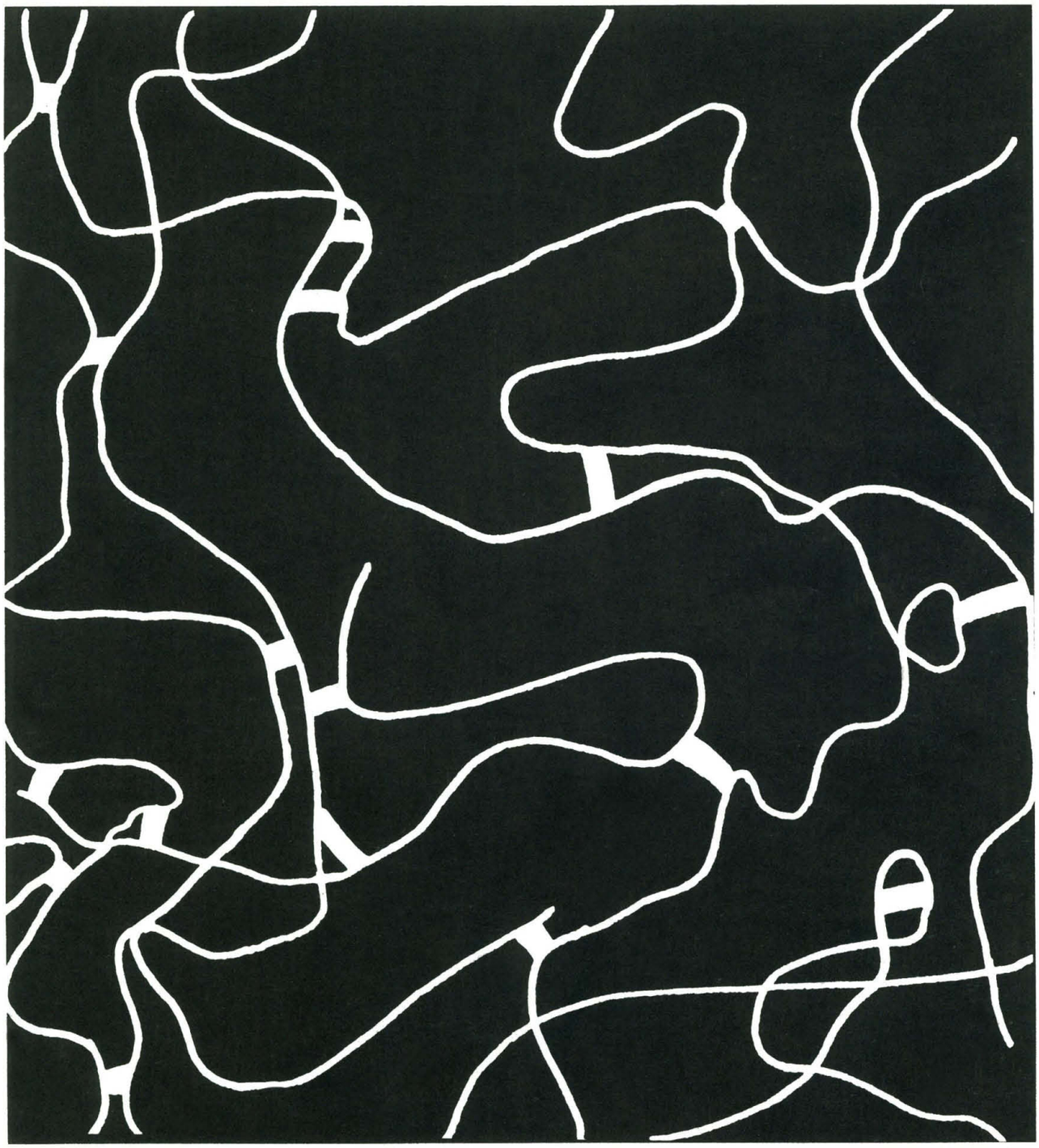
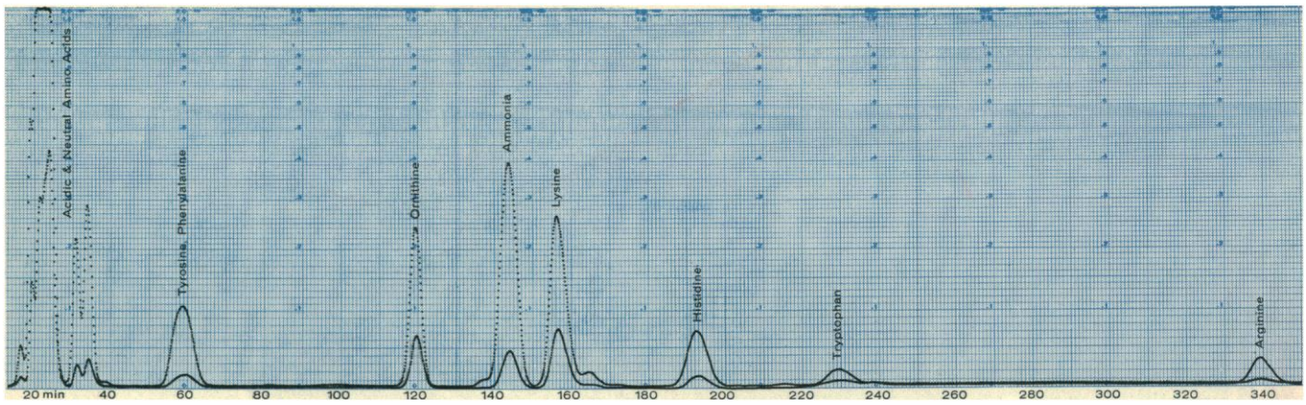
SCIENCE

22 January 1965
Vol. 147, No. 3656

AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE



UNSTRETCHED ELASTOMER



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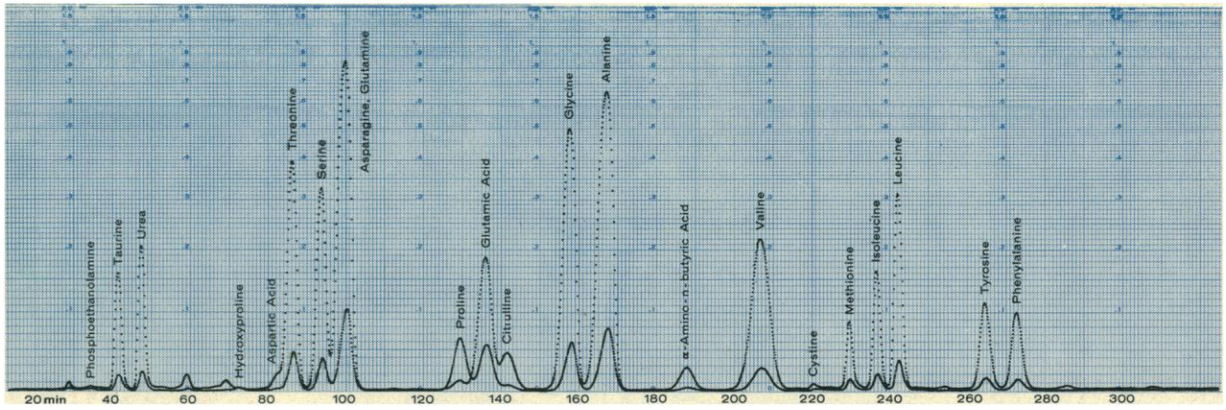
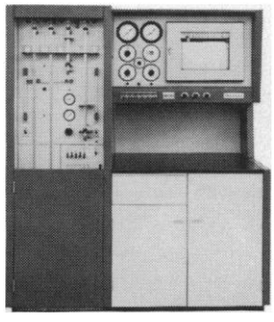


in eleven hours



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22 January 1965
Vol. 147, No. 3656

SCIENCE

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COVER

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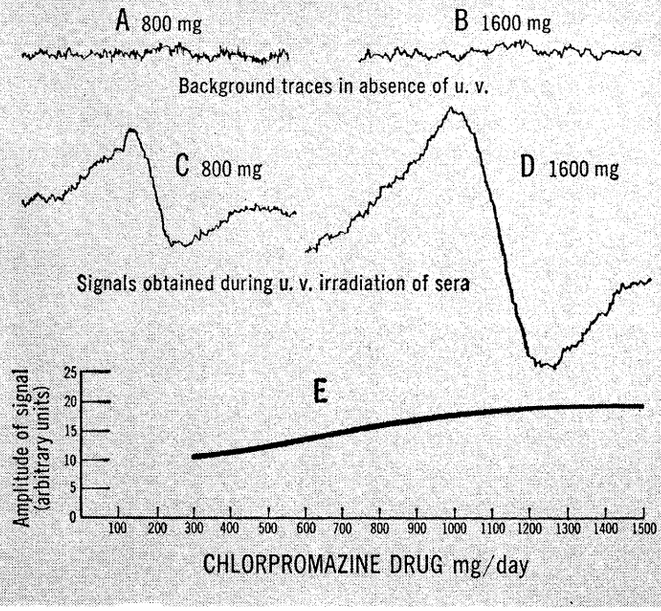
EPR IN THE WORLD OF BIOCHEMISTRY

EPR MONITORING OF DRUG LEVELS IN BLOOD SERA



When a blood serum sample of a mental patient who is being treated with one of the phenothiazine psychotropic drugs is irradiated with an ultraviolet light, a light-induced EPR signal with a line width of 8.35 gauss and a g value of 2.0042 is produced. Figs. A & B illustrate background traces taken in the absence of ultraviolet light. Figs. C & D are typical signals obtained during **in situ** irradiation with ultraviolet light of blood sera. In fig. C, the patient was on 800 mg drug per day. In fig. D, the patient was on 1600 mg drug per day. The amplitude of this signal is proportional to the amount of drug used clinically, as illustrated in E.

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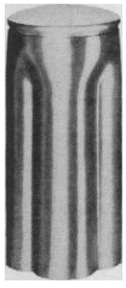

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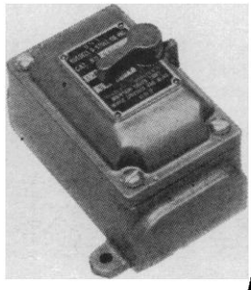

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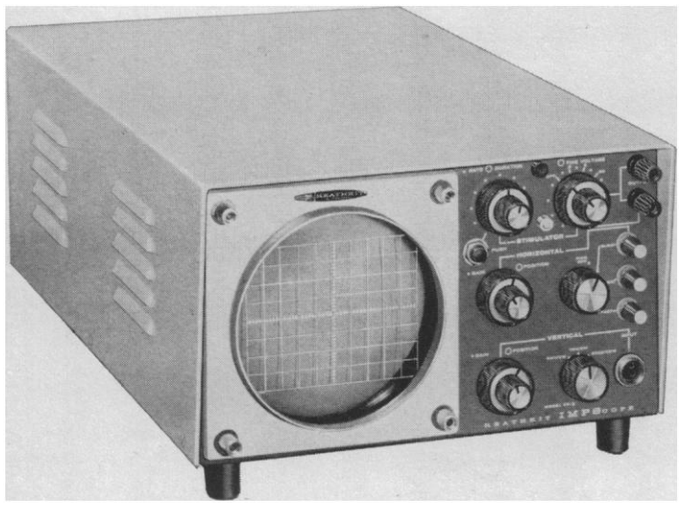

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The Heathkit model EV-3 IMPScope and its associated equipment, including the sourcebook, were developed in conjunction with project IMPS, supported by the National Science Foundation and conducted by Mr. Norman N. Goldstein, Jr. at the University of California, Berkeley. Mr. Goldstein, also is the author of the unique sourcebook containing extensive laboratory experiments.

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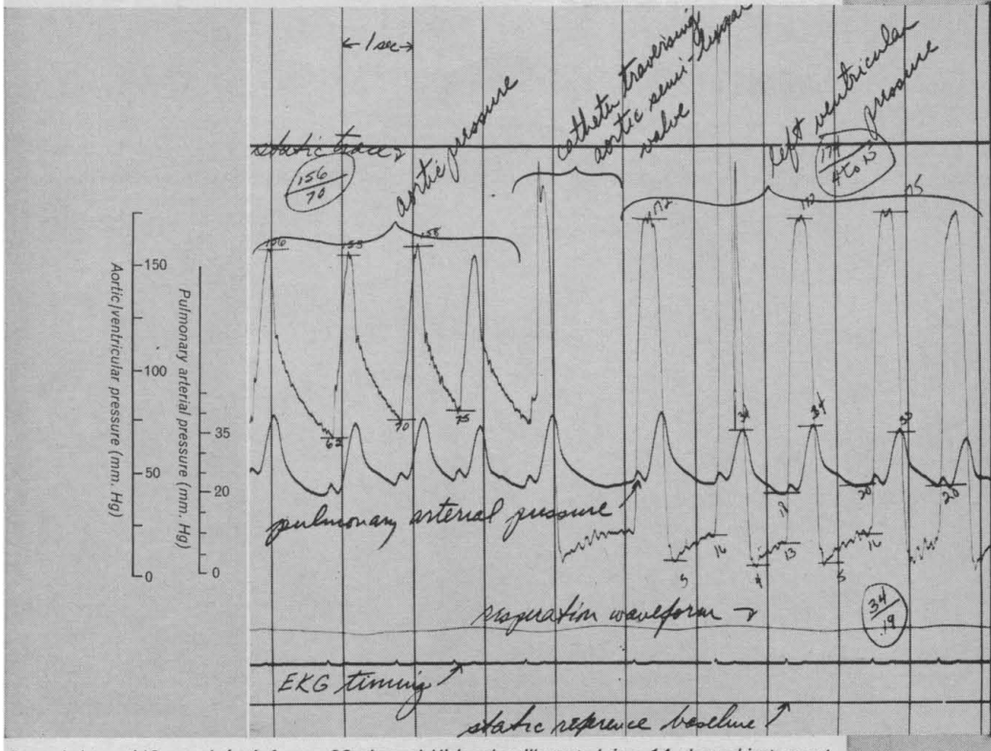
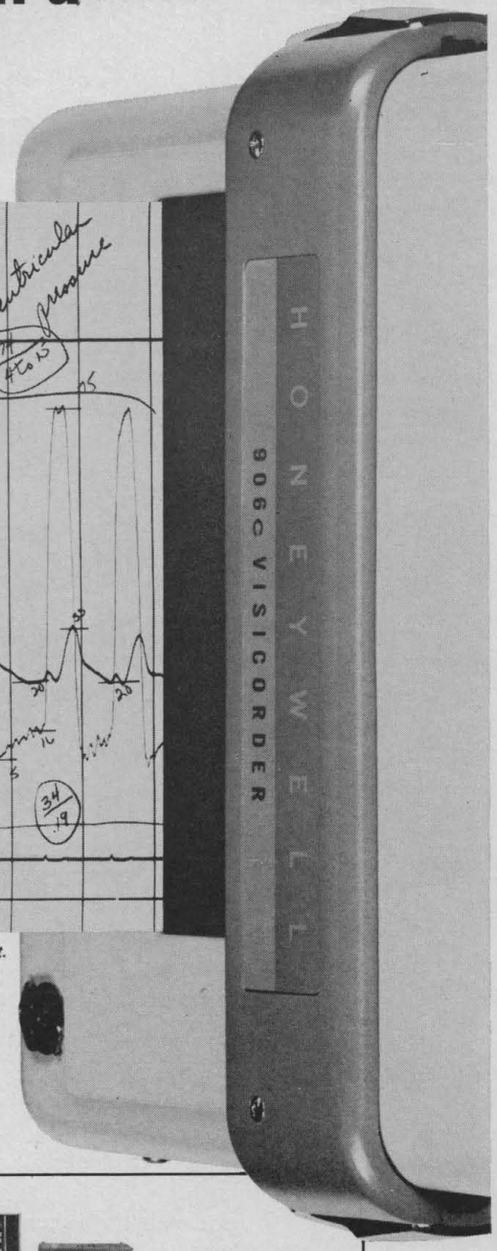
This is a typical record from a Honeywell Cardiovascular Recording System



Record shown 1/3 actual size is from a 36-channel Visicorder; illustrated is a 14-channel instrument.



