bylandtlaan 8, The Hague, Netherlands)

28–1. Medicine and Public Health in the Arctic and Antarctic, conf., Geneva, Switzerland. (World Health Organization, Palais des Nations, Geneva)

29–31. Association for Computing Ma-

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chinery, natl. mtg., Syracuse, N.Y. (J. Moshman, Council for Economic & Industry Research, 1200 Jefferson Davis Hwy., Arlington 2, Va.)

29–31. Society for Industrial and Applied Mathematics, summer meeting, Vancouver, B.C. (J. H. Griesmer, Thomas J. Watson Research Center, P.O. Box 218, Yorktown Heights, N.Y.)

29–2. American Sociological Assoc., Washington, D.C. (T. Parsons, Emerson Hall, Cambridge 38, Mass.)

29–3. Prehistoric and Protohistoric Sciences, intern. congr., Rome, Italy. (L. Cardini, c/o Museo Preistorico L. Pigorini, Via del Collegio Romano 26, Rome)

29–4. International Assoc. of Logopedics and Phoniatrics, congr., Padua, Italy. (C. Martinolli, IALP, Via Bergamo 10, Padua)

29–5. British Assoc. for the Advancement of Science, annual, Manchester, England. (BAAS, 3 Sanctuary Buildings, Great Smigh St., London, S.W.1, England)

29–5. Electron Microscopy, intern. congr., Philadelphia, Pa. (Congress on Electron Microscopy, 7701 Burholme Ave., Philadelphia 11)

30. Alpha Epsilon Delta, Lafayette, Ind. (M. L. Moore, 7 Brookside Circle, Bronxville, N.Y.)

30–1. European Forestry Commission, session on torrent control, avalanche protection, and watershed management, Rome, Italy. (Intern. Agency Liaison Branch, Office of Director General, Food and Agriculture Organization, Viale delle Terme di Caracalla, Rome, Italy)

30–2. World Acad. of Art and Science, 1st plenary mtg., Brussels, Belgium. (H. Boyko, WAAS, 1 Ruppin St., P.O. Box 534, Rehovot, Israel)

30–4. Analytic Functions, conf., Kraków, Poland. (Polish Acad. of Sciences, Inst. of Mathematics, 30 Solskiego Str., Kraków)

30–5. Photo Interpretation, symp., Delft, Netherlands. (Secretariat, Commission VII, Intern. Training Center for Aerial Survey, Kanaalweg 3, Delft)

31–8. Horticulture, intern. congr., Brussels, Belgium. (General Secretariat, Intern. Soc. for Horticultural Science, 233 Coupure Links, Ghent, Belgium)

September

1–3. Astronomical League, Albuquerque, N.M. (H. C. Sehested, 3223 Westcliff Rd. W., Fort Worth, Tex.)

1–7. Wilderness Soc., Mt. McKinley Natl. Park, Alaska. (H. Zahniser, 2144 P St., NW, Washington 7)

2–5. Neuropsychopharmacology, intern. congr., Munich, Germany. (P. Deniker, c/o Hôpital Sainte-Anne, 1 rue Cabanis, Paris 14e, France)

2–7. AAAS Laurentian Hormone Conf., Quebec, Canada. (G. Pincus, 222 Maple Ave., Shrewsbury, Mass.)

2–7. Information Theory, intern. symp., Brussels, Belgium. (M. Selleslags, Université Libré, 50 Avenue Franklin D. Roosevelt, Brussels)

2–8. Brain Edema, symp., Vienna, Austria. (P. Bailey, c/o NINDB, Institut Bunge, Berchem-Antwerp, Belgium)

2–9. Prophylactic Medicine and Social Hygiene, intern. congr., Bad Aussee, Austria. (E. Berghoff, Piaristengasse 41, Vienna VIII, Austria)

3–5. Psychometric Soc., St. Louis Mo. (W. G. Mollenkopf, Procter & Gamble Co., P.O. Box 599, Cincinnati 1, Ohio)

3–6. Alpine Meteorology, intern. congr., Sauze d'Ouix-Sestriere, Italy. (M. Bossolasco, Società Italiana di Geofisica e Meteorologia, P.O. Box 3145, Genoa, Italy)

3–7. Advanced-Technology Management, natl. conf., Seattle, Wash. (Inst. of Radio Engineers, 1 E. 79 St., New York 21)

3–7. Alcohol and Road Traffic, intern. conf., London England. (R. F. Borkenstein, Dept. of Police Administration, Indiana Univ., Bloomington)

3–7. Anesthesiology Congr., Vienna, Austria. (R. Kucher, Postgraduate Medical School, Alserstr. 4, Vienna IX)

3–7. Antarctic Biology, symp., Paris, France. (R. Carrick, c/o Antarctic Div., D.S.I.R., P.O. Box 6022, Wellington, New Zealand)

3–7. Institute of Management Sciences, Dublin, Eire (T. Fabian, c/o *Mathematica*, 76 Nassau St., Princeton, N.J.)

3–7. International College of Experimental Phonology, congr., Padua, Italy. (B. Vallancien, 16 rue Spontini, Paris 16°, France)

3–7. Microwave Tubes, intern. congr., Delft, Netherlands. (Congress Office, P.O. Box 62, Eindhoven, Netherlands)

3–7. Passivity, intern. symp., Toronto, Ont., Canada. (Mr. Cohen, Natl. Research Council of Canada, Ottawa, Canada)

3–7. Transsonicum Symp., Aachen, Germany. (K. Oswatitsch, c/o Institut für Theoretische Gasdynamik, Theaterstr. 13, Aachen)

3–7. Water Pollution Research, intern. conf., London, England. (J. E. Holmstrom, Scientific Conf. Center, Heading-ton Hill Hall, Oxford, England)

3–8. Chemical Machinery, Engineering, and Automation, intern. congr., Brno, Czechoslovakia. (F. Brabec, Czechoslovak Scientific and Technical Soc., Siroka 5, Prague I, Czechoslovakia)

3–8. Corpuscular Photography, intern. symp., Munich, Germany. (H. Fireser, Inst. for Scientific Photography of the Munich Inst. of Technology, Munich)

3–8. Intern. Dairy Federation, intern. congr., Copenhagen, Denmark. (K. Frederiksen, Raadhuspladsen 3, Aarhus, Denmark)

3–8. Neohippocratic Medicine, intern. congr., Montpellier, France; Cos, Greece; and Salerno, Italy. (M. Martiny, 10 rue Alfred-Roll, Paris 17°, France)

4–6. Practical Methods of Assisting Radiotherapy Centers in Less-Developed Areas, Montreal, Canada. (World Health Organization, Palais des Nations, Geneva, Switzerland)

4–7. Association for Computing Machinery, natl. conf. and exhibit, Syracuse, N.Y. (R. S. Jones, Sylvania Electric Products, Inc., Camillus, N.Y.)

4–7. Problems of Exercise Metabolism, intern. seminar, Milan, Italy. (R. Margaria, Inst. of Physiology, Univ. of Milan, Milan)

4–8. Syphilis and Other Treponematoses, intern. forum, Washington, D.C. (W. Griggs, Communicable Diseases Center, U.S. Public Health Service, Atlanta, Ga.)

5–6. Blood Transfusion, intern. seminar,

Mexico, D. F., Mexico (Comité Intern. de la Croix-Rouge, Geneva, Switzerland)

5–7. High-Polymer Science, annual forum, Windsor, Ont., Canada. (L. Breitman, Research and Development Div., Polymer Corp. Ltd., Sarnia, Ont.)

5–7. Measurement of Thermal Radiation Properties of Solids, symp., Dayton, Ohio. (C. R. Andrews, Univ. of Dayton, Dayton 9)

5–7. Temperature Acclimation, intern. symp., Leiden, Netherlands. (A. Nixon, Organizing Committee, 9650 Wisconsin Ave., Washington 14)

5–8. American Political Science Assoc., Washington, D.C. (E. M. Kirkpatrick, APSA, 1726 Massachusetts Ave., NW, Washington 6)

5–8. Internal Medicine, intern. congr., Munich, Germany. (H. Ludwig, Buergerspital, Basel, Switzerland)

5–9. International Soc. of Audiology, congr., Leiden, Netherlands. (A. Spoor, Ear-Nose-Throat Dept., Academisch Ziekenhuis, Leiden)

5–11. International Council for Building Research Studies and Documentation, Cambridge, England. (General Secretariat, c/o Bouwcentrum, 700 Weena, P.O. 299, Rotterdam, Netherlands)

6–7. Honor Soc. of Phi Kappa Phi, Madison, Wis. (L. R. Guild, 3839 Wilshire Blvd., Los Angeles 5, Calif.)

6–7. Problems in Chemistry and Physics of Non-Metallic Solids, symp., Quebec City, P.Q., Canada. (P. A. Giguere, Dept. of Chemistry, Laval Univ., Quebec City)

6–8. Acclimation to Cold and Heat, symp., Leiden, Holland. (Executive Officer, Federation of American Societies for Experimental Biology, 9650 Wisconsin Ave., Washington, D.C.)

6–8. Pacific Slope Biochemical Conf., annual, Seattle, Wash. (P. E. Wilcox, Biochemistry Dept., Univ. of Washington, Seattle 5)

6–8. Parapsychological Assoc., annual, Durham, N.C., (G. R. Schmeidler, 17 Kent Ave., Hastings-on-Hudson, N.Y.)

6–11. International Soc. of Blood Transfusion, biennial congr., Mexico, D.F., Mexico. (R. Medina, Avenue Chapultepec 522, Mexico 20)

6–16. International Institution for Production Engineering Research, The Hague, Netherlands. (IIPER, 233 Boulevard Raspail, Paris 14e, France)

7–8. Anthropology, annual conf., Carson City, Nev. (R. Shutler, Jr., Dept. of Archaeology, Nevada State Museum, Carson City)

7–9. International Geographical Union, commission on national atlases, Budapest, Hungary. (K. A. Salishchev, Univ. of Moscow, Moscow, Leninskije Gory, U.S.S.R.)

7–10. American Statistical Assoc., Minneapolis, Minn. (D. C. Riley, ASA, 1757 K St., NW, Washington 6)

7–10. Institute of Mathematical Statistics, Minneapolis, Minn. (G. E. Nicholson, Jr., Dept. of Statistics, Univ. of North Carolina, Chapel Hill)

7–12. Crystal Lattice Defects, intern. conf., Kyoto, Japan. (R. R. Hasiguti, Univ. of Tokyo, Bunkyo-ku, Tokyo, Japan)

8–11. Institute of Management Sciences,

Ann Arbor, Mich. (T. Fabian, c/o *Mathematica*, 76 Nassau St., Princeton, N.J.)

9–12. Society of Mining Engineers, fall meeting, Gatlinburg, Tenn. (SME, 345 E. 47 St., New York 17)

9–14. American Chemical Soc., natl. meeting, Atlantic City, N.J. (A. T. Windstead, Natl. Meetings Dept., ACS, 1155 Sixteenth St., NW, Washington 6)

9–14. American Congr. on Surveying and Mapping—American Soc. of Photogrammetry, St. Louis, Mo. (Convention Headquarters, ACSM, Box 2731, Soulard Station, St. Louis 4)

9–14. Homeopathic Medicine, intern. congr., Bad Godesberg, Germany. (W. Schwarzhaupt, Sachsenring 73, Cologne, Germany)

9–14. Illuminating Engineering Soc., Dallas, Tex. (C. L. Amick, Day Brite Lighting, Inc., P.O. Box 141, St. Louis 66, Mo.)

9–14. International College of Surgeons, biennial, New York, N.Y. (H. E. Turner, 1516 Lake Shore Dr., Chicago 11, Ill.)

9–15. Dermatology, intern. congr., Washington, D.C. (E. D. Osborne, 71 North St., Buffalo, N.Y.)

9–15. International Soc. of Hematology, congr., Mexico, D.F., Mexico (L. Sánchez-Yllades, c/o Instituto de Estudios Médicos y Biológicos, Apartado postal 25228, México 20, D.F.)

9–15. Paediatrics, intern. congr., Lisbon, Portugal. (M. Cordeiro, Clinica Pediatrica Universitoria, Hospital Santa Maria, Avenue 28 de Maio, Lisbon 4, Portugal)

9–23. Technical Science in the Service of Progress and Peace, intern. trade fair, Brno, Czechoslovakia. (Embassy of the Czechoslovak Socialist Republic, 2349 Massachusetts Ave., NW, Washington 8)

10–12. Geochemical Soc., organic geochemistry group, Milan, Italy. (U. Colombo, G. Donegani Research Inst., Montecatini Co., Via del Lavoro 4, Novara, Italy)

10–12. Technical Assoc. for Waste Water, annual, Wiesbaden, Germany. (Abwassertechnische Vereinigung, Bertha-von-Suttner-Platz 8, Bonn, Germany)

10–14. Applied Meteorology, natl. conf., Hampton, Va. (D. A. Lea, Navy Weather Research Facility, Naval Air Station, Norfolk 11, Va.)

10–14. Inelastic Scattering of Neutrons in Solids and Liquids, symp., Chalk River, Canada. (Intern. Atomic Energy Agency, 11 Kärntner Ring, Vienna 1, Austria)

10–15. Analog Computation Applied to Aeronautics, seminar, London, England. (S. C. Redshaw, Civil Engineering Dept., Univ. of Birmingham, Edgbaston 15, Birmingham, England)

10–15. International Assoc. of Game, Fish, and Conservation Commissioners, Moran, Wyo. (IAGFCC, 16413 Canterbury Dr., Hopkins, Minn.)

10–15. International Gravimetric Bureau, general assembly, Paris, France. (J. J. Levallois, Intern. Assoc. of Geodesy, 19 rue Auber, Paris 8e)

10–15. Molecular Structure and Spectroscopy, intern. symp., Tokyo, Japan. (Secretary, Organizing Committee, Science Council of Japan, Ueno Park, Tokyo)

10–15. Research in Mammary Tumours, World Health Organization scientific group, London, England. (WHO, Palais des Nations, Geneva, Switzerland)

10–16. Protection Against Corrosion, symp., Bratislava, Czechoslovakia. (Mr. Jelinek, Dôm Technicky, Kocel'ova 17, Bratislava)

10–16. Relationship between Soil Fauna and Soil Microflora, symp., Oosterbeek, Netherlands. (J. van der Drift, Inst. for Biological Field Research, Kemperbergerweg 11, Arnhem, Netherlands)

10–18. Variations of Existing Glaciers, symp., Obergurgl, Austria. (L. J. Tison, Intern. Assoc. of Scientific Hydrology, 61 rue des Ronces, Gentbrugge, Belgium)

10–21. Experimental Stress Analysis, inst., Detroit, Mich. (J. Der Hovanesian, Engineering Mechanics Dept., Wayne State Univ., Detroit 2)

11–17. Ornithology, all-union conf., L'vov, U.S.S.R. (Ministry of Higher and Secondary Special Education, Moscow, U.S.S.R.)

11–17. Physiology, intern. congr., Leiden, Netherlands. (W. O. Fenn, Dept. of Physiology, Medical Center, Univ. of Rochester, Rochester 20, N.Y.)

12–14. Condensation and Evaporation of Solids, intern. symp., Dayton, Ohio. (Office of Aerospace Research, U.S. Air Force, Washington 25)

12–14. Plutonium as a Power-Reactor Fuel, natl. meeting, Richland, Wash. (American Nuclear Soc., 86 E. Randolph St., Chicago 1, Ill.)

12–18. International Inst. de Sociologie, Córdoba, Argentina. (C. C. Zimmerman, 200 Emerson Hall, Harvard Univ., Cambridge 38, Mass.)

13–14. Advanced Gas-Cooled Reactors, symp., London, England. (Secretary, British Nuclear Energy Conf., 1–7 Great George St., London, S.W.1)

13–14. Engineering Management, annual conf., New Orleans, La. (Inst. of Radio Engineers, 1 E. 79 St., New York 21)

13–14. Engineering Writing and Speech, natl. symp., Washington, D.C. (Inst. of Radio Engineers, 1 E. 79th St., New York 21)

13–15. Polymer Research, annual symp., Łodz, Poland. (A. Boryniec, Technical Univ. of Łodz, Zwirki 36, Łodz)

14–16. Society of Exploration Geophysicists, annual intern. meeting, Calgary, Alberta, Canada. (N. J. Christie, 209A Sixth Ave., SW, Calgary)

15–17. Psychology and Pedagogy, intern. symp., Turin, Italy. (Servizio di Assistenza Psico-Medico Sociale della Provincia di Torino, Via Giovannida Verazzano 4, Turin)

16–19. American Inst. of Chemical Engineers, natl. meeting, Denver, Colo. (Secretary, AICE, 25 W. 45 St., New York 36)

16–22. Latin American Chemistry Congr., annual, Buenos Aires, Argentina. (Secretary, Congreso Latinoamericano de Quimica, Casilla de Correo 2153, Buenos Aires)

16–22. Low-Temperature Physics, intern. conf., London, England. (LT8, Queen Mary College, University of London, Mile End Rd., London, E.1)

16–24. Military Medicine and Pharmacy, intern. congr., Caracas, Venezuela. (E. P. Vivas, c/o Ministerio de la Defensa, Caracas)

17–18. Hydrofoils and Air Cushion Vehicles, natl. meeting, Washington, D.C. (W. H. Arata, Jr., Manager-Market Planning, Fairchild Stratos, Hagerstown, Md.)