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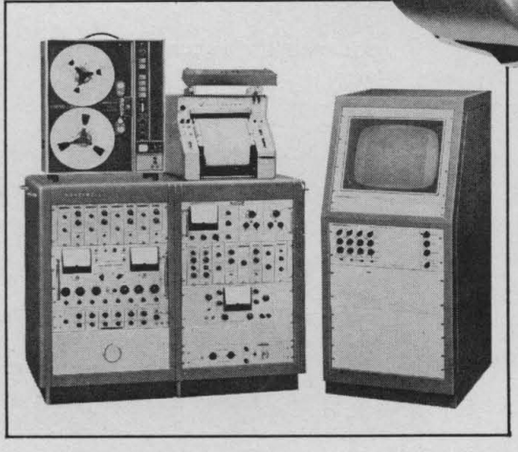

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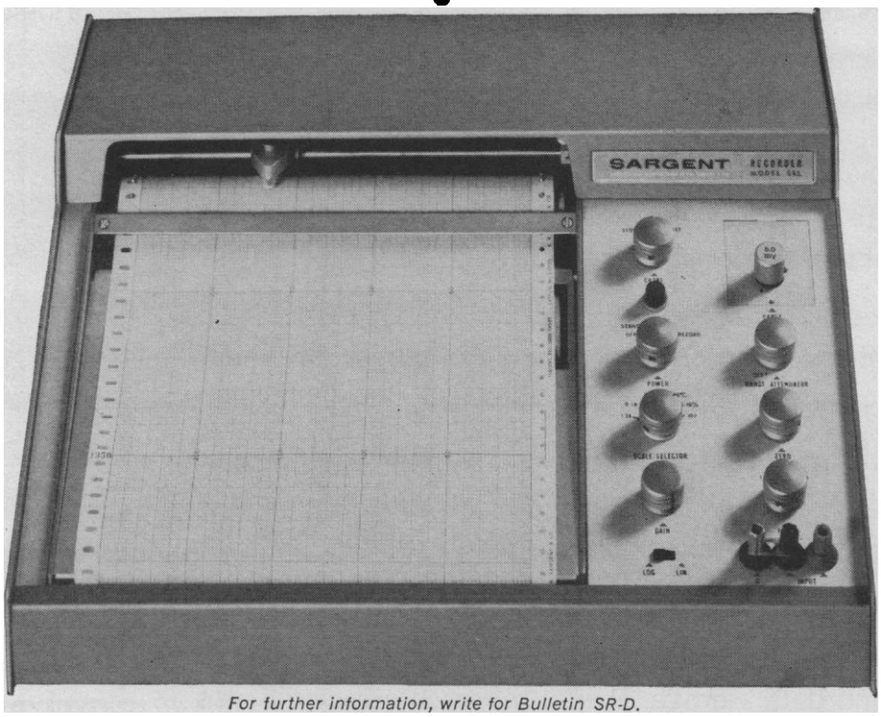

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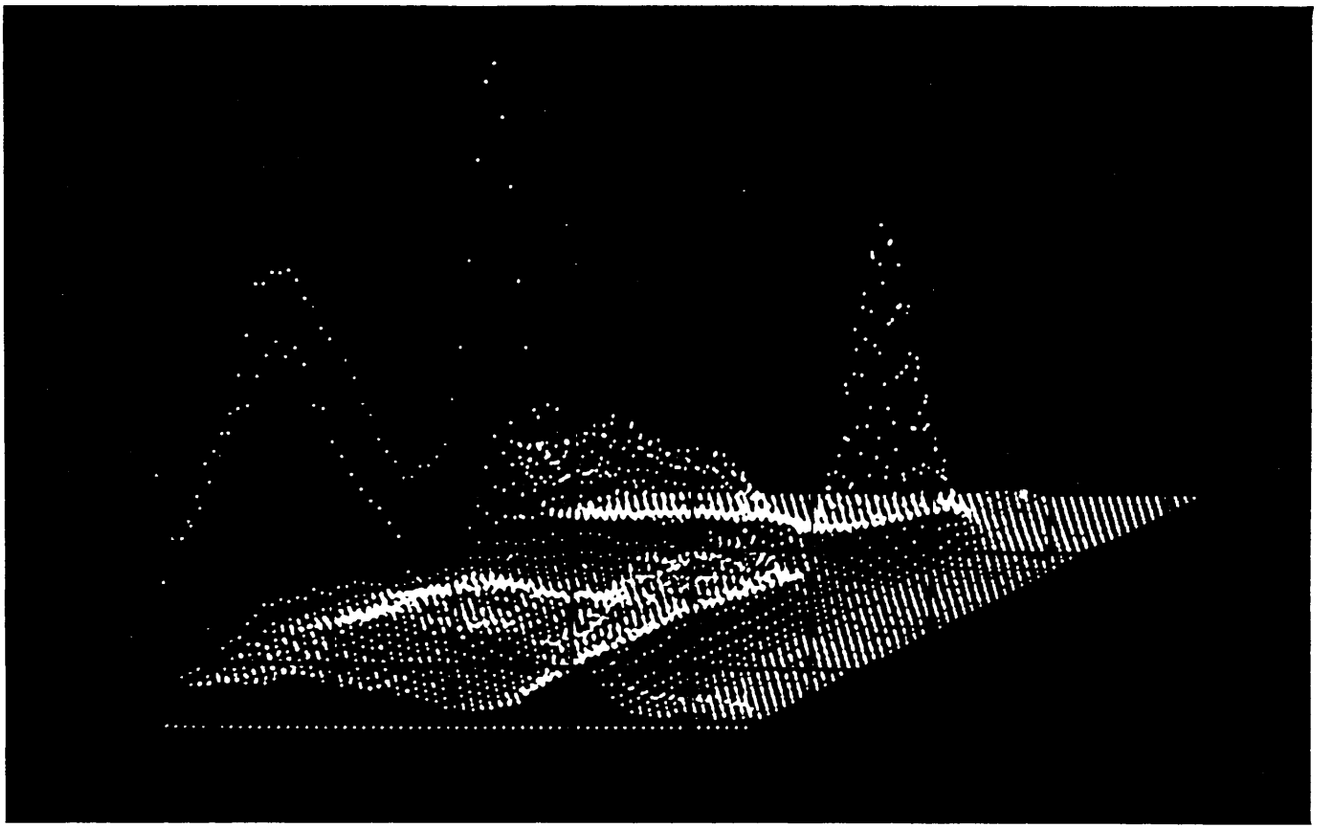

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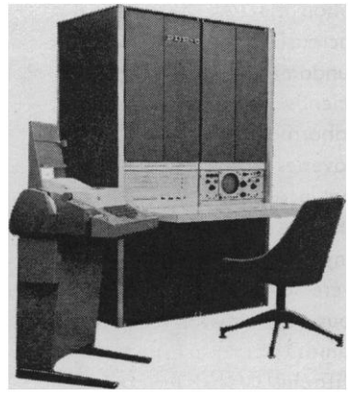

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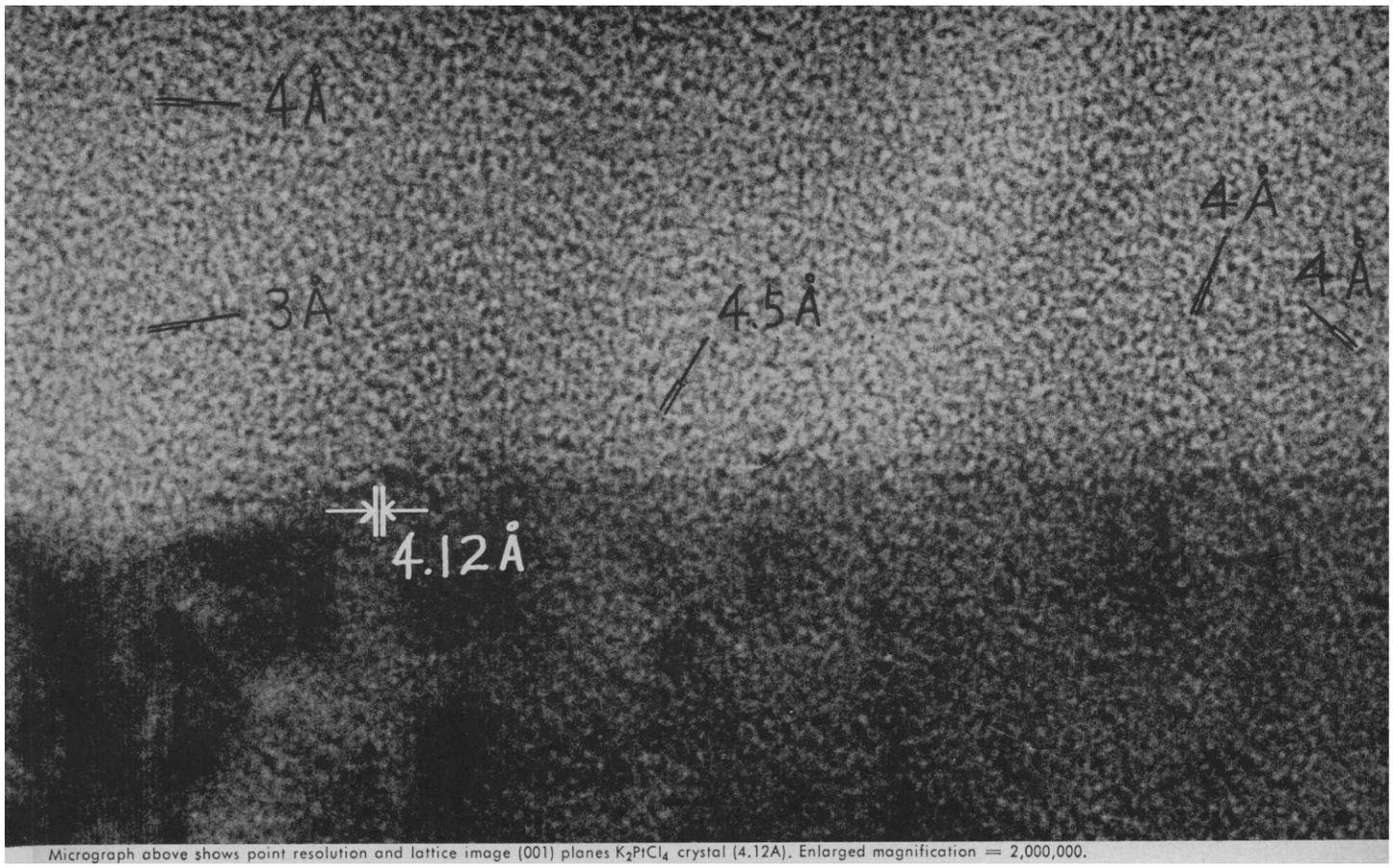

Micrograph above shows point resolution and lattice image (001) planes K_2PtCl_4 crystal (4.12A). Enlarged magnification = 2,000,000.

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As research in the life sciences and solid state physics accelerates, ultra high resolution electron microscopy assumes an increasingly important role as a source of fundamental new information. Recently, scientists at the Hitachi Central Research Laboratory have announced new discoveries in electron optics which are being incorporated in their latest designs. The five electron micrographs below of a tiny (0.05 micron) hole in collodion film were taken at equal intervals during a four minute period. They demonstrate the remarkable performance of the new Hitachi HU-11B Electron Microscope.