17–18. Water Protection, symp., Schaffhausen, Switzerland. (Ligue Suisse pour la Protection des Euz, Kurbergstrasse 19, Zurich 49, Switzerland)

17–19. Pharmaceutical Products, intern. symp., Florence, Italy. (A. Soldi, Società Italiana di Scienze Pharmaceutiche, Via Giorgio Jan 18, Milan, Italy)

17–21. Hormones and the Kidney, colloquium, London, England. (P. C. Williams, c/o Imperial Cancer Research Fund, Burtonhole Lane, London, N.W.7)

17–21. Malacological Congr., London, England. (H. E. J. Biggs, 19 Siward Rd., Bromley, Kent, England)

17–21. Vector Control, symp., Geneva, Switzerland. (World Health Organization, Palais des Nations, Geneva)

17–22. High-Speed Photography, intern. congr., The Hague, Netherlands. (Congress Secretariat, 14 Burgemeester de Monchyplein, The Hague)

17–22. International Brain Research Organization, central committee meeting, Paris, France. (H. H. Jasper, U.N. Educational, Scientific and Cultural Organization, Place de Fontenoy, Paris 7e)

17–22. International Union Against Tuberculosis, annual, Paris, France. (IUAT, 15 rue Pomereau, Paris 16e)

17–24. History of Medicine, intern. congr., Warsaw and Krakow, Poland. (Organizing Committee, Chocimska 22, Warsaw)

17–29. Chromatographic Methods for Lipid Research, intern. congr., Milan,

Italy. (R. Paoletti, Congrès International, V. del Sarto 21, Milan)

18–21. Food Science and Technology, intern. congr., London, England. (F. J. Griffin, 14 Belgrave Sq., London, S.W.1)

18–22. Agricultural Aviation, intern. conf., Grignon, France. (P. Journet, Service de la protection des végétataux, Ministère de l'Agriculture, 78 rue de Varenne, Paris 7°, France)

18–23. International Assoc. of Geodesy, Munich, Germany. (J. J. Levallois, IAG, 19 rue Auber, Paris 8°)

18–24. Effects of Use and Disuse of Neuromuscular Functions, Prague-Liblice, Czechoslovakia (by invitation). (Czechoslovak Acad. of Sciences, Narodny Tr. 5, Prague I)

18–26. Equatorial Aeronomy, intern. symp., Huaychulo, Peru. (A. A. Giesecke, Scientific Program Committee, Apartado 3747, Lima, Peru)

18–28. International Atomic Energy Agency, general conf., Vienna, Austria. (IAEA, 11 Kärntner Ring, Vienna I)

19–20. Industrial Electronics, annual symp., Chicago, Ill. (E. A. Roberts, Comptometer Corp., 5600 Jarvis Ave., Chicago 48)

19–21. Rocky Mountain Minerals Conf., Butte, Mont. (Metallurgical Soc. of AIME, 345 E. 47 St., New York 17)

19–22. Information Retrieval, seminar, Minneapolis, Minn. (Director, Center for Continuation Study, Univ. of Minnesota, Minneapolis 14)

19–23. Air Force Assoc., convention and aerospace panorama–weapons meet, intern., Las Vegas, Nev. (AFA, 1901 Pennsylvania Ave., NW, Washington 6)

20. Surgery of the Hand, intern. conf., Paris, France. (L. Gosse, c/o Hôpital de Nanterre, 3 Av. de la République, Nanterre (Seine), France)

20–22. Sulphur Therapy, intern. symp., Innsbruck, Austria. (K. Weithaler, c/o Medizinische Universitäts Klinik, Innsbruck)

20–23. International Soc. for Practical Applied Medicine, intern. congr., Salzburg, Austria. (Sekretariat, Internationale Gesellschaft für Praktisch Angewandte Medizin, Lange Str. 21a, Oelde, Westfalen, Germany)

20–23. Rockets and Space Flight, symp., Coblenz, Germany. (Deutsche Raketen-Gesellschaft, Fritz-Beindorf-Allee 9, Hanover, Germany)

20–28. Intergovernmental Oceanographic Commission, Paris, France. (U.N. Educational, Scientific and Cultural Organization, Place de Fontenoy, Paris 7°)

20–30. Handling and Lifting Equipment and Industrial Electricity, intern. study sessions, Charleroi, Belgium. (Société Coopérative de Gestion, Palais des Expositions, Avenue de l'Europe, Charleroi)

22. Pharmacy Assembly, annual, New York, N.Y. (J. Yellin, Hebrew Home for the Aged, Bronx, N.Y.)

22–29. International Scientific Film Assoc., congr., Warsaw, Poland. (F. Gazan, ISFA, 38 Avenue des Ternes, Paris 17°, France)

23–26. Latin American Congr. of Angiology, Buenos Aires, Argentina. (E. Sales, Santa Fé 1171, Buenos Aires)

23–26. Petroleum Mechanical Engineering, conf., Dallas, Tex. (American Soc. of

Mechanical Engineers, Meetings Manager, 29 W. 39 St., New York 18)

23–27. Electrochemical Soc., Boston, Mass. (ES, 1860 Broadway, New York 23)

23–27. Metal, intern. congr., Vienna, Austria. (Metall-u. Farben A.G., Kärntnerstrasse 7, Vienna I)

24–26. European Assoc. Against Poliomyelitis, symp., Prague, Czechoslovakia. (P. Recht, EAAP, 56 rue Charles Legrelle, Brussels 4, Belgium)

24–26. National Power Conf., Baltimore, Md. (American Soc. of Mechanical Engineers, 29 W. 39 St., New York 18)

24–26. World Veterinary Poultry Assoc., conf., Cambridge, England. (W. M. McKay, Cyanamid of Great Britain, Ltd., Bush House, Aldwych, London, W.C.2, England)

24–28. International Astronautical Federation, congr., Sofia, Bulgaria. (J. A. Stemmer, IAF, P.O. Box 37, Baden, Switzerland)

24–28. Organometallic Derivatives, intern. colloquium, Paris, France. (H. Normant, Faculté des Sciences, Université de Paris à la Sorbonne, 47 rue des Écoles, Paris 5e)

24–29. International Committee on Electrochemical Thermodynamics and Kinetics, Rome, Italy. (N. Ibl, c/o Laboratory of Physical Chemistry, Federal Polytechnicum, 6 Universitätsstrasse, Zurich, Switzerland)

24–29. Pharmaceutical Sciences, intern. congr., Vienna, Austria. (W. Thor, Organizing Committee, Spitalgasse 31, Vienna 9)

24–29. Technical Assoc. of the Pulp and Paper Industry, annual conf., Stockholm, Sweden. (I. F. Hendry, Research and Development, Wigging Teape & Co., Ltd., Beaconsfield, Bucks, England)

24–30. European Seismological Commission, general assembly, Jena, Germany. (E. Peterschmitt, ESC, 38 Boulevard d'Anvers, Strasbourg, France)

24–30. Vital Substances, Nutrition, and Civilization Diseases, intern. convention, Garmisch-Partenkirchen, Germany; and Innsbruck, Austria. (Intern. Soc. for Research on Nutrition and Vital Substances, Bremeroderstr. 61, Hanover-Kirchrode, Germany)

25–28. Association of Iron and Steel Engineers, Cleveland, Ohio. (Managing Director, AISE, 1010 Empire Bldg., Pittsburgh 22, Pa.)

25–28. Electric Power Systems for Space, conf., Santa Monica, Calif. (American Rocket Soc., 500 Fifth Ave., New York 36)

26–28. Practice of Gas Chromatography, meeting, East Lansing, Mich. (C. G. Harriz, Houdry Process & Chemical Co., Box 427, Marcus Hook, Pa.)

26–29. Austrian Soc. of Biochemistry, Society for Physiological Chemistry, German Pharmacology Soc., Vienna, Austria. (Secretariat, Vienna Medical Acad., 4 Alserstr, Vienna IX)

26–29. Neurobiologists, intern. meeting, Kiel, Germany. (W. Bargmann, Neue Universität, Olshausenstrasse 40/60, Kiel)

27–29. Protection of Plants and Extermination of Pests, symp., Magdeburg, Germany. (Chemische Gesellschaft in der D.D.R., Unter den Linden 68–70, Berlin W.8, Germany)

New Products

A series of **growth chambers** has been added to the line of "Ambi-Lo" cabinets including models with choice of humidity and lights, humidity only, or light only, plus the normal refrigeration and heating system. Temperature range is from 32° to 120°F with the lights off. With the lights on, the range is from 40° to 120°F. Temperature control is maintained at ±1°F with temperature uniformity at extreme points in the chamber of ±2°F. Control sensitivity is ±0.5°F. The compact units occupy only 4½ square feet of floor space, yet provide over 6 cubic feet of usable chamber area. A larger model is also available. Four 18-inch fluorescent lamps provide up to 1000 ft-ca light intensity. Lamps can be arranged either grouped or singly above each shelf. Timers can be installed to handle lamps individually or in combinations. A centrifugal type of humidifier injects humidity into the forced air system and provides uniform conditions throughout the chamber by means of an engineered conditioning plenum in the chamber. Humidity is controlled with a humidistat which is sensitive to ±2 percent relative humidity. Humidity range is from ambient dew point to 90 percent RH. Three inches of low-density Fiberglas insulation eliminates "sweating." Triple range controls permit selection of the best-suited temperature control combination. Hi-Lo temperature safeties prevent accidental overheating or overcooling. A dial thermometer is located on the door. The "Ambi-Lo" growth chambers have wide application for bacteriological culture incubations; plant, animal, and insect studies; aging tests, by use of heat, cold, light, and humidity; sample storage; conductivity tests; and so forth. —R.L.B. (Labline/Hudson Bay Co., 3070 W. Grand Ave., Chicago, Ill.)