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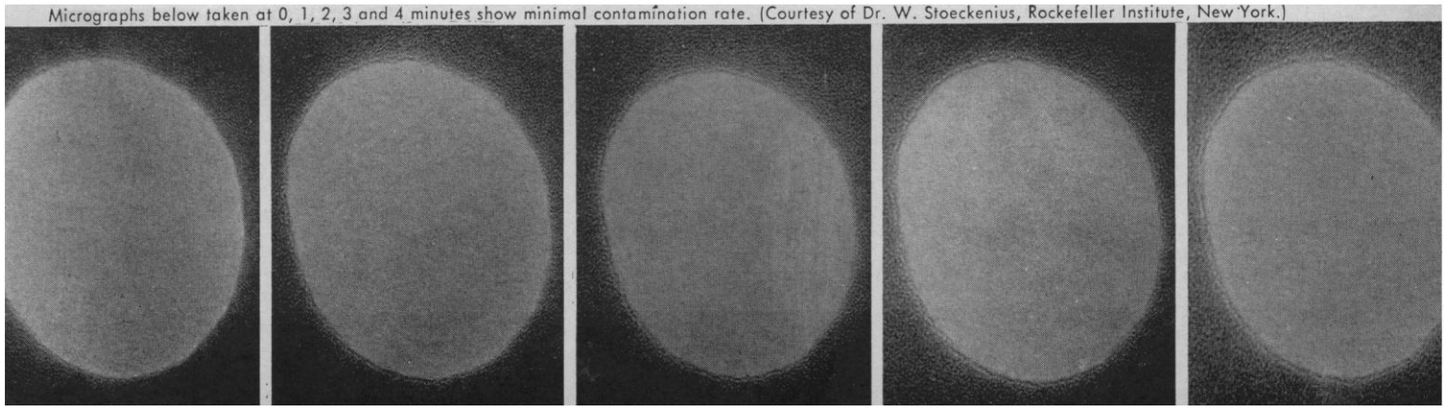
Micrographs below taken at 0, 1, 2, 3 and 4 minutes show minimal contamination rate. (Courtesy of Dr. W. Stoeckenius, Rockefeller Institute, New York.)



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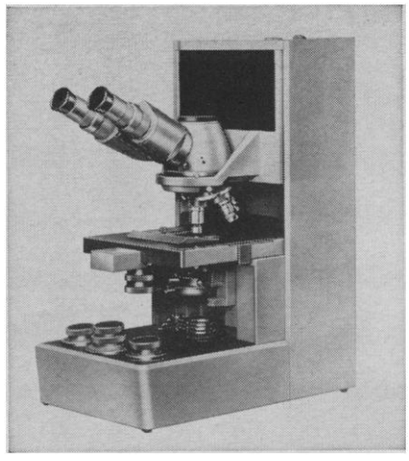

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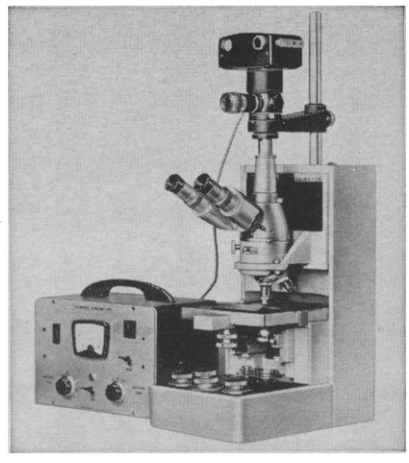

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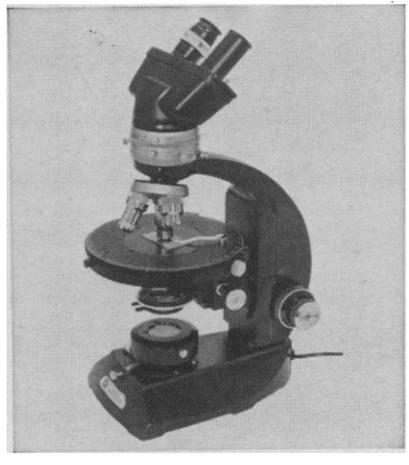

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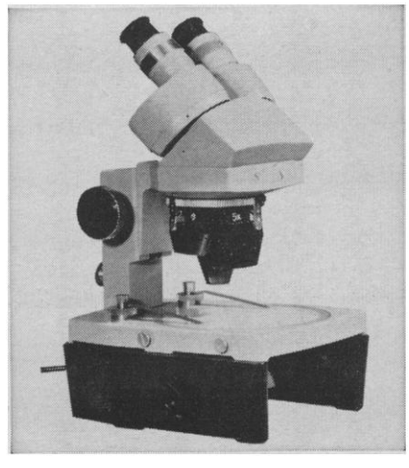

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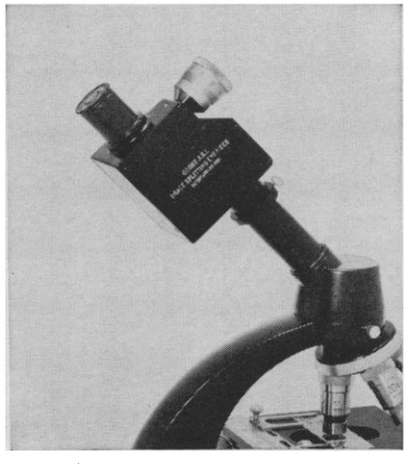

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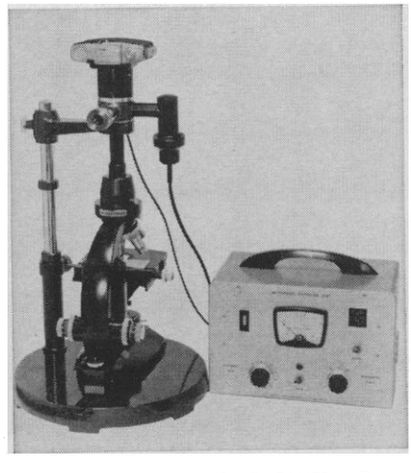

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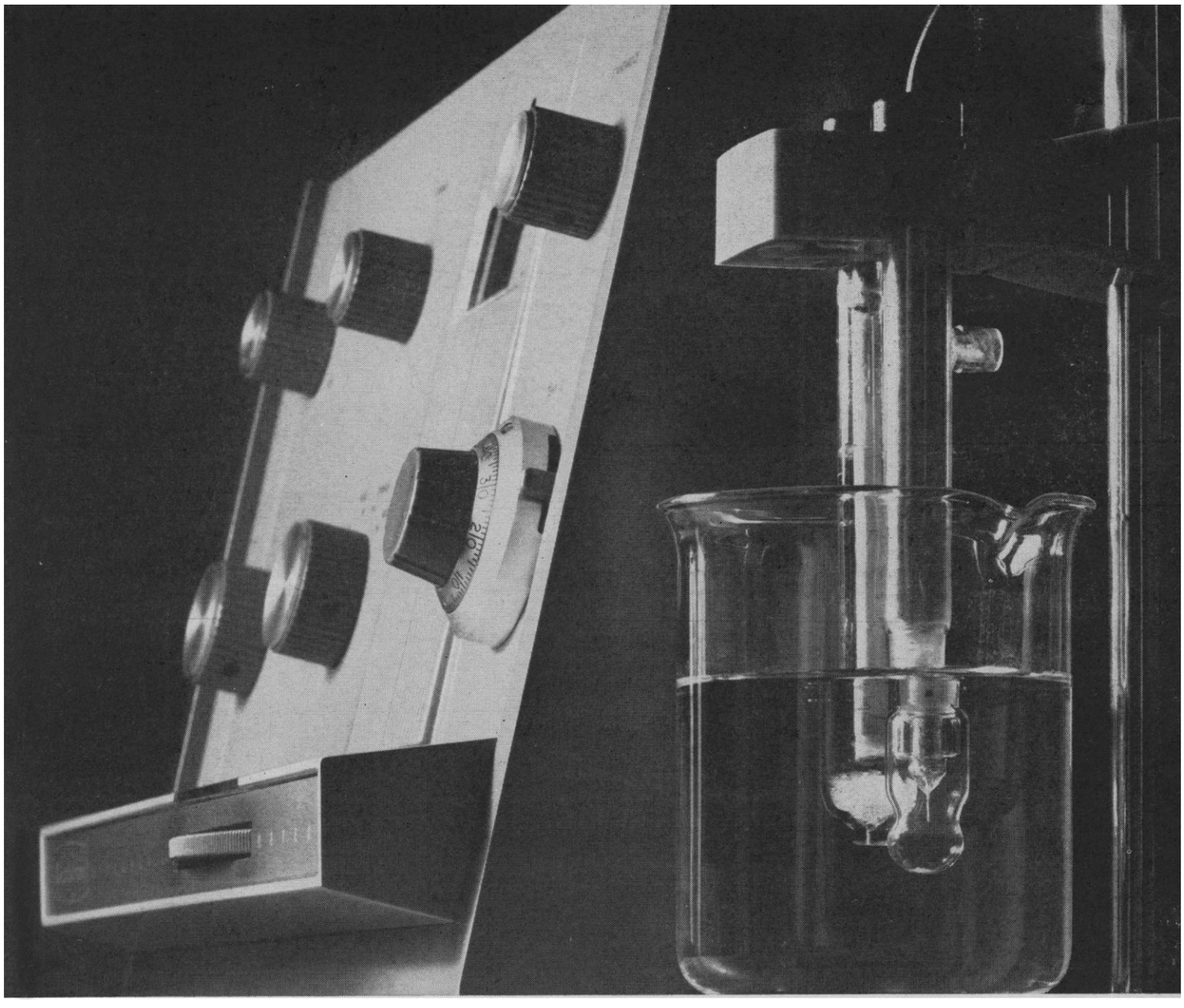

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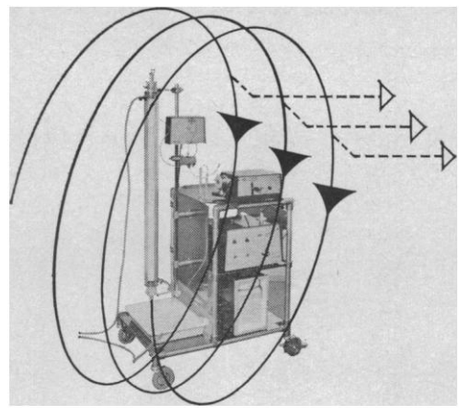
Introducing the LKB ReCyChrom for

RECYCLING CHROMATOGRAPHY

NEW INSTRUMENTATION FOR A NEW TECHNIQUE* IN CHROMATOGRAPHIC SEPARATION



The ReCyChrom is equally applicable for preparative and analytical separation of mixtures of large-sized or of small-sized molecules. These molecules do not have to be electrolytes and restrictions on the type of buffer used are less than with other types of chromatography. Components within a narrow range of molecular sizes, usually not resolved on simple gel filtration columns, are separated in the ReCyChrom by allowing the sample to pass repeatedly through the bed, thereby multiplying its effective height many times. Separated fractions and uninteresting or disturbing parts of the effluent may be bled out of the stream after any cycle without interrupting the separation of the remaining components.

The apparatus is especially suitable for grading homologous series of polymers, e.g., dextrans; for routine control of the purity of biochemical preparations such as serum proteins, enzymes and hormones; and for separation of heat labile substances.

One unique advantage of recycling chromatography is the need for columns of only moderate length. Columns in two standard lengths, 60 cm and 100 cm, both with 32 mm bore are available at present. The range of sample volumes accommodated by these columns depends greatly on the nature of the sample. For simple desalting operations or for separation of peptides and amino acids from proteins, a sample of up to *150 ml* is not unusual, whereas for purity controls of radioactively tagged concentrated preparations, quantities down to 1/100 of this volume are feasible. Sample application by pipette is eliminated. The pump sucks sample through a selector valve with a holdup of 150 µl—a reproducible and non-critical method.

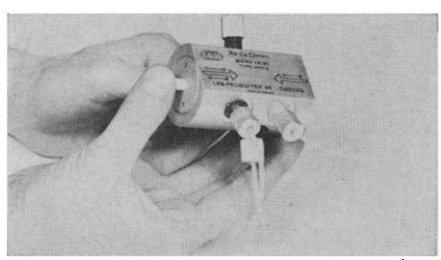
The four main components of the ReCyChrom, namely, a separation column, a peristaltic pump, a selector valve and a flow analyzer are available separately for incorporation into other instrument setups. The specially constructed columns with adjustable plungers at both ends can be sealed completely to eliminate the pressure of water head and permit liquid flow in either direction. Closed system operation and ascending flow maintains even packing and prevents the flow rate from falling off with use, even when beds of material with low mechanical strength (gels) are used.

LKB's specially designed peristaltic pump has a very high flow constancy—0.5% over a period of a week—and a continuously variable pumping rate from 0-390 ml/hr.

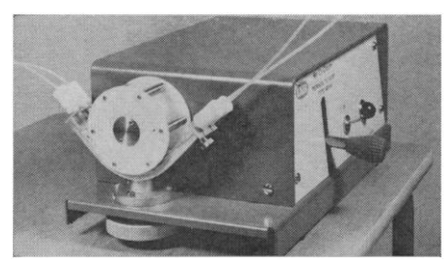
A choice of three flow analyzers, cooling jackets, terminal box, connections and a cart comprise the remainder of the assembly.

Request literature file 4900S-1 for details.

*According to J. Porath and H. Bennich



The simple push of a button on the Selector Valve alters the flow circuit from injection or bleeding to recycling.



The Peristaltic Pump has many other uses when not in service for the ReCyChrom.

LKB INSTRUMENTS, INC., 4840 Rugby Ave., Washington, D.C. 20014

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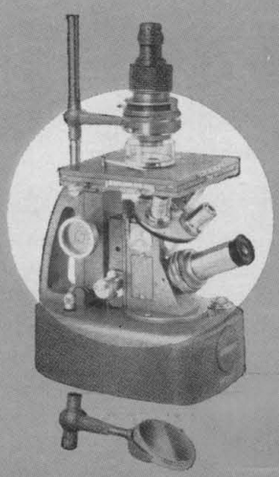
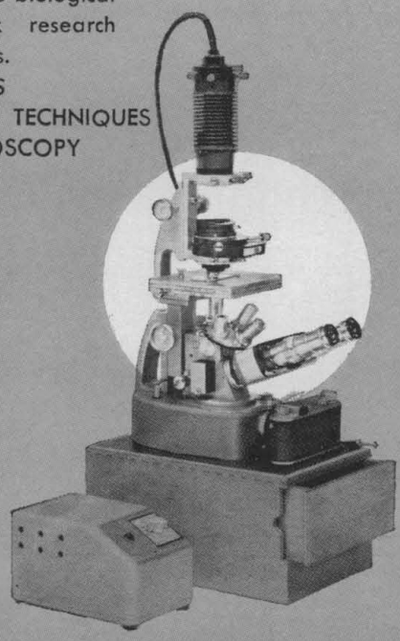
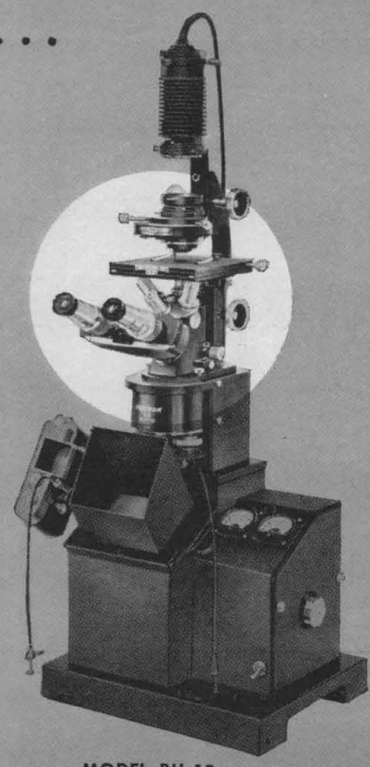


MODEL MIC



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.**

BINOCULAR MODEL BMIC. Binocular version of Model MIC, with camera mechanism. **$609.**

Brightfield Research Models:

MONOCULAR MODEL BR-MIC. Five brightfield objectives 5X, 10X, 20X, 40X, 100X (oil); eyepieces 5X, 10X, 15X; rack and pinion condenser mechanism with individual centering adjustments for condenser and illuminator; elevating compartment provides handy storage for accessories. **$545.**

BINOCULAR MODEL BR-BMIC. Binocular version of Model BR-MIC, with camera mechanism. **$745.**

Phase Research Models:

MONOCULAR MODEL PH-MIC. Eight phase objectives 10X, 20X, 40X, 100X (oil) in both bright and dark-medium contrast; eyepieces 5X, 10X, 15X; high intensity Koehler-type illuminator; five-choice intensity transformer; phase turret condenser with aperture for brightfield; elevating base. **$812.**

BINOCULAR MODEL PH-BMIC. Binocular version of Model PH-MIC plus built-in camera mechanism. **$1012.**

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.

CAMERA-MICROSCOPES

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.

Brightfield Research Models:

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BINOCULAR MODEL BU-12. Binocular version of Model U-12. **$1379.**

Phase Research Models:

MONOCULAR MODEL U-13. Same phase objectives, turret condenser, and visual eyepieces as Model PH-MIC. **$1390.**

BINOCULAR MODEL BU-13. Binocular version of Model U-13. **$1580.**

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accommodates slides, wet mounts, special glassware, warming chambers and micro-manipulators ● unobstructed stage for easy access ● built-in, correct intensity illumination ● glare-free coated optics ● special petri dishes for observation of cultures even by highest power oil immersion objective ● graduated mechanical stage ● accessory camera attachments ● long working distance 40X objective and other accessories also available

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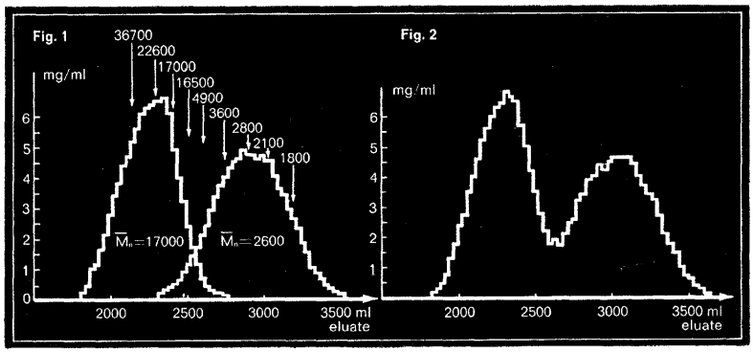
Gel filtration with Sephadex, which separates molecules according to size and shape, offers a convenient means of fractionating water-soluble polymers.

In many cases a complete separation of the lower members of a homologous series can be effected. With the higher members there is, of course, a smaller relative increase in molecular size between successive members. Efficient fractionation should give at least partial separation of these higher members. In polymer fractionations it is particularly important to use carefully packed, long or recyclic, columns to obtain the necessary high resolution.

Fractionation of a Dextran Mixture



The diagrams show a separation of two fractions with $\bar{M}_n$ 17,000 and 2,600 respectively, chromatographed on two Sephadex G-100 and G-25 columns connected in series.

Figure 1 shows the elution pattern of the separate fractions.
Figure 2 demonstrates the elution pattern of the dextran mixture.

All Sephadex-G Types Now Available in Bead Form

Sephadex Type	Fractionation range (MW)* determined for polysaccharides
G-25 Fine/Coarse	100- 5,000
G-50 Fine/Coarse	500- 10,000
G-75	1,000- 50,000
G-100	5,000-100,000
G-200	5,000-200,000

*For proteins the fractionation range is larger. P. Andrews, Biochem. J. 91:222, (1964).

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Sephadex is also available in charged form as DEAE-, CM- and SE-Sephadex. These ion-exchangers have high capacities, low non-specific adsorption, and can be repeatedly regenerated.

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Two chromatographic columns (1″x18″ and 1″x40″) especially designed for gel filtration with Sephadex are now available. Cooling jackets for both types are also available.

BLUE DEXTRAN 2000

BLUE DEXTRAN 2000 with a weight average molecular weight of 2,000,000 is completely excluded from all types of Sephadex columns. It is particularly suitable for (1) void volume determinations on beds of all types of Sephadex, (2) checking column packing, and (3) for demonstration purposes.

Sephadex literature or information is available on request. *Address all inquiries to:*

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Model CTD is the world's standard for routine frozen sectioning. Modestly priced, this unit features anti-fog control, ±1°C temperature control, internal quick-freezing.

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All are equipped with IEC's famous Minot Custom Microtome . . . the precision instrument for both paraffin and frozen sectioning. Cuts sections from 2 to 16 microns, with 18 to 40 micron sectioning optional. 100% rustproof. Autoclavable. Many other high precision features.

CTD, CTI and CTR include special micrometer adjusted anti-roll plate. A new wire loop type anti-roll and frozen sectioning knite are also available. Other accessories such as razor blade holder and rapid freeze device available.

Send for Bulletin CT for complete description of all three models.

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MODEL CTI

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CHEMICAL CARCINOGENESIS AND CANCERS *by* **W. C. Hueper** *and* **W. D. Conway**, *both of National Cancer Institute, Bethesda, Md.* Provides for the first time a sound basis for rational study of environmental chemical cancer hazards and cancers. The various chemicals are classified and analyzed as to composition and structure in relation to carcinogenicity, causative mechanism and metabolism. *About 592 pp., 34 il. (Amer. Lec. Living Chemistry) In Press*

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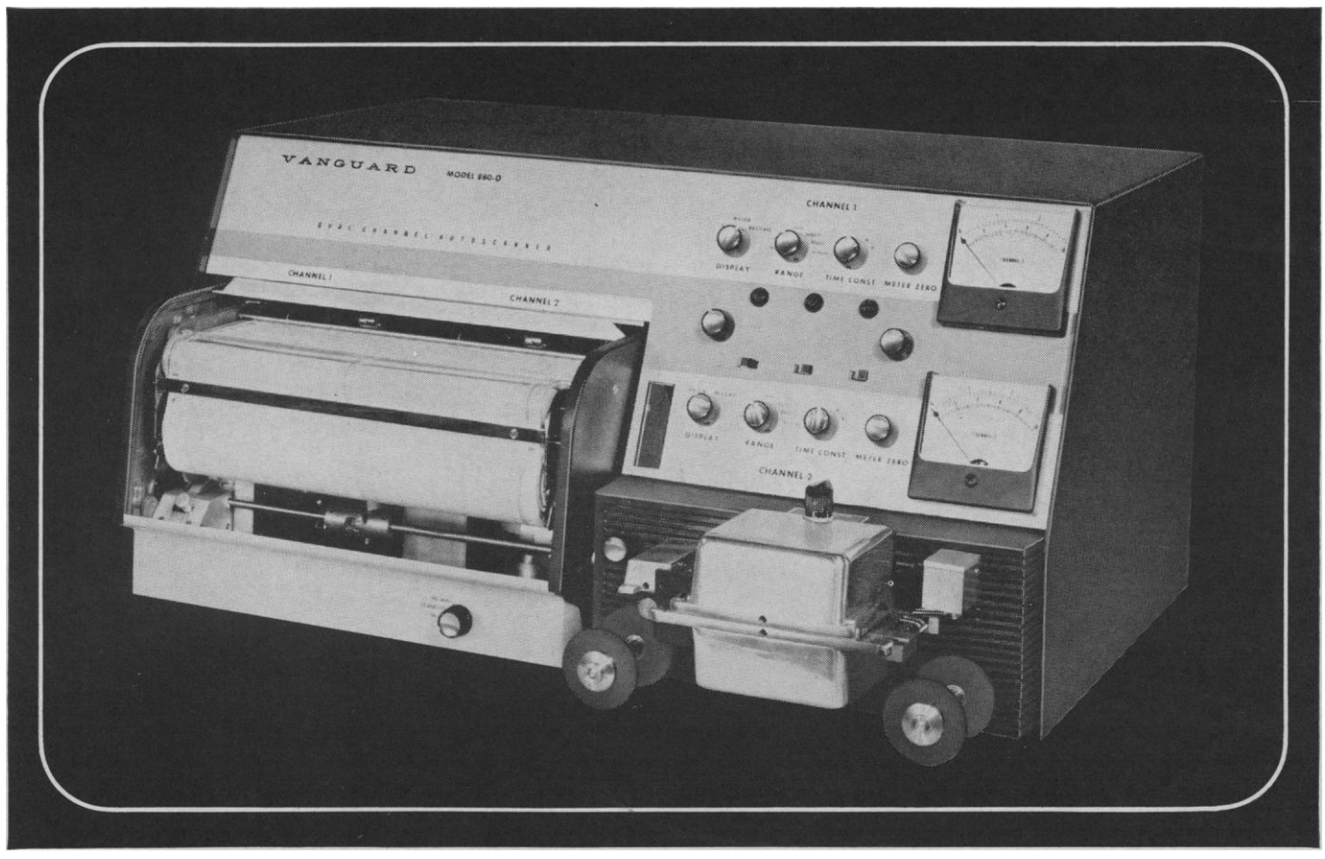

dual channel low background autoscanner

Model 880-D Dual Channel Low Background Autoscanner features two separate channels, both taking their input from the common detector. There is a common high voltage supply for the detecting chambers. Pulses from the chambers are summed under the condition that they not be coincident in time, and are then supplied to both channels of analysis.

Each channel has independent range and time constant selectors and an independent recorder channel. In operation, for example, one channel may be set with a high range and short time constant while the other channel may be set for a low range and long time constant. The net effect is that where there are intense areas of radioactivity interspersed with weak areas on the paper chromatogram, each will be presented on one of the two channels without running off the recording top or yielding a peak mix so small it cannot be interpreted. ■ Texas Instrument dual channel galvanometric-type recorder provides two 5″ charts on one 10″ strip ■ May be used to examine simultaneously intense and weak areas of radioactivity in the presence of each other ■ Completely transistorized ■ Automatic shut-off of gas and power ■ Better than 2% accuracy of count rate on all ranges ■ Compact, one unit system adaptable to direct digital quantitation.

Designed as an accessory to operate with Model 880-D, the Model 885 Glass Plate Scanner provides a convenient, low cost system to assay TLC glass plates with unequaled accuracy and sensitivity.

For complete specifications on Model 880-D Dual Channel Low Background Autoscanner and the Model 885 Glass Plate Scanner (shown at left), send for new informative brochure. For immediate information, call or write the address below.

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Eastman Briefs
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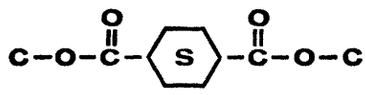
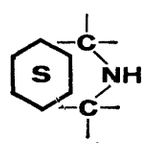


Dimethyl 1,4-Cyclohexanedicarboxylate

Form ..... *partially crystallized liquid*
Isomer concentration, approx.
cis stereoisomer *48%*
trans stereoisomer *52%*
Assay, by gas chromatography *99%*

Polymer chemists looking for a bulky cross-linking agent or a group to stiffen the backbone of randomly coiling chains could investigate this. So, too, could pharmaceutical chemists synthesizing diuretics.

Eastman Chemical Products, Inc.
Kingsport, Tennessee **B30**



3-Azabicyclo (3.2.2) nonane

Form ..... *white solid*
Melting point ..... *approximately 180°C. (sublimes)*
Boiling point ..... *approximately 180°C. (sublimes)*
Assay *98%*

AZBN's pK_b is half-way between those of piperidine and NH_4OH. It scavenges CO_2. It's soluble in alcohols, ethers, ketones, esters. In water its solubility decreases with rising temperature. Surely *someone* can use a substance with these properties!

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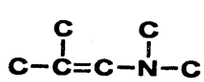
Kingsport, Tennessee **B32**

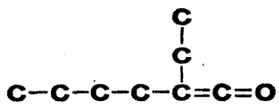


N,N-Dimethylisobutenylamine

Form ..... *colorless liquid*
Boiling point, 760 mm ..... *87-88°C.*
Assay *97.5%*

Versatile is the word for DMIA. With electrophilic compounds it forms a variety of materials too heterogeneous to be categorized in a few lines. Send for a sample and a data sheet you can use at the bench.

Eastman Chemical Products, Inc.
Kingsport, Tennessee **B57**

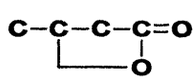


Butyl Ethyl Ketene

Form ..... *yellow liquid*
Boiling point, 12 mm ..... *36°C.*
Flash point, T.O.C. ..... *18°C.*

Not quite so ravenously reactive as ketene itself, B61 still reacts readily with anything sporting an active hydrogen or double bond. When you get your sample (20% in hexane) read the instructions about storage carefully. Physical data above are for undiluted BEK.

Eastman Chemical Products, Inc.
Kingsport, Tennessee **B61**



β-Butyrolactone

Form ..... *colorless liquid*
Specific gravity, 20°/20° *1.0409*
Refractive index, n_D^{20} *1.4772*
Flash point, C.O.C. ..... *175°F.*

The fact that you can open the ring on either side of the oxygen makes BBL a versatile as well as a reactive compound. It's useful, as you can understand, in preparing butyric, β-hydroxybutyric, and crotonic acid derivatives.