Circle 1 on Readers' Service card

Catalog of **chromatographic column packing materials** for gas and liquid systems lists a comprehensive stock of solid and liquid phases, and includes active solid phases. A table lists reported applications of specific phases but does not include literature references.—R.L.B. (Research Specialties Co., 200 S. Garrard Blvd., Richmond, Calif.)

Circle 2 on Readers' Service card

Recording vacuum microbalance (model RG) operates on a null balance electrical feedback system that supplies enough current to a moving coil to restore the system to null. The restoring current is then used to measure the weight of the sample. An elastic ribbon suspension is said to eliminate bearing friction and delicate knife edges. Pans are provided at two positions on the weighing end of the beam for 1-g and 2.5-g rated loads and a pan on the other end provides for tearing. The control box provides range switching and recorder span selection controls and is connected by a cable so that it can be located with the recorder away from the balance. A vacuum chamber 30 cm long by 12 cm diameter inside is provided with electrical feed-throughs and three 40/50 standard taper joints for access to the three pan positions. The system has a sensitivity to 0.1 μg with an electrical output of 50 mv/mg calibrated for connection to 1-mv potentiometric type recorders. The system has an ultimate sensitivity of 0.1 μg and is precise to 1 part in a million of the sample weight. Output is 50 mv/mg with time constant adjustable from 0.01 to 0.6 sec. Connection to a standard 1-mv potentiometric recorder is recommended.—R.L.B. (Cahn Instrument Co., 15505 Minnesota Ave., Paramount, Calif.)

Circle 3 on Readers' Service card

Vacuum furnace (model 62-HD) is designed for conducting hot-hardness studies within the vacuum at temperatures to 3000°F. Up to 20 specimens can be tested in one run without shutting down the furnace or the vacuum equipment. Individual specimens can be removed from the apparatus for evaluation through a vacuum interlock so that a series of tests at different temperatures and on various materials can be made in one continuous test run. The load

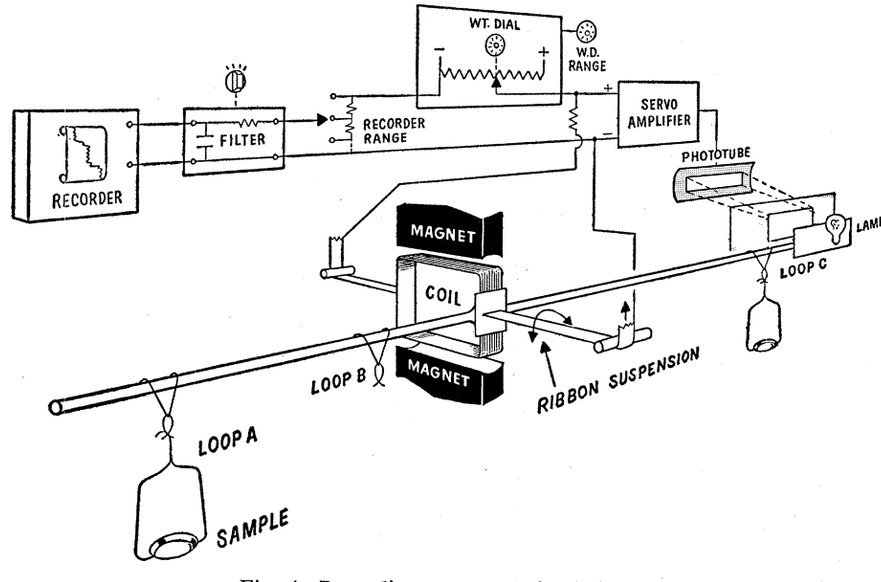


Fig. 1. Recording vacuum microbalance.

The material in this section is prepared by the following contributing writers:

Robert L. Bowman (R.L.B.), Laboratory of Technical Development, National Heart Institute, Bethesda 14, Md. (medical electronics and biomedical laboratory equipment).

Joshua Stern (J.S.), Basic Instrumentation Section, National Bureau of Standards, Washington 25, D.C. (physics, computing, electronics, and nuclear equipment).

The information reported here is obtained from manufacturers and from other sources considered to be reliable. Neither *Science* nor the writers assume responsibility for the accuracy of the information. A Readers' Service card for use in mailing inquiries concerning the items listed is included on page 435. Circle the department number of the items in which you are interested on this card.

cell that controls both the load applied to the specimen and the rate of loading and unloading is coupled by transducers in the top of the furnace tank and the system may be controlled manually or programmed for automatic operation. Cooling water flow and pressure within the system are electrically interlocked in a control panel. Loss of vacuum or of water will immediately shut off power to the molybdenum heating elements. Element temperature and the loading operation can be monitored optically through viewing ports while platinum-rhodium thermocouples provide temperature measurement and control. The indentor can be moved to permit impressions in concentric circles or "X" patterns and the anvil can be rotated through 360 deg.—J.S. (Marshall Products Co., 270 W. Lane Ave., Columbus 2, Ohio)

Circle 4 on Readers' Service card

Recording digital voltmeter scans a number of input lines in sequence, measures the voltage on each line in turn, and prints the measured value directly on a paper tape. One model accommodates up to 20 and another up to 100 two-wire input lines. Upper and lower scan limits are set independently by panel controls; a readout indicates which line is connected to the metering circuit at any time. Scanning can be repetitive, or a single scan can be commanded. Four-digit measurements are made from 0 to ± 999.9 volts d-c or may be fixed in one of three alternative decade ranges. The instrument will accept a modular plug-in converter for a-c measurements. Accuracy is guaranteed by the manufacturer to remain within ± 0.01 percent of reading ± 1 digit for at least 90 days after calibration. Measurement rate is up to 40 measurements per minute.—J.S. (Cimron Corp., 1152 Morena Blvd., San Diego 10, Calif.)

Circle 5 on Readers' Service card

Kit of **equipment for autoradiography** by use of fluid-emulsion dipping technique facilitates the preparation of high-resolution autoradiographs for microscopic observation of localization of radioactivity. The kit is designed around a rapid, convenient method claimed to insure uniform results. An exposure chamber holds up to 200 slides and is provided with a light-tight door, a desiccant tray, and a simple, effective air-purging system to reduce latent image fading. An accessory unit contains components selected

for their compatability with the fluid-emulsion technique. Included are a timer, hot plate, safe light, emulsion container, and containers and rack for slide development.—R.L.B. (Controls for Radiation, Inc., 130 Alewife Brook Parkway, Cambridge 40, Mass.)

Circle 6 on Readers' Service card

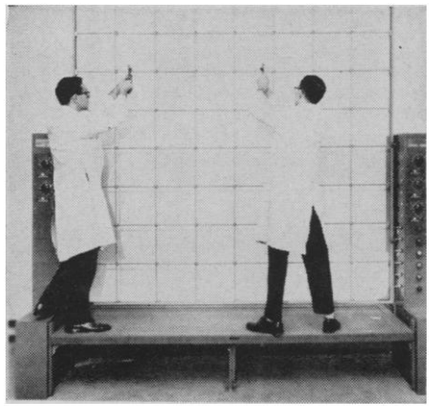
Continuous-wave gas-phase laser, using a mixture of helium and neon gases as the active medium, produces a continuous monochromatic beam of coherent light at a wavelength of 11530 A in the near infrared region of the spectrum. Output power is about 1 mw. The beam is highly directional with a spread of less than 1 minute of arc when focused to a parallel beam. The laser's resonator is a 2-foot-long fused-silica tube with internal confocal reflectors that have a multilayer dielectric coating. The tube is contained in a 3.5-inch diameter protective housing. The excitation unit, integrally mounted in the center of the plasma tube, is a 40-w, 40.68 Mcy/sec radiofrequency oscillator. A remote supply provides the d-c power.—J.S. (Perkin-Elmer Corp., Norwalk, Conn.)

Circle 7 on Readers' Service card

Ruby laser rods are available in three grades. The highest grade is fabricated from synthetic rubies selected by densitometer and spectrometer analysis as well as by x-ray diffraction to possess doping uniformity within 1 percent and practical minima of both strain and crystal-axis deviation. The ends are guaranteed to be flat within 1/20 wavelength of sodium light and to be parallel within 1 sec of angle. The second grade is characterized by flatness within 1/10 wavelength and parallelism within 2 sec. The third grade is fabricated of synthetic boules of lower quality and flatness specification is ¼ wavelength and parallelism 5 sec. They are guaranteed by the manufacturer to perform as lasers. The first two grades are available in either zero or 90-deg orientation, ¼-inch diameter, and a choice of three lengths: 3, 2.5, and 2 inches. The third grade is available only in 2.5-inch length.—J.S. (Valpey Crystal Corp., Holliston, Mass.)