Eastman Chemical Products, Inc.
Kingsport, Tennessee **B62**

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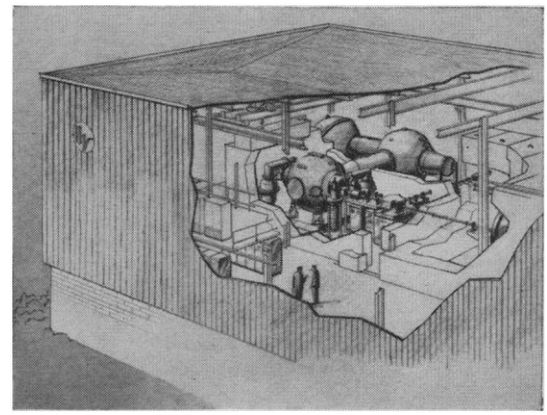
ACCELERATOR AUXILIARIES:
how HVEC research programs broaden the versatility of particle accelerators

New HVEC Tandem Research Laboratory

Expanding the versatility and flexibility of particle accelerator systems requires a continuing research and development effort. HVEC's new Tandem Research Laboratory will be an outstanding contribution to this effort.

This new $1.5 million laboratory will have five important missions:

(1) To examine basic acceleration processes, ion beam formation and handling, and voltage handling and stabilization in the presence of intense ion beams;
(2) To develop single-stage tandem injectors and two-stage tandem accelerators capable of proton and negative hydrogen currents in the tens-of-milliampere range;
(3) To develop high proton current capabilities of 3-stage tandem accelerators;
(4) To enable tandems to handle all the heavy ions that can be generated;
(5) To develop neutral-beam tandem injector technology.

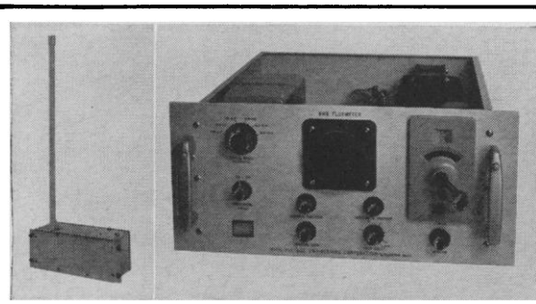


A 3-MV ICT-powered Tandem Accelerator and another higher energy machine to allow complete testing of 3-stage tandem operation will be housed in the new 20,000 square-foot laboratory which will be staffed by 20 research personnel.

New High-Transmission System

Analyzed proton currents in the order of 10 to 15μA can be achieved over the entire energy range of Model EN and FN Tandem Accelerators equipped with inclined field tubes by the use of a newly developed high-transmission system. The system is now available from High Voltage and can be installed in the field or delivered with new machines.

New Single-Probe Fluxmeter

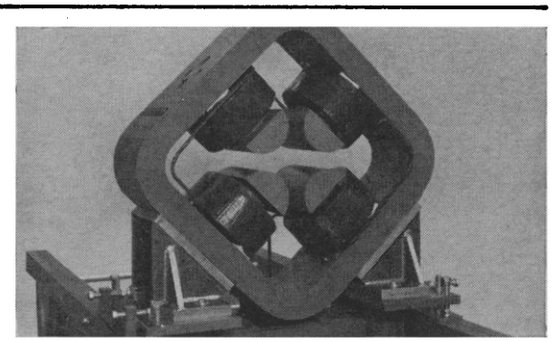


This new NMR fluxmeter allows convenient and accurate determination of magnetic field strengths over a range of 900 gauss to 19 kilogauss. A single probe covers the entire range; there is no need for probe changing and/or shunting. Accuracy is one part in 10^5 and signal-to-noise ratio is 20 db, making the unit easily tunable. At magnetic fields exceeding 10 kilogauss, the proton probe is at least one hundred times more sensitive then deuterium or lithium.

New Magnetic Auxiliaries

A new multiport switching magnet, Model 70-88, is available for use with HVEC Tandem Accelerators. The new switching system will deflect a 77 MeV proton through an angle of 70°.

The new HVEC Quadrupole Lens Model QMD 2.5-360 has been designed for use with the Model 70-88 Switching Magnet beam tube extension. The lens aperture is 2.5 in. and the field at the pole tip center is 2.25 kg/in. Shown at right: new 5-in. aperture Quadrupole Lens Model QMS-5-1100.



HVEC accelerator auxiliaries are all designed to enhance the versatility and flexibility of HVEC accelerator systems.

For detailed information, please write to Technical Sales, High Voltage Engineering Corporation, Burlington, Massachusetts.

HIGH VOLTAGE ENGINEERING

22 January 1965, Volume 147, Number 3656 **SCIENCE**

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Geographic Distribution of R&D Funds

One sometimes hears complaints that this or that state or region receives too much or too little federal research and development money. The detailed analysis of federal R&D expenditures* that the NSF has prepared for congressional use may provide some ammunition for arguments about geographic distribution, but the 23 pages of text and charts and 606 pages of statistical tables probably tell more than most people want to know about the topic. What they demonstrate most clearly is that the geographic distribution differs greatly for different agencies, purposes, and kinds of recipients.

Of eight geographic regions, the Pacific Coast receives the most federal R&D dollars, with the Middle and South Atlantic regions next. The leading states, in order, are California, New York, Maryland, Texas, Massachusetts, and Pennsylvania. But on a per capita basis, Nevada and New Mexico receive more than any of the states that lead in total dollars.

Some of the differences among the states are accounted for by large government installations, such as the AEC facilities in Nevada, the facilities of NASA in Florida and Alabama, or the agricultural and medical laboratories in Maryland. If the large government installations are omitted from the calculations, the order of the states changes significantly. It changes again if one analyzes R&D contracts to industry, and still again if one considers only grants to educational institutions. Educational institutions in New York received the most in 1964, with California, Massachusetts, Illinois, and Pennsylvania following. But states are not equivalent educational units; per Ph.D. conferred in one year, New Mexico, Alabama, Maryland, Massachusetts, California, Washington, and several other states received more than did New York.

Each federal agency must try to use its funds where it can best accomplish its primary objectives. This requirement leads to different distributions. NASA and the Department of Defense spend more of their R&D money in the Pacific states than in any of the other eight regions. The AEC spends the highest percentage in the Mountain states; the Department of Health, Education, and Welfare, in the Middle Atlantic states; and the NSF, in the South Atlantic states. The Agricultural Research Service spends little in Connecticut, and Kansas expects little from the Coast and Geodetic Survey.

Federal R&D expenditures of 15 or more billions a year make important differences to the regions in which the money is spent, and regional leaders can be expected to continue to seek for more. The claimants must remember, however, that each of the agencies has national responsibilities: for defense, atomic energy, space, health, or something else. The agencies cannot be unmindful of regional claims, but neither can they let those claims outweigh their primary purposes. Nor can there be any simple and single criterion of what is proper geographic distribution. Claims for more are most likely to be successful if directed to specific kinds of activity and if supported by strong evidence of capacity to produce.—DAEL WOLFLE

* *Obligations for Research and Development, and R&D Plant, by Geographic Divisions and States, by Selected Federal Agencies, Fiscal Years 1961–1964* (House of Representatives Committee on Science and Astronautics, 1964)

other materials, which uses a 14-Mev generator with an output of 2×10^{11} neutrons per second, was described by V. P. Guinn (General Atomic). This system is completely automated and employs a dual pneumatic-tube transfer system (for sample and monitor), sample and monitor rotation during activation, and simultaneous counting of sample and monitor; reproducibilities within the limits of the counting statistics are now achieved. Sensitivity of the system is about 10 μg of oxygen, that is, 1 part per million in a 10-g sample; at higher oxygen levels the precision and absolute accuracy are within 1 to 3 percent. Samples can be analyzed nondestructively at the rate of one per minute or faster. Very low levels of oxygen have been successfully determined in such metals as Li, Na, K, Cs, Be, Al, Fe, Si, Nb, W, Ti, and Mo. Reactive metals are handled and encapsulated (in low-oxygen copper) in a special inert-atmosphere box.

Certain results of activation-analysis studies in the biological-medical field are most intriguing. M. H. Feldman (Walter Reed Army Institute of Research) pointed out that the average concentrations of manganese in different species of ants may differ by as much as 100-fold, and that concentrations in all ants are much higher than those in man; in some species the concentration is as high as 670 ppm. The resistance to radiation of certain species of ants may be related to these high concentrations of Mn. Manganese concentrations in various species of mosquitoes also vary rather widely. F. Girardi (Euratom laboratories, Ispra) reported studies on Mn in fresh-water mollusks in which an automated, purely instrumental procedure was used. Analysis of various organs and tissues of the mollusks revealed a greater accumulation of Mn in some sites than in others.

G. D. Bird (University of Florida) reported studies on manganese in the urine of patients with kidney stones. Surprisingly, such patients excrete rather large amounts of Zn but small amounts of Mn, even though both elements are thought to inhibit mineralization. It is believed that certain trace elements tend to prevent the formation of kidney stones and that persons living in areas where the drinking water is very low in trace elements are more likely to develop kidney stones. Osteoporosis patients also excrete large amounts of Zn, and one diabetes patient studied was found to

excrete large amounts of Mn. N. Spronk (Free University of Amsterdam) presented an apparent solution to one of the major problems in the activation analysis of biological samples for trace elements, that of the large interference produced by the great amounts of Na^{24} formed. In a procedure requiring less than a minute, the activated sample is wet-ashed on top of a Dowex-1 anion exchange column with aqua regia at 60°C, and the sodium is eluted with 6*N* HCl. Polyvalent cations such as Cu^{++} remain in the column. In a typical case 99.99 percent of the Na was removed, with negligible loss of Cu. Spronk is currently measuring the Cu levels in the foot muscles and brains of freshwater snails. G. S. Nixon (University of Glasgow) reported studies of possible roles played by such trace elements as V, Mo, and Se in the prevention of dental caries. H. J. M. Bowen (Wantage Laboratory) announced the preparation of 90 kg of powdered kale leaves as an international laboratory standard for biologists interested in trace-element determinations. Some 30 elements in kale have been identified; samples are available from Bowen.

Two papers on the use of neutron activation-analysis for forensic purposes were presented. R. F. Coleman (Aldermaston Laboratory) reported on characterization of hair trace-element levels; he and co-workers have found as many as ten trace elements in single strands of human hair by purely instrumental analysis; this result is similar to that of R. E. Jervis *et al.* A least-squares computer program is used to resolve the gamma-ray spectrum data. The amounts of some elements in an individual's hair seem to vary considerably owning to external contamination. Coleman's group is initiating a large-scale study of trace-element levels in human hair in Great Britain. Guinn described forensic activation-analysis studies of several types of material, the detection of traces of Ba and Sb in gunshot residues on the skin, and the first three court cases in the United States in which results of activation analysis were admitted as evidence.

The conference, which was preceded by a 2-week advanced training course, was sponsored by NATO. For study and experiment, participants had the use of the new research reactor at East Kilbride, facilities of the University of Glasgow and the Western Regional Hospital Board, and various

activation-analysis equipment, especially neutron generators and multichannel pulse-height analyzers, provided by American and European manufacturers.

Publication of the proceedings is not planned, but abstracts of the 23 papers presented are available from the program supervisor, J. M. A. Lenihan, Regional Physics Department, 9 West Graham Street, Glasgow, C.4.

V. P. GUINN
General Atomic, San Diego, California
R. E. WAINERDI
Agricultural and Mechanical College of Texas, College Station

Dental Caries: A New Look

Dental caries is a multifactorial disease whose gross manifestations are preceded by events on the molecular, atomic, and subatomic levels. It was specifically to explore and delineate these events that the New York Academy of Sciences sponsored a conference on the mechanisms of dental caries 30 November–1 December 1964 in New York City. The conference represented a multidisciplinary attack on the problem, rather than the usual clinical approaches which have been exhaustively explored in previous dental symposiums.

The mineral structures of the tooth and the physico-chemical laws governing the dissolution of the mineral components were dealt with at the first session. W. E. Brown (American Dental Association) and B. M. Wallace (National Bureau of Standards) pointed out that calcium and phosphorus ions may diffuse through enamel at different rates and that, as a result, an increased concentration of calcium, phosphorus, and hydrogen ions might occur within the enamel; this could account for the subsurface dissolution of the structure. The mechanisms of diffusion of these ions through the enamel can be explained by treating the enamel layer as a semipermeable membrane according to L. S. Fosdick (Northwestern University). Similar results were obtained by M. D. Francis (Miami Valley Laboratories, Proctor & Gamble), who demonstrated a surface complex which controls the rate of dissolution of the underlying enamel structures.

The effects of fluoride were examined in a series of papers from A. S. Posner's (Cornell Medical) group

at the Hospital for Special Surgery. They found that the incorporation of fluoride increases the sharpness of the x-ray diffraction patterns of hydroxyapatite, indicating an improvement in the crystallinity of the mineral toward a more "perfect" apatite. In this respect, Koulourides, Pigman, and Feagin (University of Alabama) reported that while fluoride accelerates the remineralization of enamel, it is ineffective unless calcium and phosphate ions are incorporated into the remineralizing solutions.

The other sessions dealt with the biological structures of the tooth and with their biochemistry and pathology during caries. The concept that enamel is not a dead tissue like hair and nails was stressed by T. B. Coolidge (University of Chicago) in his demonstration of the existence of submicroscopic channels along the apatite crystals. These channels are normally closed at the completion of calcification but are found to be reopened at the onset of caries. H. H. Neumann and N. A. Disalvo (Columbia University) presented the thesis that the process of chewing, in which measurable lengthening and shortening of the teeth occur, influences by compression the molecular structures in the teeth.

The biological dynamism of this once thought "dead" structure was further demonstrated by G. Neil Jenkins (King's College, England), who reported that the plaque was laid down from the proteins of the saliva and only subsequently colonized by acid-producing bacterial flora. S. Wah Leung (University of British Columbia) and I. D. Mandel (Columbia University) emphasized anew that human saliva is made up of a number of components. Mandel's report of differences in the proteins of parotid and submaxillary salivas was of particular interest.