Circle 8 on Readers' Service card

Lab/Rack provides a unitized foundation structure for setting up chemical and physical equipment that require water, gas, and electrical connections. The rack is free standing and consists



of a heavy drainboard shelf, 6 or 8 feet long, flanked by heavy iron frames, 8 inches wide, that provide removable panels for the installation of variable transformers, manual or electric valves, and controls. Between the frames a lattice of Flexaframe rod is erected to provide for mounting of glassware, columns, heaters, and so forth, by means of the standard Flexaframe connectors. The drainboard shelf can be adjusted from 6 to 20 inches from the floor to accommodate heavy equipment on or under it. It would appear that this foundation unit would greatly facilitate and reduce some of the hazards of complex pilot plant setups, chromatography systems, vacuum systems, and so forth.—R.L.B. (Fisher Scientific Co., 415 Fisher Bldg., Pittsburgh 19, Pa.)

Circle 9 on Readers' Service card

Flash-evaporator data bulletin provides descriptions and technical data for more than a dozen flash-evaporators for accelerated evaporation work in laboratories. The evaporators include portable, batch-operation, and continuous-operation units. The bulletin gives a summary of operations for each instrument described, a picture, its scope of performance, kinds of operations it is suited to, the equipment variations that are possible, the material of component parts, the power required, and the price. Among the instruments described is a portable flash-evaporator with a glass spiral condenser for efficient cooling. The solution to be evaporated is placed in a flask that is immersed in a stainless-steel pan of temperature-controlled hot water. The flask is rotated to expose the solution to the maximum possible surface from which it can evaporate. The vacuum eliminates most of the air pressure that would inhibit evaporation. The vapors thus drawn off are channeled into a glass spiral condenser. Glass-to-glass connections throughout the evaporating system prevent contamination. The rotary seal connecting the flasks requires no grease. With this apparatus, solvents can be rapidly removed from solutions sensitive to heat or prolonged exposure to air with a minimum exposure of the solute to heat. The evaporation can be made at low, even lyophilizing, temperatures. The material can be dried without being frozen.—R.L.B. (LaPine Scientific Co., 6001 S. Knox Ave., Chicago 29, Ill.)

Circle 10 on Readers' Service card

Servomultiplier operates without gears or motors to perform multiplication, function generation, and other operations with response time said to be 10 msec, and accuracy $\pm$ 0.25 percent. The multiplier utilizes as the drive mechanism a meter movement incorporating a low-inertia coil and low-torque wipers with infinite resolution feedback and follow-up potentiometers. Initial mounting position or changes in axis orientation are said to be without effect on the instrument's performance. Standard servosystems are available in sensitivities from 200 mv to 100 v d-c with standard follow-up potentiometers ranging in resistance from 1 to 40 kohm. Nonstandard potentiometers, both linear and nonlinear, can be had on special order. Two adjustable limits, with relays, are also available to provide control of the first variable.—J.S. (Computer Instruments Corp., 92 Madison Ave., Hempstead, L.I., N.Y.)

Circle 11 on Readers' Service card

Spectral transmittance chart of solvents of spectroquality shows the windows available in the spectra of solvents on a convenient 11¾ by 24-in. wall chart. The ultraviolet, near infrared, and infrared to 16-μ regions are covered for the 34 solvents in the line. The chart is available without cost.—R.L.B. (Matheson Co., Inc., East Rutherford, N.J.)

Circle 12 on Readers' Service card

Gas chromatography supplies and accessories brochure (No. 162) discusses the function and significance of the liquid phase in gas chromatography and introduces 58 new polar polymer phases for advanced research applications. The new phases are specially

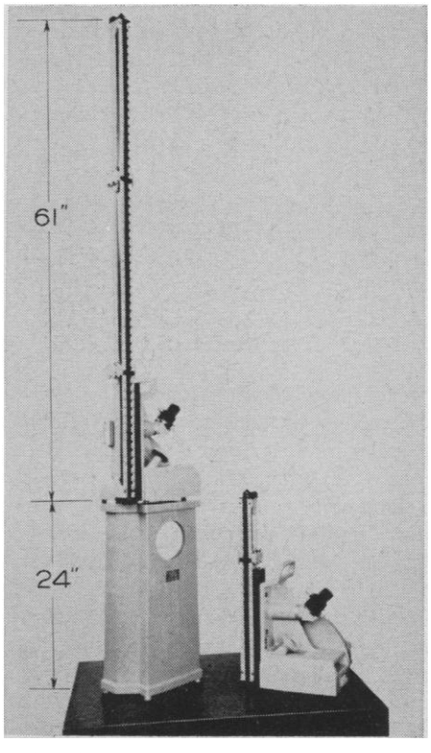
synthesized by use of alcohols and acids of different chain lengths in order to achieve varying degrees of polarity. Among other subjects covered are the properties of a variety of inert solid supports, a range of solid adsorbents for gas-solid chromatography, and over 100 specialty and standard liquid phases for steroid, fatty acid, and numerous other gas chromatographic analyses. Ready-to-use prepacked, conditioned, and tested columns and sample syringes are also listed.—R.L.B. (Analytical Engineering Laboratories, Inc., P.O. Box 5215, Hamden 18, Conn.)

Circle 13 on Readers' Service card

Broad-band **ultrasonic generator** (model IU-250-BB) is capable of furnishing ultrasonic power at frequencies from 20 to 1000 kcy/sec at power levels from 0 to 250 watts. The generator is contained in a console that provides coarse and fine adjustment of frequency and power. Frequency can be varied during experiments—J.S. (International Ultrasonics, Inc., 331 Centennial Ave., Cranford, N.J.)

Circle 14 on Readers' Service card

Optical height gages cover height ranges to 25, 37, 49 and 61 inches. Each gage is basically a stack of gage blocks permanently wrung together and mounted so that the stack may be raised and lowered over a range of 1 inch. Settings are made by means of a lever-operated cam and vernier adjustment handwheels and are read by means of an eyepiece. Accuracy is said to be $\pm$ 5 μin./in. of height. A riser block is available that can be placed under the base of the gage to increase the height by 24 inches.—J.S. (Webber Gage Co., Cleveland 11, Ohio)



Circle 15 on Readers' Service card

Logarithmic voltmeter-converter accepts d-c or a-c signals from 10 cy to 50 kcy/sec and indicates the value on a single logarithmic scale graduated in three ranges—0.001 to 3.16 v, 0.01 to 31.6 v, and 0.1 to 316 v. A movable linear decibel scale (20 $\times$ log of the voltage ratio) permits selection of reference level over a range of $\pm$ 75 db. The d-c output voltage for log recording is 1 mv per decibel with 0.2 db absolute accuracy over 70 db range. Full-scale deflection requires 1.3 sec. The instrument employs a three-turn linear potentiometer with 11 equally spaced taps. Each tap point is clamped by a special tapped toroid in a manner to maintain the voltage at each tap twice that of the lower tap, that is, to provide 6.02 db tap spacing. The load resistor provides a loading function between successive taps accurate to $\pm$ 0.05 db. The process is repeated over and over as the wiper of the multiturn pot is driven by a servo to maintain a constant wiper output voltage. The latter, after detection, is compared with the output of a double-regulated, temperature-compensated zener reference supply. The servo simultaneously drives the scale pointer and the wiper of a floated output potentiometer to provide an output signal of 1 mv per decibel.—R.L.B. (Houston Instrument Corp., P.O. Box 22234, Houston 27, Tex.)

Circle 16 on Readers' Service card

Magnetic material analyzer (model 910), consists of a magnetizer unit and a fluxmeter unit mounted in a rack cabinet. The sample to be examined is magnetized by inserting it into a magnetizing coil. A switch on the magnetizer unit selects the desired modes of combined a-c and unidirectional fields along the length of the magnetizing coil. The magnetized sample is removed from the magnetizing coil and inserted into a search coil, automatically cocking a trigger in the search-coil firing mechanism. Releasing the trigger drives the magnetized sample through the search coil. The ensuing pulse from the coil is fed to the flux-

meter unit to produce a meter reading of the remanent flux in the sample. Remanent flux obtained under different modes of magnetization are used to compute the coercivity and retentivity characteristics of the material sample, as well as the long-wavelength recording performance in the case of a magnetic-tape sample. Powdered or slurry materials are prepared for testing by pouring a measured volume into a glass container.—J.S. (Acoustronics, Inc., 156 Olive St., Huntington Station, N.Y.)

Circle 17 on Readers' Service card

Mass spectrometer leak detector (model D1D-1101) is a helium detector with sensitivity said to be 10^{-11} standard ml/sec with full pumping speed and close to 10^{-12} standard ml/sec when throttled. The instrument uses a 90-deg stainless-steel spectrometer tube, an amplifier stabilized by negative feedback and regulated power supply, and an electronically controlled emission regulator to supply the ion source.—J.S. (Elion Instruments, Inc., U.S. Route 130, North Burlington, N.J.)

Circle 18 on Readers' Service card

Kit for **bacteriological analysis of water and milk** is designed to equip laboratories for rapid testing of potable water, milk, and other liquids by the latest APHA standard method. The kit includes a Pyrex filter holder, 1-liter Pyrex vacuum flask, vacuum-pressure pump, forceps, graduated pipette, 47-mm Millipore filters, MF-Endo medium, and plastic disposable petri dishes for making about 300 tests for coliform organisms. Each kit contains the Millipore manual, "Microbiological Analysis of Water and Milk," which gives detailed instructions for coliform tests, total counts, biological examinations, and many other procedures. The complete kit sells for $160.—R.L.B. (Millipore Filter Corp., Bedford, Mass.)

Circle 19 on Readers' Service card

New **technical periodical** entitled *Criteria* is devoted to articles relating to the manufacturer's products. The first issue, dated March 1962, describes a **solid-state printer** and a **high-resolution digital voltmeter.** The printer (model 1453) accepts all digital data codes in common use, according to the manufacturer, and prints up to 12 digits at three lines per second in black and red. The digital voltmeter (model 4011) measures d-c voltage from 1 mv to 999.9 v, and d-c ratio. If complemented

by the manufacturer's converted units, it will also measure resistance and a-c voltage. Resolution is stated to be 0.01 percent.—J.S. (Beckman Instruments, Inc., Berkeley Div., 2200 Wright Ave., Richmond, Calif.)

Circle 20 on Readers' Service card

Transient storage oscilloscope can be used to store a waveform; to store the waveform without viewing for up to 1 week; for automatic storage from the instant the time base is triggered; or as a conventional oscilloscope with variable persistence from 1 second to 2 minutes. The instrument is provided with a single-shot time base with lockout facilities to avoid the confusion of superimposed traces. The oscilloscope external modulation terminal is directly coupled by means of a floating, stabilized high-voltage supply to the grid of the writing gun. It is said to be capable of freezing displays down to the nanosecond region. Erasure can be effected in less than 1 sec by depressing a pushbutton or by applying an external triggering voltage. Tube brightness is rated at 700 lam with a contrast ratio greater than 50 : 1. Resolution is 40 lines/cm. Writing speed is 4 cm/μsec. Linearity of the X amplifier is better than 1 percent and that of the Y amplifier better than 3 percent. Bandwidth is d-c to 4 Mcy/sec and sensitivity is better than 5 mv/cm.—J.S. (Calvert Electronics, Inc., 220 E. 23 St., New York 10)

Circle 21 on Readers' Service card

Educational film on uses of nuclear radiation in medicine is said to be ideally suited for medical schools, nurses training programs, and other medical use. The 15-minute 16-mm film available in black-and-white or color, for purchase or rental, is part of a six-film series titled "Nuclear Radiation." The film emphasizes the contributions of nuclear science to medical diagnosis and therapy and takes the student into some of the most modern medical facilities in the world.—R.L.B. (Cenco Educational Films, 1700 Irving Park Rd., Chicago 13, Ill.)

Circle 22 on Readers' Service card

Fluorescence microscope illuminator contains an Osram HBO-200 mercury arc lamp in a fan-cooled housing. Heat absorbing filters, exciter filters, iris diaphragm, and glass condensing lenses are enclosed in a light-tight housing. The horizontal beam of light

is deflected upward into the microscope from a projecting portion of the housing which fits between the in-base illuminator and the substage condenser. The lamp and microscope are provided with a common base plate provided with guides so that the illuminator may be retracted to allow tungsten lamp illumination and then slide back into position for fluorescence. The compact lamp power supply is said to provide easy starting of the lamp. Photomicrographic accessories and various filters are also available.—R.L.B. (American Optical Co., Instrument Div., Buffalo 15, N.Y.)

Circle 23 on Readers' Service card

Micro freezing probe uses liquid nitrogen conducted through insulated concentric tubes to freeze tissue in contact with the probe tip. A probe 7 inches long and 0.1 inch in diameter has been used to freeze or cool localized regions in the brain and nervous system to provide temporary or permanent inactivation for experimental and therapeutic neurosurgery. The freezing is restricted to the tip by conducting the liquid nitrogen down the inner tube and removal of the expanded gas through the outer tube and by providing conductive copper wire between the double layer of insulation. A thermocouple welded at the tip can be used to monitor the temperature during the freezing cycle. In addition to the applications noted, the probe may be of value for quickly freezing a sample of deep tissue for analysis of evanescent products.—R.L.B. (Invengineering, Inc., Belmar, N.J.)

Circle 24 on Readers' Service card

Light source for continuous solid-state laser operation (model CLP-200) provides intensity of light said to be more than sufficient to pump above threshold of typical solid-state laser materials. The excitation unit consists of a xenon arc lamp, a 24-inch ellipsoidal mirror, electromagnetic shutter, and power supply. The light source has eight power output selections ranging from 1.1 kw to 4.2 kw to provide radiation outputs from 50 to 200 w through a 15-mm aperture, the focal point for installation of laser optics. Spectral distribution of the light is similar to that of the sun but is said to have the advantage of a greater percentage (24.8 percent) of the total radiation in the visible range.—J.S. (Texas Instruments, Inc., 6000 Lemmon Ave., Dallas, Tex.)

Circle 25 on Readers' Service card

Particle-monitor alarm is an auxiliary unit that converts the manufacturer's airborne or liquidborne particle monitors into warning instruments. Both visual and audible alarms are provided when preset conditions of particle concentration are exceeded. The unit can be installed either adjacent to or remote from the monitor equipment. It provides for adjustment to the desired tolerance and for establishment of the specific particle-size range to be under surveillance. Terminals are provided for either normally opened or normally closed connection to remote indicators. —J.S. (Royco Instruments, Inc., 440 Olive St., Palo Alto, Calif.)

Circle 26 on Readers' Service card

Laboratory animal manual presents information on the care, breeding, feeding and sanitation of nine popular laboratory animals. The manual is especially useful to anyone planning to use or raise laboratory animals, and provides convenient reference information for those already using laboratory animals. A table of chemical composition of the company's laboratory animal chows is unusually complete.—R.L.B. (Ralston Purina Co., Checkerboard Square, St. Louis 2, Mo.)

Circle 27 on Readers' Service card

Federal University-Laboratory

If the proposal of Weinberg [*Science* **136**, 27 (6 Apr. 1962)] that federal laboratories be converted into federal universities be adopted, I believe that Weinberg himself will preside over the demise of a national laboratory that is *now* a good place to do basic research and that it is *now* filling a unique niche in our national research effort. The national laboratories are institutions where nuclear research can be done through utilization of special facilities unencumbered by the usual fund-raising activities and endless committee duties that are found on a university campus. If the national laboratories were to become federal universities (and to undertake research in nonnuclear areas, as suggested by Weinberg on other occasions), would not the national laboratories become so large and cluttered by staff members whose primary responsibility was not in nuclear research that their present usefulness would be diluted to a point no greater than that of a university? There is no doubt in my mind (and evidence for the following view can be provided) that if the national laboratories were to become degree-granting institutions, nonresearch activities would be imposed upon the staff, as follows: development of classroom lectures; development of course work; development of laboratory courses; development of structures to relate the content of one course to that of another (that is, a curriculum committee); development of grading procedures (a grading committee); development of admission policies (an admissions committee); development of teaching opportunities for graduate students (an instructional committee); and perhaps development of administrative structures (deans and vice presidents). Even if a staff should be brought to the national laboratory site from an existing academic institution to handle these nonresearch duties, I cannot see that any increased, total number of graduate students could be trained without increasing the staff of both institutions.

This is not to say that national universities are not needed (how about international universities?), but rather to urge that such institutions be created from new sources, and not by a process whereby we are left with no national laboratories as we now know them.

CLAIRE J. SHELLABARGER
Zoology Department and *Medical School, University of Michigan, Ann Arbor*

I congratulate Alvin Weinberg for his article, "The federal laboratories and science education." It is an excellent suggestion for a policy that would not only increase the supply of scientists but also energize them. Weinberg's suggestion has that combination which someone characterized as the wonderful dialogue between teacher and student in which each transcends himself.

It seems appropriate to me that big users of the output of education (graduates) should reimburse the education bank for what they draw out. Smaller users, both private and public, probably can't practice this policy, but big users of high-talent manpower ought to establish at least an equilibrium position in their balance of payments with education. Better yet, some should deliberately get into a creditor position. Fortunately, a few companies seem to be doing just this. It is heartening to see the director of one of the top federal laboratories adopt a philosophy so essential to the long-run regeneration of talent.

It is good, too, that Weinberg took a straight-faced look at the implications his proposal has for getting the federal government further into graduate education. This debate (and there is bound to be one) can best be conducted with candor at the start. The fact is that federal big science is already involved, through research grants and contracts and through scholarships. The additional step, suggested by Weinberg, of recasting federal laboratories into combination graduate schools and research institutions is one that deserves discussion, to see if benefits will offset potential hazards.