The role of bacteria in the production of acid was studied by H. V. Jordan (National Institutes of Health), using gnotobiotics. He found that plaque and caries were absent in germ-free hamsters but could be produced at will by infecting the animals with cariogenic streptococci. However, the role of bacteria in the production of acid was disputed by V. F. Lisanti and B. Eichel (Institute of Stomatological Research, Brookline, Massachusetts). They attributed the greater glucolytic activity to mammalian leukocytes present in the oral cavity. A masking effect which covers the acid produc-

tion by bacteria in the human mouth was attributed by J. Tonzetich and S. Friedman (Colgate-Palmolive Co.) to exfoliated epithelial cells and their greater metabolic activity.

The coordination of calcium by certain naturally occurring complexing agents was shown by M. L. Schole (Bronx-Lebanon Hospitals) and J. F. Frederick (Dodge Chemical Co. Research Labs.) to be a probable mechanism for releasing protons. These protons, normally displaced from biological ligands by the coordinated cation, could add to the sum total of hydrogen ions influencing the dissolution of the enamel.

The possibility of an anti-caries "vaccine" was suggested by the brilliant presentation by H. Blechman and M. Mori (New York University) of proof of antibody production and the presence of antigenic substances in carious dentin.

The audience was brought up to date on the epidemiological approach to the problem by J. Dunning (Harvard University) and on the prospects for future research by B. Bibby (University of Rochester).

The papers presented at the conference will be published by the New York Academy of Sciences.

JEROME F. FREDRICK
Dodge Chemical Company, Bronx, New York

Forthcoming Events

January

27–30. **Geological** Soc., Southwestern Federation, Austin, Tex. (S. P. Ellison, Jr., Department of Geology, Univ. of Texas, Austin)

27–31. **Neurosurgical** Soc. of America, San Juan, Puerto Rico. (C. H. Davis, Jr., Bowman Gray School of Medicine, Winston-Salem, N.C.)

28–29. Interactions of **Man and His Environment**, symp., Chicago, Ill. (W. K. Stuckey, Dept. of Public Relations, 1802 Chicago Ave., Northwestern Univ., Evanston, Ill. 60201)

28–29. **Rheology** Soc., winter meeting, Santa Barbara, Calif. (R. S. Porter, California Research Corp., Richmond Laboratory, 576 Standard Ave., Richmond, Calif.)

28–30. American **Geophysical** Union, southwest regional, Socorro, N.M. (J. B. Franzini, Civil Engineering Dept., Stanford Univ., Stanford, Calif.)

28–30. International **Medical** Assembly of Southwest Texas, San Antonio. (S. E. Cockrell, Jr., 202 W. French Pl., San Antonio 12)

28–30. **Large-Scale Air-Sea Interaction**, symp., Bombay, India. (UNESCO, Office of Oceanography, Pl. de Fontenoy, Paris 7e, France)

28–30. **Mathematical** Assoc. of America and American Mathematics Soc., Denver, Colo. (H. M. Gehman, MAA, Univ. of Buffalo, Buffalo 14, N.Y.)

28–30. Selected Topics in **Cardiology**, conf., American College of Cardiology, Gainesville, Fla. (G. L. Scheibler, ACC, 350 Fifth Ave., New York, N.Y. 10001)

29–31. Southern **Radiological** Conf., Point Clear, Ala. (M. Eskridge, P.O. Box 4097, Mobile, Ala.)

31–2. Institute of **Electrical and Electronics** Engineers, New York, N.Y. (C. A. Woodrow, c/o General Electric Co., 1 River Rd., Schenectady 5, N.Y.)

31–5. Institute of **Electrical and Electronics** Engineers, New York, N.Y. (E. C. Day, IEEE, Box A, Lenox Hill Station, New York 10021)

31–6. International Festival of the **Scientific Film**, Brussels, Belgium. (Cercle des Sciences. Université Libre de Bruxelles, 22 avenue Paul Heger, Brussels 5)

February

1–2. **Protein** Conf., 19th annual, Rutgers Bureau of Biological Research, New Brunswick, N.J. (J. H. Leathem, Rutgers Univ., New Brunswick)

1–3. Solid Propellant **Rocket** Conf., American Inst. of Aeronautics and Astronautics, Washington, D.C. (D. L. Raymond, AIAA, 1290 Avenue of the Americas, New York 10019)

1–3. **Myasthenia Gravis**, conf., New York Acad. of Sciences, New York. (NYAS, 2 E. 63 St., New York, N.Y.)

1–4. **Information Storage and Retrieval**, American Univ., Washington, D.C. (American Univ. Center for Technology and Administration, 2000 G St., NW, Washington 20006)

1–4. **Solar Atmosphere** Seminar, U.S.–Japan Cooperative Science Program, Honolulu, Hawaii. (Office of Intern. Science Activities, National Science Foundation, Washington, D.C.)

1–5. **Gas Chromatography**, conf., Los Angeles, Calif. (H. L. Tallman, Physical Sciences Extension, Room 6532, Engineering Bldg., Univ. of California, Los Angeles 90024)

2–3. American Soc. **Tool and Manufacturing Engineers**, Die Design and Press Tooling, seminar, Detroit, Mich. (L. S. Fletcher, ASTME, 10700 Puritan St., Detroit 38)

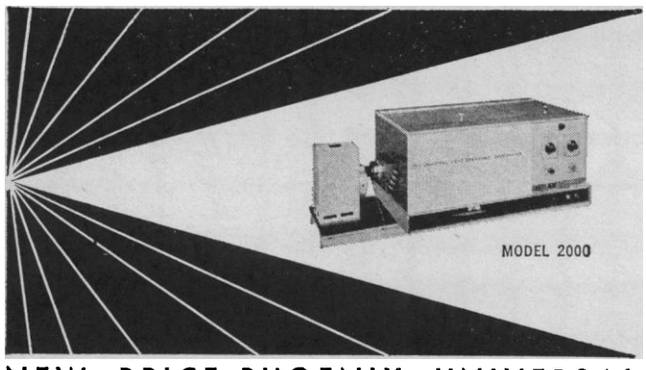
2–4. On-Line **Computing**, Symp., Los Angeles, Calif. (T. Kramer, Engineering Extension, Univ. of California, Los Angeles 90024)

2–4. Society of the **Plastics** Industry, Reinforced Plastics Div. conf., Chicago, Ill. (C. L. Condit, SPI, 250 Park Ave., New York 10017)

3–5. Southwest **Chemical** Assoc./Chemical Market Research Assoc., joint meeting, Houston, Tex. (H. F. Pfann, Enjay Chemical Co., 60 W. 49 St., New York 10020)

3–5. **Military Electronics**, Inst. of Electrical and Electronics Engineers, Los Angeles, Calif. (IEEE, 3600 Wilshire Blvd., Los Angeles 90005)

3–5. Institute of **Management Science**, annual, San Francisco, Calif. (F. L. Weldon, Matson Navigation Co., 215 Market St., San Francisco 5)



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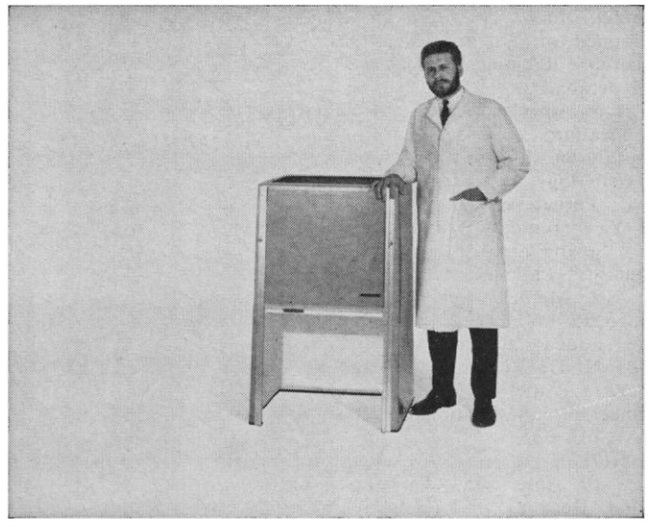

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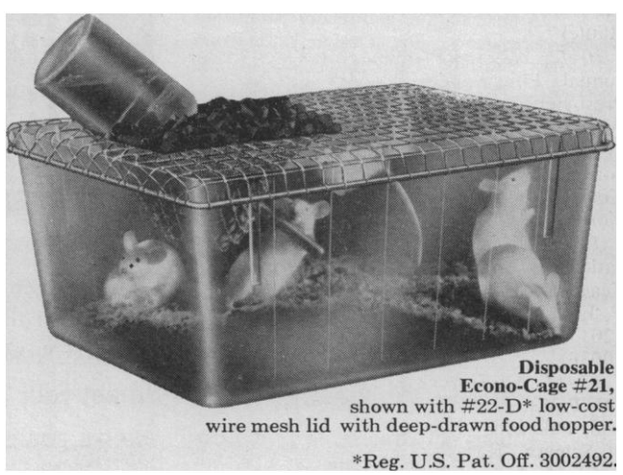

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3–6. **Fatty Acids** Seminar, Council of Scientific and Industrial Research, Hyderabad-9, India. (G. Satyanarayana Rao, Council of Scientific and Industrial Research, Regional Research Laboratory, Hyderabad-9)

4–5. American Soc. for **Engineering Education**, college-industry conf., Pittsburgh, Pa. (L. N. Canjar, Carnegie Inst. of Technology, Pittsburgh)

5. **Parenteral Drug Assoc.**, New York, N.Y. (Parenteral Drug Assoc., Inc., Western Saving Fund Bldg., Broad and Chestnut Sts., Philadelphia, Pa. 19107)

6–9. **Medical Education**, annual, Chicago, Ill. (W. S. Wiggins, Council on Medical Education, American Medical Assoc., 535 N. Dearborn St., Chicago 60610)

7–11. American Inst. of **Chemical** Engineers, 55th national, Houston, Tex. (AIChE, 345 E. 47 St., New York, N.Y. 10017)

8–10. American **Astronautical** Soc., annual, Denver, Colo. (Miss G. W. Heath, Flight Safety Foundation, 468 Park Ave. S., New York 10016)

8–11. Managerial Implications of the Emerging **Technology**, Washington, D.C. (P. W. Howerton Center for Technology and Administration, American University, 2000 G St., NW, Washington 20006)

8–12. American Soc. for **Testing and Materials**, spring meeting, Cleveland, Ohio. (ASTM, 1916 Race St., Philadelphia, Pa.)

9–10. International Soc. of **Terrain Vehicle Systems**, U.S.–Canadian regional meeting, Houghton, Mich. (E. W. Niemi, Dept. of Mechanical Engineering, Michigan Technological Univ., Houghton 49931)

10–11. Corrosion of **Water Supply Systems**, 7th sanitary engineering conf., Urbana, Ill. (B. B. Ewing, Univ. of Illinois, Urbana)

10–12. American **Educational Research** Assoc., annual, Chicago, Ill. (R. A. Dershemer, 1201 16th St., NW, Washington, D.C.)

10–12. National Assoc. **Corrosion Engineers**, conf., Calgary, Canada. (T. J. Hull, NACE, 980 M&M Bldg., Houston, Tex. 77002)

10–13. National Soc. of College Teachers of **Education**, annual, Chicago, Ill. (E. J. Clark, Indiana State College, Terre Haute)

10–13. American College of **Radiology**, annual, Philadelphia, Pa. (F. H. Squire, Presbyterian–St. Luke's Hospital, 1753 West Congress St., Chicago, Ill. 60606)

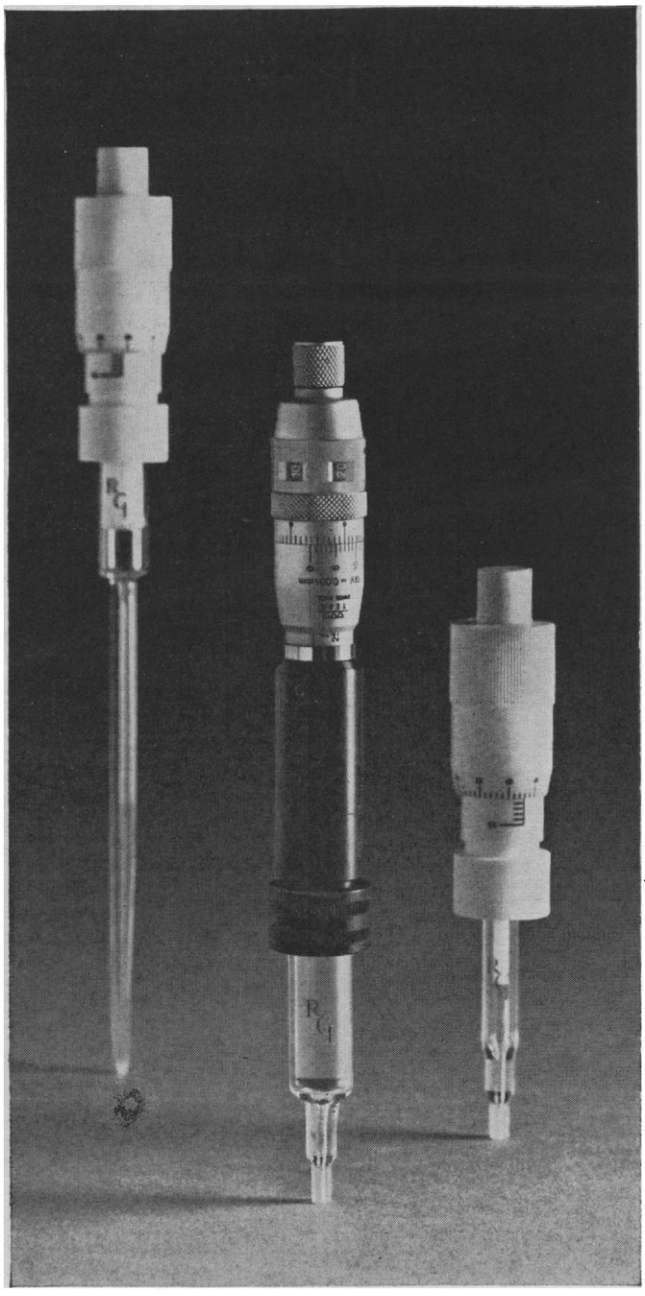
11–13. **Biology of Human Variation**, conf., New York Acad. of Sciences, New York, N.Y. (NYAS, 2 E. 63 St., New York 10021)

12. **Science Programs** for General Education and the Preparation of Elementary Teachers, conf., Long Beach, Calif. (A. F. Eiss, National Science Teachers Assoc., 1201 16th St., NW, Washington, D.C. 20036)

12–17. All **Science** Conf., annual, Karachi, Pakistan. (N. Ahmad, Secretary General, Pakistan Assoc. for the Advancement of Science, Karachi)

13–15. National Assoc. for Research in **Science Teaching**, annual, Chicago, Ill. (J. D. Novak, Bio-Science Dept., Purdue Univ., Lafayette, Indiana)

14. Scientific Conference on **Psychoanalysis**, 3rd annual, Council of Psycho-



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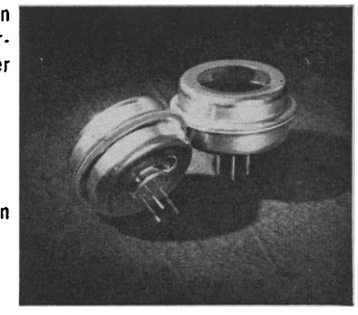

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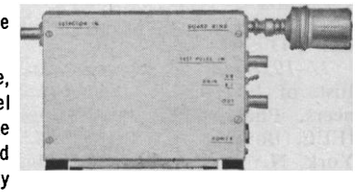

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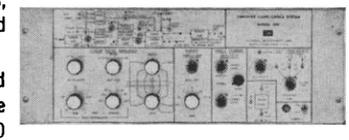

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analytic Psychotherapists, Inc., New York, N.Y. (Miss M. Nelson, 1965 Conference Program, Box 255, East Setauket, Long Island, N.Y.)