WILLIAM J. PLATT
Management Sciences Division,
Stanford Research Institute,
Menlo Park, California

I certainly agree with Alvin Weinberg that the federal laboratories should play an increasing role in science education to help the 19 out of 20 qualified individuals who are not currently getting their doctorates in science. However, I doubt that the granting of graduate degrees by federal laboratories, as proposed, would do anything except divert graduate students from universities. Currently there are ample opportunities for every qualified college student to undertake graduate training. The problem is getting those 19 students to the point where they can undertake graduate training.

Expansion of the present programs

of the Oak Ridge National Laboratory that are concerned with science education and increased attention to the quality of high school science teaching in the South would be much more valuable than a graduate training program. In Tennessee there are few able science teachers in either the colleges or the high schools; this has been particularly true since the formation of Oak Ridge. One means of combatting the siphoning off of present and potential science teachers by federal laboratories such as Oak Ridge would be for these laboratories to supplement the salaries of high school science teachers and employ them during the summer months. Another suggestion is that some of the scientists currently employed by these laboratories be given a leave of absence, with full pay, to teach in neighboring small colleges and high schools each year.

JOHN N. FAIN
National Institutes of Health, Bethesda, Maryland

The suggestion by Weinberg that, by playing a greater role in education, big science can diminish the manpower shortage it has created is worthy of the most careful consideration. The counterpart to this suggestion, described below, may also warrant consideration.

It is widely recognized that big science is playing an ever-increasing role in the academic world. The effects of this role are not always wholesome; they include too frequently decreasing attention to teaching as the academician's research responsibilities increase. Aside from certain improvements in academic research management, it is suggested that big science in universities be organized into research institutes, somewhat like the federal laboratories described by Weinberg; from there on, the plans are similar.

Thus, the universities living with big science provide for dual roles: those academicians most capable as researchers emphasize the search for *new* truths; those most capable as teachers emphasize the presentation of truths. In only rare cases need an academician be only a researcher or only a teacher. Perhaps the researcher deals mostly with postdoctoral fellows and really advanced courses while the teacher works mostly with graduate and undergraduate students. The essence of the idea is the establishment of emphasis, frankly recognized, without the attempt to be all things to all men.

Many simplifications should derive

from such organization of academic activity, not the least of which would be clarification of the roles being played. It would no longer be necessary for the highly talented researcher to pose as a popular teacher for large groups of students, and vice versa. That all researchers are teachers is implicit, and this is exactly what Weinberg wishes to exploit. By organizing big science into research institutes on university campuses, the best in teaching *and* research would emerge.

R. C. BARD

200 Foxcatcher Lane,
Media, Pennsylvania

In his thoughtful letter Shellabarger makes several points, and I shall discuss them one by one.

1) He seems to imply that, because of the pressure of committee work and so on, modern American universities are fast becoming impossible places in which to do basic research or to educate graduate students. I think the situation is not as bad as Shellabarger suggests; certainly if so much of the average research professor's time is taken up with things not relevant to research, he must be getting support from NIH and NSF under false pretenses. Nor do I believe the teaching of bordering areas of science detracts from one's research potential; in general, I should think that teaching would add to this potential.

Actually, the adjoined or neighboring graduate school which I envisage is small, averaging about one or two graduate students per staff Ph.D. I cannot believe that so few graduate students could create an undue amount of busy work.

2) Shellabarger suggests that a cooperative arrangement with a graduate school would divert the federal laboratories from their primary missions. I have already dealt with this point in my article, but I will add the following: insofar as the mission is basic research, graduate students ought to help, not hinder, the laboratory to fulfill its mission. For applied research the problem is more complicated. One would have to move slowly and feel one's way; any scheme which reduces the ability of a national laboratory to move swiftly into important areas of development would be self-defeating. On this score our own experience with a branch of the M.I.T. Practice School has been most reassuring.

3) I have no intention of presiding over the demise of any institution, least

of all the Oak Ridge National Laboratory. There already are federal laboratories in this country, notably the Lawrence Radiation Laboratory, that follow a variant of the pattern suggested in my article. In Europe, especially in the Soviet Union, the pattern seems to be a good deal more prevalent than here. The experience of these institutions leads me to believe that such university-laboratory arrangements are fundamentally sound.

ALVIN M. WEINBERG
Oak Ridge National Laboratory, Oak Ridge, Tennessee

Civil Service Salaries

I agree in principle with the view expressed in the editorial "Federal pay reform" in a recent issue of *Science* [**136**, 461 (11 May 1962)] but do not feel that it would be appropriate for me, as a federal employee, to comment upon the recommendations in detail. However, I would like to point out a factual error, which tends to give a somewhat poorer picture of the present situation than is actually justified.

The current salary range of a GS-7 position is $5355 to $6345 (not counting longevity increases) rather than an average of $5280, as stated in the editorial. In addition, since July 1960, most physical scientists and engineers and many biologists and scientists of other types at the GS-7 level have been paid the maximum salary—namely, $6345. Therefore, at the lower levels (recent college graduates), Civil Service salaries for scientists are reasonably comparable with salaries in private industry.

BENJAMIN LEPSON
Numerical Analysis Branch, U.S. Naval Research Laboratory, Washington, D.C.

NASA's Fellowship Program

The piece in a recent issue by Daniel S. Greenberg on NASA's new fellowship program [*Science* **136**, 305 (27 Apr. 1962)] contains two excellent points—namely, that the Executive branch of the federal government should bring more information, coherence, and rationality to its multitudinous fellowship programs and that the Congress should consider more positively the need for support below the graduate

level in order to assure an adequate flow of scientific talent upward.

The piece does seem to imply that NASA has been impetuous and excessively aggressive in launching its new fellowship program. It fails to take account of the fact that NASA has a very specific mission and timetable and can hardly afford to await the ordering of the federal fellowship situation. It must seek now to stimulate the training of scientists; otherwise an even more severe manpower shortage in the late 1960's could lead to the failure of its program. Likewise, it cannot single-handedly persuade the Congress to modify its long-standing reluctance to support education below the graduate level.

It should also be noted that these and many associated problems were thoroughly explored with NASA prior to the inauguration of its fellowship program. This was no spur-of-the-moment venture. True, the program was developed expeditiously, but only after widespread consultation in the government and among the universities.

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Retirement

At this time, when our country needs to expand vastly its scientific and engineering manpower and when, indeed, strenuous efforts are being made to induce able young people to enter scientific and engineering professions, able, active-minded, experienced scientists are being forced to retire just because arbitrary age limits for employment have been firmly set by universities, governmental agencies, and industrial establishments. The criterion for such forced retirement is chronological, not physiological, age. Thus, there is both a shameful neglect of very useful, much-needed brainpower and a complete disregard for the vital and social needs of those compelled to retire.

Recently, a nonscientific friend of mine, a retired librarian, Elizabeth Woodruff, of Mineral Wells, Texas, who is greatly concerned with the social problem of older citizens, wrote me suggesting ways in which such scientists and engineers could continue to serve our nation and continue to lead fruitful lives. She wrote: "I feel that the professor (and his kind) should

use his knowledge to create new avenues in which his ability could be expanded and take new growth." She offers the following suggestions.

1) The present retirement age limit of scientists and engineers could be raised, provided the potential retiree desired it.

2) Libraries could establish or enlarge scientific departments in which retired scientists could serve to make a knowledge of science more easily and readily available to the public.

3) The various communication media (newspapers, magazines, and radio and television stations) which have potential for useful instruction could engage retired scientists either to teach or to assist others in teaching science to nonscientists.

4) Scientists having their own businesses could employ scientists of retirement age on an equal footing, or could form partnerships to expand such businesses.

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The Cost of Credit

It is alarming to me that Reavis Cox [*Science* **135**, 48 (1962)] overlooked entirely the basis upon which the editor wrote in support of the Douglas "Truth in Lending Act" (S. 1740) [*Science* **134**, 913 (1961)]. The editorial concludes: "The statement of simple annual interest rate would permit a customer to compare the true costs of different forms of credit and to act rationally on that basis. *On balance, we favor any step that encourages rational decisions* [italics mine]." Although the bill requires disclosure of both the dollar cost and the simple rate, the editor selected the latter aspect to be "the main feature of the bill." This is the most controversial and significant feature of the bill. Therefore, one conversant with the subject would have appreciated why the editorial was headed "Tricks with numbers," and why the subject was introduced with the theme that a comparison of absolute numbers instead of rates may lead to fallacious conclusions.

But instead of arguing the promotion-of-rational-decisions issue, Cox chose to argue the absolute-number-versus-rate issue, and said that the editor "claimed too much." How did Cox prove that rate information is not needed? He reduced the simple formula $I = Prt$ to an

$I = r$ (constant) equation by fixing P (principle) at \$100 and t (time) at 6 months. Of course, a contract with a greater I would also have a greater r, so he is correct in concluding that no further information than dollar costs is needed in order to decide who offers the buyer the better bargain. But such a simple case inadequately supports his conclusion that the government need require disclosure of only the absolute dollar amounts and not the rates.

If Cox had allowed in his example for variations in time t or in principle P, his case would have been realistic and less useful for his policy position. For example, one loan might have been repaid in monthly payments and not in a lump sum at the end of 6 months. Or perhaps one loan might have been for 7 months. He might have varied the amounts of the loans, with one for \$100 and the other for \$99.45. Or, one loan might have required that the first payment include the total credit charge or payment of the finance charges at the beginning rather than during or at the end of the contract period. Had these or many of the other variations experienced in real life been recognized in Cox's case, he might have been less ready to suggest that mere comparison of absolute numbers is sufficient for judging which of two alternatives is a better bargain. I doubt that savings and investment decisions or decisions made by lenders are based on comparison of absolute dollars alone! If rate comparisons are useful in making many financial decisions, why a double standard for borrowers and lenders as to facts needed for decision making?

At no time does Cox debate the editor's statement "a customer [of consumer credit] usually has no way to determine what his true credit rates are and no standard by which to compare different schemes." In fact, he gives additional examples of confusion. Yet, he rejects the Douglas bill on the grounds that "the bill seems to assume that simplified formulas borrowed from the austere world of pure arithmetic can be applied literally to the complex and disorderly world of commerce." Support for his deprecation of the usefulness of that formula, which many of us find so useful, appears in the March 1962 monthly letter of the First National City Bank (p. 33): "But, in the business world, simple interest is little more than something once learned in school; it is not used in millions of credit transactions consummated each day. . . . Simple interest is too compli-

cated." Evidently the world of commerce makes the borrower's education obsolete.

What does Cox propose? The situation, he says, calls for further study. And only after such study would it be appropriate to prescribe remedies, if any are required. I emphasize the last four words, "if any are required"; this indicates his failure to understand the rationale for the editorial! Cox seems to assume that disorderliness is to be expected and that need for corrective action to standardize the terms of trade for more intelligent action by borrowers and lenders is not obvious. That the system is too complex for the consumer to make rational choices efficiently evidently does not concern Cox sufficiently for him to recognize the essence of the editorial.

Why the difference in attitude between the editor and Cox? Can it be attributed to a social lag between the physical and social sciences? I think not. Cox, as a student of marketing, shows interest in a description of events, "of what really happens, with what consequences, to how many people." He wants to know how many win and lose or are affected by present practices. He is not interested in whether the market system respects rationality or whether facts are disclosed so that lenders will then compete in a market for borrowers who are armed with essential facts. I dare say he reflects a professional interest in marketing but not in evaluating marketing in the context of progressive public policy (except to defend the status quo). The editor of *Science*, however, reflects a professional interest in rationality. He has taken a very defendable stand from the viewpoint of the scientist, it seems to me. In effect, he says: "How can we expect respect for science on the part of a public which is nurtured in a system which decries the application of even the simple interest formula to everyday credit transactions?" Surely an economy which stimulates competitive deception, discredits the application of intelligence to everyday decisions, and makes thoughtful action costly encourages ridicule of learning and rationality. For example, is there a science teacher who would not find his teaching job less complicated if students had been raised in families which computed prices per pound when buying, or rates of charge when shopping for credit? And how much simpler science teaching might be if students had previous experience with the decimal metric system in the mar-

ket? Scientists do have a direct interest in the social environment. It seems to me that the editor has taken a very responsible position with respect to the scientific community. For his breadth of view I wish to commend him.

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If I understand Morse's argument correctly he has worked himself into the extraordinary position of asserting that anyone who urges Congress to find out the facts of a situation before trying to regulate it is attacking rationality! As I see it, the issue posed by the "Truth in Lending Act" (S. 1740) is not one of rationality versus irrationality but one of true rationality versus pseudorationality. In pure mathematics or logic the test of truth is consistency alone. In mathematics or logic applied to the real world we must add the test of relevance. It is not really rational to transfer principles bodily from mathematics into politics without assembling and analyzing whatever evidence we can obtain as to their relevance.

The merchants and consumers whom Senator Douglas would regulate are not intellectual constructs or systems of equations limited to a few arbitrarily chosen variables. They are flesh-and-blood people whose welfare is at stake. They differ widely in ability, shrewdness, diligence, integrity, intelligence, education, persistence, and purpose. The specific physical, social, and commercial environments in which they live are spread over a wide spectrum. I therefore have no apology to offer for saying that before Congress enacts this law it should do a better job than I believe it has done thus far in deciding what will happen to whom after it has acted. Nor do I see any real conflict between expressing concern as to "how many win and lose" and efforts to help consumers be more rational in their buying. Morse merely assumes that enactment of S. 1740 would be a "step that encourages rational decisions." Legislation should be based upon knowledge, not assumptions.

Morse is correct when he says that in my illustrations I have arbitrarily held P and t constant and so made r equal I in the formula $I = Prt$. He neglects to say, however, that I have done this only to point out that even in the world of pure logic the assumption that one must always compare rates in order to be rational is not valid. I do not know and I believe no one else knows, as a matter of fact based upon empirical evidence, the proportion of purchases in which consumers would get from absolute numbers all the information they need for rational comparison of the bargains offered them by different sellers.

Morse apparently has no doubts as to his own knowledge of the facts. He says that introducing many variations of P and t would have made my case "realistic," more in accord with what is "experienced in real life." In practice, I suspect, most individual consumers when they make specific installment purchases have to choose not from all the mathematical possibilities but from quite narrow assortments of alternatives as to goods, sellers, and terms available in the markets open to them. Whether the system now used "is too complex for the consumer to make rational choices" is a question of fact that can be answered only by going into the field and seeing what consumers do. So is the question of whether working with formulas for "true" interest will increase or decrease the complexity of the problems faced by real consumers in the real world.

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Ancient Agriculture in the Negev

The editor of *Science* has kindly consented to the publication of a letter not to exceed 600 words and focusing sharply on material introduced by Evenari *et al.* but not mentioned in my earlier communication (*1*). I have learned too late that the policy of *Science* allows only one letter of criticism and the author's rebuttal; hence I must reserve my detailed reply to Evenari *et al.* for another forum.

The present issue centers on the following statement by Evenari *et al.*: "Finally, in objecting to our theory Mayerson refers to unpublished information . . . of a series of experiments carried out by the Hebrew University (by us) and the Soil Conservation Service. These experiments, Mayerson maintains, showed that 'undisturbed hammada gave much more runoff than the adjoining piece of ground that was bared of its upper cover. The exact percentages have not been published, but they range from 100%–200%'. . . . This statement is false."

Let me state simply and directly that

I have never cited this information in objection to, or in refutation of, the efficient-runoff (soil-crusting) theory of Evenari *et al.*, nor have I made any attempt whatsoever to evaluate the information. My actual words regarding the experiments were these (*2*): "The results, of course, are tentative and we await confirmation and elaboration by the sponsors of the experiments. Yet, had these experiments proved that cleared *hammada* did in fact increase runoff, they still would not have proved conclusively that the *teleilât* were the result of a conscious effort on the part of the farmer to increase runoff. They would only have proved that it was *scientifically demonstrable* to increase rates of runoff by clearing stones from the *hammada*."

In other words, my interest focused solely and exclusively upon whether these experiments, successful or not, could in any way prove that the ancient farmer stripped slopes of their stone cover in order to enhance crusting and thereby increase rates of runoff. I believe they did not and will not.

The article in which the foregoing statement appeared was entitled, "The ancient agricultural remains of the Central Negeb: Methodology and dating criteria," and the report of the soil-crusting experiments by the Hebrew University and the Soil Conservation Service was cited to support a methodological position which I have steadfastly maintained and which I believe is grounded in scientific logic: namely, that observations on the function of ancient agricultural installations which cannot be supported by ancient or modern analogies must be regarded as speculative. It is from this position alone that I object to the soil-crusting theory of Evenari *et al.*, for not one of their citations (*3*) provides the slightest support for the theory.

This was the point I wished to make with respect to the experiments undertaken by the Hebrew University—no other. And as for my own view on the stone heaps (*teleilât el 'anab*), I am not so wedded to my theory—which I only maintain is more plausible than others—that I would not divorce myself from it if sound and substantive evidence were adduced in support of the efficient-runoff (soil-crusting) theory or any other theory. But above all, let evidence and testimony, not invective and detraction, prevail. *Absit invidia.*

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References and Notes

1. *Science* **134**, 1751 (1961).
2. *Bull. Am. Schools Oriental Res. No. 160* (1960), p. 27.
3. *Science* **133**, 979, ref. 36 (1961). The citation of B. Hellström has no bearing whatsoever on the soil-crusting theory, and the installations he describes do not in the slightest resemble the stone heaps of the Central Negev.

Evenari informs us that he sees no reason for making additional comments on this subject.—Ed.

Center for Retired Scientists

It is pleasant to read that C. W. Weiant proposes a "center for retired scientists" [*Science* **135**, 961 (1962)]. There are a number of suitable locations in Mexico and Central America. As an alternative to Weiant's Jalapa. I would like to suggest Tapachula, which lacks the "*Nortes*" so numerous in Jalapa.

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