14–11. German Foundation for the Developing Countries, **Public Health Training** Problems in Asia, intern. seminar, Berlin, Germany. (GFDC, Tagungsreferat, Agrippinenstrasse 10, 53 Bonn, Germany)

14–18. American Inst. **Mining, Metallurgical and Petroleum Engineers**, annual, Chicago, Ill. (R. W. Taylor, AIME, 345 E. 47 St., New York, N.Y. 10017)

14–18. Society of **Economic Geologists**, annual, Chicago, Ill. (E. N. Cameron, Room 30, Science Hall, Univ. of Wisconsin, Madison)

15–17. **Flight Testing** Conf., American Inst. of Aeronautics and Astronautics, Huntsville, Ala. (D. L. Raymond, AIAA, 1290 Avenue of the Americas, New York, N.Y. 10019)

15–17. American **Standards** Assoc., Inc., Chicago, Ill. (ASA, Inc., 10 E. 40 St., New York, N.Y. 10016)

15–20. Impact of **Mendelism on Agriculture, Biology, and Medicine**, intern, symp., New Delhi, India. (A. T. Natarajan, Secretary, Indian Soc. of Genetics and Plant Breeding, Division of Botany, Indian Agricultural Research Inst., New Delhi 12)

17. Use of **Enzymes** in the Food Industry, seminar, New York Inst. of Food Technologists, Inc., New York, N.Y. (A. Bolaffi, Jell-O Division Laboratories, General Foods Technical Center, Tarrytown, N.Y.)

17. Colors in **Food**, seminar, New York Inst. of Food Technologists, Inc., New York, N.Y. (A. Bolaffi, Jell-O Division Laboratories, General Foods Technical Center, Tarrytown, N.Y.)

17–19. American Acad. of **Occupational Medicine**, annual, Columbus, Ohio. (G. M. Hemmett, AAOM, Eastman Kodak Co., 343 State Street, Rochester 4, N.Y.)

17–19. **Solid State Circuits**, intern. conf., Inst. of Electrical and Electronics Engineers, Philadelphia, Pa. (R. Emberson, IEEE, Box A, Lenox Hill Station, New York, N.Y. 10021)

17–21. American College of **Cardiology**, annual, Boston, Mass. (Executive Director of the College, Empire State Building, New York, N.Y. 10001)

18–19. Mechanical and Transplant **Heart Substitutes**, symp., Heart Assoc. of Southeastern Pennsylvania, Philadelphia. (L. L. Perry, HASP, 318 S. 19 St., Philadelphia 19103)

18–20. **Skin Bacteria** in Infection, symp., San Francisco, Calif. (Administrative Secretary, Div. of Dermatology, Univ. of California, San Francisco Medical Center, San Francisco 94122)

19–20. **Comparative Psychopathology**—Animal and Human, annual symp., American Psychopathological Assoc., New York, N.Y. (F. J. Kallmann, APA, 722 W. 168 St., New York 10032)

20. **Reliability**, 6th annual West Coast symp., American Soc. for Quality Control, Los Angeles, Calif. (A. S. Golant, Rocketdyne, Canoga Park, Calif.)

20–26. Caribbean **Dental** Convention, 4th annual, Port of Spain, Trinidad. (K. Henry, Dental Assoc. of Trinidad and Tobago, 109 Frederick St., Port of Spain)

(Continued from page 392)

tropomyosin (7 papers); Energetics of muscle contraction (6 papers); and Theories of muscle contraction (4 papers).

Biomedical Sciences Instrumentation. vol. 2. Proceedings, Second National Symposium (Albuquerque, N.M.), May 1964. William E. Murry and Peter F. Salisbury, Eds. Plenum Press, New York, 1964. 304 pp. Illus. $12.50. Twenty-five papers presented at the symposium sponsored by the Instrument Society of America; the sessions were Transmission of vibratory energy through tissue: A tool for the measurement of physiological parameters (3 papers); Eye motion: Methods for measurement and their significances (6 papers); Implantable sensors (4 papers); Present problems in physiological monitoring (6 papers); and Biotelemetry and physiology (6 papers).

Bird Structure. An approach through evolution, development, and function in the fowl. D. A. Ede. Hutchinson, London, 1964. 120 pp. Illus. Paper, 15s. Introductory textbook.

The Birds of Costa Rica: Distribution and Ecology (*Bull. Am. Mus. Nat. Hist.* No. 128). Paul Slud. American Museum of Natural History, New York, 1964. 430 pp. Illus. Paper, $10.

Contributions to Developmental Neuropsychiatry. Paul Schilder. Lauretta Bender, Ed. International Universities Press, New York, 1964. 419 pp. Illus. $8.50.

Copper and Peroxides in Radiobiology and Medicine. Jack Schubert. Thomas, Springfield, Ill., 1964. 229 pp. Illus. $9.

Depression. Proceedings of a symposium (Cambridge, England), September 1959. E. Beresford Davies, Ed. Cambridge Univ. Press, New York, 1964. 394 pp. Illus. $17.50. The papers presented and discussions of the papers are included; the main topics include clinical aspects, psychological and psychopathological aspects, and neuropharmacological aspects of depression and the therapy of depression.

Dynamics in Metazoan Evolution. The origin of the coelom and segments. R. B. Clark. Oxford Univ. Press, New York, 1964. 323 pp. Illus. $7.70.

Dynamic Studies of Metabolic Bone Disease. O. H. Pearson and G. F. Joplin, Eds. Davis, Philadelphia, Pa., 1964. 239 pp. Illus. $10. Twelve papers: "Study of tracer techniques for bone disease" by Goran, C. H. Bauer; "Interpretation of calcium kinetic data" by Robert P. Heaney; "Calcium[47] accretion and resorption rates in man" by F. W. Lafferty and O. H. Pearson; "The quantitation of bone mineralization as an organ and tissue in osteoporosis" by James S. Arnold; "Disuse osteoporosis" by Robert P. Heaney; "High dietary calcium and osteoporosis" by Leo Lutwak; "The response of osteoporosis to androgens, estrogens, and high calcium intakes" by F. W. Lafferty, G. E. Spencer, and O. H. Pearson; "Effects of corticoids on bone" by Eugene Eisenberg; "Accelerated aging and premature death of bone cells in osteoporosis" by Marshall R. Urist; "Skeletal dynamics in vitamin D resistant rickets" by F. W. Lafferty, C.

H. Herndon, and O. H. Pearson; "Isotopic (Ca^{47}) analysis of the suppressive action of aspirin on Paget's disease of bone" by Louis V. Avioli and Philip H. Henneman; and "Urinary hydroxyproline as an index of bone metabolism" by Leroy Klein and Paul H. Curtiss, Jr.

Experience in Renal Transplantation. Thomas E. Starzl. Saunders, Philadelphia, 1964. 403 pp. Illus. $17.

Fabric and Mineral Analysis of Soils. Roy Brewer. Wiley, New York, 1964. 484 pp. Illus. $15.

Fishes of the Great Lakes Region. Carl L. Hubbs and Karl F. Lagler. Univ. of Michigan Press, Ann Arbor, ed. 3, 1964. 263 pp. Illus. Plates. $6.95.

Flora Europaea. vol. 1, *Lycopodiaceae to Platanacea*. T. G. Tutin, V. H. Heywood, N. A. Burges, D. H. Valentine, S. M. Walters, and D. A. Webb, Eds. Cambridge Univ. Press, New York, 1964. 498 pp. Maps. $16.

Glossary of the British Flora. H. Gilbert-Carter. Cambridge Univ. Press, New York, ed. 3, 1964. 120 pp. $3.50.

Handbook of Pharmacology. The actions and uses of drugs. Windsor C. Cutting. Appleton, Century, Crofts, New York, ed. 2, 1964. 661 pp. Illus. Paper, $5.95.

Handbuch der Binnenfischerei Mitteleuropas. R. Demoll, H. N. Maier, and H. H. Wundsch, Eds. vol. 2A, *Anatomie der Fische*. Wilhelm Harder. Schweizerbart'sche, Berlin, 1964. Text, 322 pp.; plates, 121 pp. Illus. Paper, DM. 94; cloth, DM. 103.

An Index to the Collembola. *Bull. Roy. Soc. New Zealand*, No. 7, vols. 1 and 2. J. T. Salmon. Royal Soc. of New Zealand, Wellington, 1964. vol. 1, 144 pp.; vol. 2, 500 pp. Paper.

Instrumentation with Semiconductors. For medical researchers. Clinton C. Brown and George N. Webb. Thomas, Springfield, Ill., 1964. 272 pp. Illus. $10.50.

International Biomedical Research. First National Institutes of Health, International Symposium (Bethesda, Md.), October and November 1963. Kelly M. West, Ed. U.S. Department of Health, Education, and Welfare, Washington, D.C., 1964. 261 pp. The symposium was concerned with international relationships as they affect, and are affected by, medical science.

International Review of Connective Tissue Research. vol. 2. David A. Hall, Ed. Academic Press, New York, 1964. 364 pp. Illus. $13. Seven papers: "The precipitation of collagen fibers from solution" by G. C. Wood; "Elastic tissue" by John P. Ayer; "Chemistry and metabolism of connective tissue glycosaminoglycans (mucopolysaccharides)" by Helen Muir; "The physiology of the connective tissues of the reproductive tract" by R. D. Harkness; "Diseases of collagen and related tissues" by L. E. Glynn; "Aging of the collagen fiber" by F. Verzár; and "Mucopolysaccharides, collagen, and nonfibrillar proteins in inflammation" by Albert Delaunay and Suzanne Bazin.

Intersexuality in Vertebrates, Including Man. C. N. Armstrong and A. J. Marshall, Eds. Academic Press, New York, 1964. 489 pp. Illus. $14. Seven papers: "Chromosome deviations and sex in ver-

tebrates" by R. A. Beatty; "Intersexuality in fishes" by James W. Atz; "Intersexuality in amphibians" by Charles L. Foote; "Intersexuality in reptiles" by Thomas R. Forbes; "Intersexuality in birds" by Elsie Taber; "Intersexuality in mammals" by Joyce Bruner-Lorand; and "Intersexuality in man" by C. N. Armstrong. Introduction by A. J. Marshall.

Mammals of the World. vols. 1–3. Ernest P. Walker and others. Johns Hopkins Press, Baltimore, Md., 1964. vol. 1, 692 pp.; vol. 2, 865 pp. Illus. vols. 1 and 2, $25; vol. 3, *A Classified Bibliography*, 783 pp., $12.50; 3 vols., $37.50.

Mental Retardation. A review of research. Harvey A. Stevens and Rick Heber, Eds. Univ. of Chicago Press, Chicago, Ill., 1964. 516 pp. Illus. $12.50. Thirteen papers: "Overview" by Harvey A. Stevens; "Psychological evaluation and differential diagnosis" by Arthur L. Benton; "Research in education" by Samuel A. Kirk; "Research in learning and performance" by M. Ray Denny; "Personality" by Rick Heber; "Relation of environmental factors to intellectual functioning" by Boyd R. McCandless; "Social and occupational adjustment" by Herbert Goldstein; "Epidemiology" by Ernest M. Gruenberg; "Biochemical and clinical correlations" by Harry A. Waisman and Theo Gerritsen; "Genetics in Mental Retardation" by V. Elving Anderson; "Teratogenesis of the central nervous system" by F. Clarke Fraser; "Neuropathology" by N. Malamud; and "Behavioral disturbances in the mentally retarded" by Delton C. Beier.

Methodology of Isolates. A symposium organized by the Problem Commission of Neurogenetics, World Federation of Neurology (The Hague, Netherlands), September 1963. D. Klein, Ed. Karger, Basel, Switzerland, 1964. 140 pp. Illus. Paper, $7. Thirteen papers: "Some remarks on the theoretical basis of the investigation of isolates" by F. Vogel; "Genetic studies on the Xavante Indians of the Brazilian Mato Grosso" by J. V. Neel, P. C. Junqueira, F. M. Salzano, F. Keiter, and D. Maybury-Lewis; "An evaluation of the Kuru genetic hypothesis" by G. R. Williams, A. Fischer, J. L. Fischer, and L. T. Kurland; "The biochemical recognition of the carrier state of infantile amaurotic family idiocy" by B. W. Volk, S. M. Aranson, and A. Saifer; "Metabolic defects in some isolates of Israel" by E. Goldschmidt and L. Cividalli; "Studies in isolates" by G. R. Fraser; "Considerations on the isolate problem based on research in population genetics" by W. F. Haberlandt; "Manifestations of a recessive gene for microcephaly in a population isolate" by H. W. Kloepfer, R. V. Platou, and W. J. Hansche; "Studies on human population genetics and anthropology in isolates on the Aland Islands" by A. W. Eriksson and H. Forsius; "Démographie et généalogie de différents types d'isolats" by R. Gessain; "Heredoataxia in western Norway: Some experiences from a preliminary investigation" by H. Skre; "Isolat et diffusion des mutations chez l'homme" by J. Sutter; "Geographical distribution of some isolates with neuro-genetical afflictions in Switzerland" by D. Klein and F. Ammann.

Methods in Medical Research. vol. 10. H. N. Eisen, G. D. Snell, J. L. Strominger,

and I. Lieberman, Eds. Year Book Medical Publishers, Chicago, 1964. 389 pp. Illus. $11.50. The 48 papers are grouped under the following headings: Methods for Study of Histocompatibility Genes and Isoantigens (9 papers); Some Methods Applicable to Study of Experimental Hypersensitivity (23 papers); Resistance to Chemotherapeutic Agents (10 papers); and Methods with Cultures of Dispersed Animal Cells (5 papers).

A Model of the Brain. J. Z. Young. Oxford Univ. Press, New York, 1964. 358 pp. Illus. $8.

Oral Histology: Inheritance and Development. D. Vincent Provenza. Lippincott, Philadelphia, 1964. 562 pp. Illus. $14.

Oxygen in the Animal Organism. Proceedings of a symposium (London), September 1963. Frank Dickens and Eric Neil, Eds. Pergamon, London; Macmillan, New York, 1964. 712 pp. Illus. $22.50. Contains some 32 papers, and the discussions of the papers, presented at the symposium which was jointly sponsored by the International Union of Biochemistry and the International Union of Physiological Sciences.

Patterns of Mammalian Reproduction. S. A. Asdell. Cornell Univ. Press, Ithaca, N.Y., ed. 2, 1964. 684 pp. $9.75.

Plant Growth and Development. A. Carl Leopold. McGraw-Hill, New York, 1964. 480 pp. Illus. $12.50.

Programmed Genetics. vol. 2, *Chromosome Behavior*. Chester A. Lawson and Mary Alice Burmester. Heath, Boston, 1964. 148 pp. Illus. Paper, $2.95.

Progress in Hematology. vol. 4. Carl V. Moore and Elmer B. Brown, Eds. Grune and Stratton, New York, 1964. 319 pp. Illus. $13.75. Ten papers: "Heme synthesis in erythroid cells" by S. Granick and Richard D. Levere; "Methemoglobinemia in man" by Ernest R. Jaffé and Paul Heller; "Erythropoietin" by Robert D. Lange and Vera Pavlovic-Kentera; "Chemistry of the ABH blood group substances" by Gerald Schiffman and Donald M. Marcus; "Lead poisoning: Hematologic aspects" by Robert C. Griggs; "Chloramphenicol toxicity: Clinical features and pathogenesis" by Adel A. Yunis and Gordon R. Bloomberg; "Myeloma proteins and macroglobulins: Hallmarks of disease and models of antibodies" by George M. Bernier and Frank W. Putnam; "Recent advances in acute leukemia" by Emil J. Freireich and Emil Frei, III; "Von Willebrand's disease" by Emily M. Barrow and John B. Graham; and "Platelet and leukocyte isoantigens and their antibodies: Serologic, physiologic, and clinical studies" by N. Raphael Shulman, Victor J. Marder, Merilyn C. Hiller, and Ellen Collier.

Pulsatile Blood Flow. Proceedings of the First International Symposium (Philadelphia), April 1963. E. O. Attinger, Ed. McGraw-Hill, New York, 1964. 476 pp. Illus. $17.50. Some 26 papers on various physical and physiological aspects of arterial hemodynamics.

The Rabbit in Eye Research. Compiled and edited by Jack H. Prince. Thomas, Springfield, Ill., 1964. 668 pp. Illus. $37. Contributors are Charles D. Diesem, Irma Eglitis, Ake Holmberg, V. Everett Kinsey, David G. McConnell, Sven Erik Nilsson, Jack H. Prince, D. V. N. Reddy, Gordon L. Ruskell, and Fritiof S. Sjóstrand.

Selenium. Geobotany, biochemistry, toxicity, and nutrition. Irene Rosenfeld and Orville A. Beath. Academic Press, New York, 1964. 423 pp. Illus. $15.

Serum Proteins and the Dysproteinemias. F. William Sunderman and F. William Sunderman, Jr., Eds. Lippincott, Philadelphia, 1964. 473 pp. Illus. Forty-five papers; proceedings of an applied seminar on the serum proteins and the dysproteinemias (Washington, D.C.), which was held under the auspices of the Association of Clinical Scientists.

Somatic Cell Genetics. Fourth Macy Conference on Genetics, Princeton, N.J. Robert S. Krooth, Ed. Univ. of Michigan Press, Ann Arbor, 1964. 303 pp. Illus. $10. Ten papers: "The study of gross chromosomal abnormalities" by Jerome Lejeune; "Summary of technical problems" by Harry S. Eagle; "Introduction to the study of markers in cell cultures" by Stanley M. Gartler; "Study of the H-2 locus in murine cell cultures" by Leonard A. Herzenberg; "Study of galactosemia, acatalasemia, and other human metabolic mutants in cell culture" by Robert S. Krooth; "Study of glucose-6-phosphate dehydrogenase mutants in human cell culture" by Stanley M. Gartler; "Cellular expression of *in vitro* infection with oncogenic virus" by Hilary Koprowski and Klaus E. Bayreuther; "Drug resistance as a genetic marker" by Waclaw Szybalski; "Chromosomal markers" by Boris Ephrussi; and "Criteria for the proof of virogeny in mammalian cells" by Hilary Koprowski.

Steroid Analysis by Gas Liquid Chromatogaphy. A. Anne Patti and Arthur A. Stein. Thomas, Springfield, Ill., 1964. 103 pp. Illus. $5.50.

Strahlenschutz in Forschung und Praxis. vol. 4. Hans-Joachim Melching, Wolfgang Frik, Hubert Keim, Hans-Adolf Ladner, and Konrad Schröder, Eds. Rombach, Freiburg, Germany, 1964. 380 pp. Illus. DM. 72.

Symposium on Molecular Action of Mutagenic and Carcinogenic Agents. Held at Gatlinburg, Tenn., in April 1964. Alexander Hollaender, Ed. Oak Ridge National Laboratory, Oak Ridge, Tenn., 1964. 199 pp. Illus. Paper. Twelve papers reprinted from *Journal of Cellular and Comparative Physiology*.

Tetrapyrrole Biosynthesis and Its Regulation. June Lascelles. Benjamin, New York, 1964. 144 pp. Illus. $7.70.

Thermophilic Fungi. An account of their biology, activities, and classification. Donald G. Cooney and Ralph Emerson. Freeman, San Francisco, Calif., 1964. 200 pp. Illus. $5.

The Thymus in Immunobiology. Proceedings of a symposium (Minneapolis, Minn.), 1962. Robert A. Good and Ann E. Gabrielsen, Eds. Harper and Row, New York, 1964. 800 pp. Illus. $24.50. A conference sponsored by the University of Minnesota, the National Foundation, and the Committee on Tissue Transplantation, Division of Medical Sciences, National Academy of Sciences–National Research Council. Thirty-six papers.

Zinsser's Microbiology. David T. Smith, Norman F. Conant, John R. Overman, and others. Appleton, Century, Crofts (Meredith), New York, ed. 13, 1964. 1232 pp. Illus.

(Continued from page 385)

tration, and is designed to stimulate and encourage research in theoretical biology and theoretical biophysics. Predoctoral and postdoctoral fellowships are available at the individual's present rate of salary. Deadline for applications: *1 March*. (Harold J. Morowitz, Institute Director, Department of Molecular Biology and Biophysics, Box 2166, Yale Station, New Haven, Connecticut)

Scientists in the News

At Quadri-Science, Inc., Washington, D.C.:

Hermann J. Muller, winner of the 1946 Nobel prize in physiology and medicine, has become director of genetic biology; and

Henry Taube, an inorganic chemist and member of the National Academy of Sciences, has been named director of chemical research.

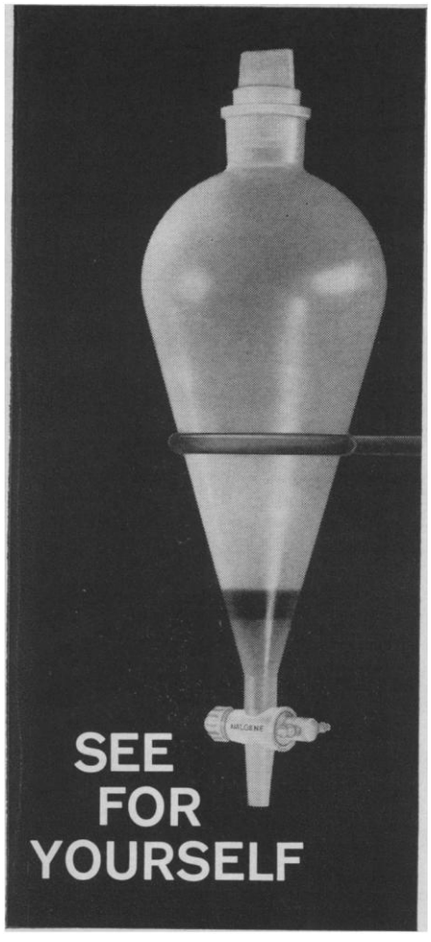
Maurice Ewing, director of Columbia University's Lamont Geological Observatory, has been awarded the Gold Medal of the Royal Astronomical Society of Great Britain. Ewing received the award for his "contributions to marine geophysics." The medal is the first the society has given specifically for geophysical work.

Robert S. Gordon, Jr., has been named clinical director of the National Institute of Arthritis and Metabolic Diseases. Gordon had been a senior investigator in the laboratory of metabolism at the National Heart Institute. He succeeds **Joseph J. Bunim**, who died in July.

Erland Nelson has been appointed professor and head of the newly created department of neurology at the University of Maryland School of Medicine. Nelson was formerly on the faculty of the medical school at the University of Minnesota.

Carl G. Hartman, research consultant at the Margaret Sanger Research Bureau in New York City, has been awarded the first Marshall Medal, an award established by the British Society for the Study of Fertility.

Edgar T. Wherry, emeritus professor of botany at the University of Pennsylvania, was awarded the Mary Soper



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Pope Medal of Cranbrook Institute of Science, Bloomfield Hills, Michigan. The medal is the only award of the Institute, and is "bestowed from time to time for distinguished contribution to the plant sciences."

Walter E. Loomis, professor of plant physiology at Iowa State University, has been appointed visiting professor of botany at the University of North Carolina, Chapel Hill, for the 1964–65 academic year.

Carl Cori has been named distinguished service professor of biological chemistry at Washington University School of Medicine, St. Louis. Cori, who is head of the department of biological chemistry, was awarded the Nobel Prize in 1947 for work on the conversion in the body of glycogen into glucose.

Antoni Zygmund has been appointed the Gustavus F. and Ann M. Swift Distinguished Service Professor of Mathematics at the University of Chicago. Zygmund has been professor of mathematics at the university.

At Harvard University:

Duncan E. Reid has been appointed the first Kate Macy Ladd Professor of Obstetrics and Gynecology. Reid is head of the department of obstetrics and gynecology at the Medical School. The professorship was established by Harvard following receipt of $500,000 from the Josiah Macy, Jr. Foundation in New York.

Elkan R. Blout has become the first Edward S. Harkness professor of biological chemistry. The Harkness professorship was one of two chairs established in the faculty of medicine by the university from a gift of $1 million from The Commonwealth Fund.

William C. Menninger and **Beryl J. Roberts** have been awarded the 1964 Citation Awards of the Society of Public Health Educators. Menninger, cofounder of the Menninger Clinic and Foundation for Psychiatric Treatment, was cited for his "pioneering exploits in broadening public interest and support for the prevention, care, and treatment of mental illness in the United States and abroad." Roberts was honored for "enlarging public understanding about new preventive techniques against overpopulation, child diseases, malnutrition, sanitation, tuberculosis, and cancer." She is pro-

fessor of health education at the University of California School of Public Health, Berkeley. The awards, which include a medallion and an engraved citation, are the highest given by the Society.

Carl L. Hubbs, professor of biology at the Scripps Institution of Oceanography at the University of California, La Jolla, has been awarded the Leidy Medal of the Academy of Natural Sciences in Philadelphia, Pennsylvania. The medal is the Academy's only award and carries a $100 honorarium.

Joseph Wood Krutch has been awarded the Richard Prentice Ettinger Medal for creative writing in both science and literature. Krutch won the medal and a $1000 honorarium for representing "the civilized conscience of man extending its insight beyond the grievous burdens of our exploding technology." The Ettinger Program is sponsored jointly by the Rockefeller Institute, the University of Pennsylvania, and New York University.

Two promotions to endowed professorships have been announced by the University of Rochester:

Lionel McKenzie, chairman of the department of economics, will become Munro Professor of Economics; and

Johannes Holtfreter, an experimental embryologist, will become Harris Professor of Zoology.

Frederick T. Wall, professor and chairman of the chemistry department at the University of California, Santa Barbara, has become editor of the American Chemical Society's *Journal of Physical Chemistry*.

Charles V. Kidd, formerly associate director for international activities at the National Institutes of Health, has joined the White House Office of Science and Technology and has been named Executive Secretary of the Federal Council for Science and Technology. Kidd succeeds **Edward Wenk, Jr.**, who has become Chief of the Science Policy Research Division, Legislative Reference Service, Library of Congress.

Erratum: In the first sentence of R. E. Snow and W. F. Seibert's letter (18 Dec. 1964, p. 1527), the quotation from Dwight J. Ingle should have read, "Studies on man have shown beyond reasonable doubt that ability to learn and reason has a genetic basis." In the fourth line, the name of the first author referred to should have been "Newman."