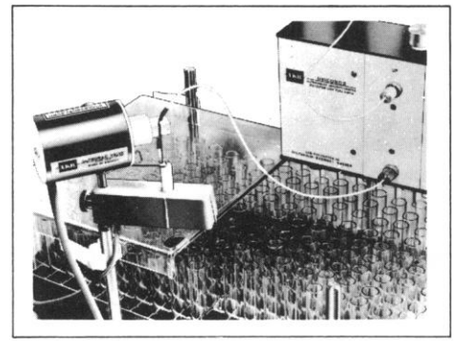
SCIENCE

25 July 1969
Vol. 165, No. 3891

AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

The LKB UV Analyzer,
the Uvicord is completely compatible with the UltroRac.
The Uvicord detector unit is here shown incorporated,
with the UltroRac, in a separation system.



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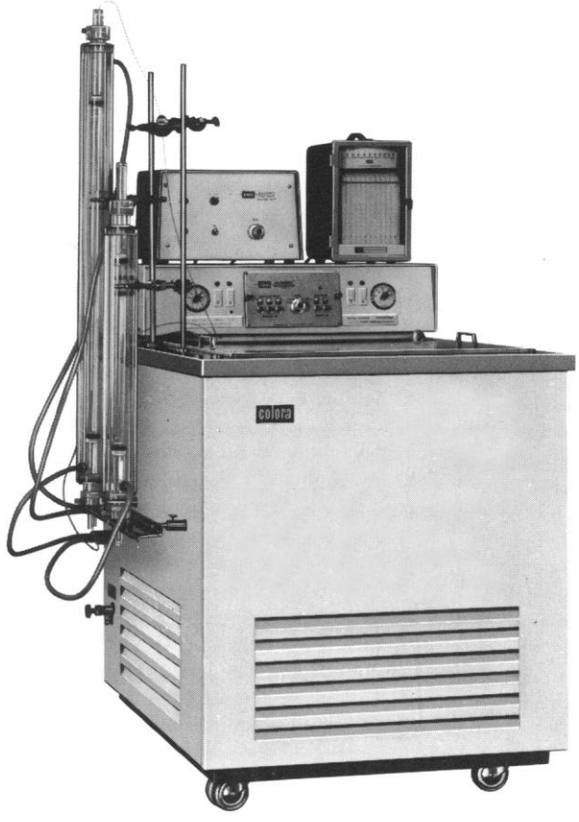
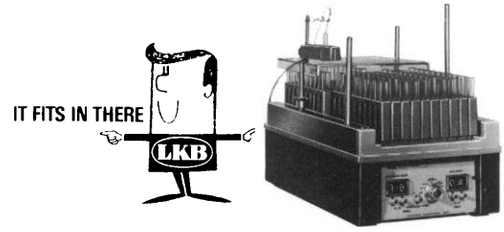
The ULTRORAC is an even better answer



The LKB 7000 ULTRORAC now the most advanced, reliable, practical, complete fraction collector on the market today.
Compact, yet takes 200 tubes—Modern, yet backed by years of experience. Drop, time or volume collection. Will operate as well at −10°C as at normal temperatures. The new "flowstop" prevents loss of samples, allows collection of acids, radio active substances and corrosives in perfect safety (by positively preventing drops falling between tubes), protects the Ultro-Rac in case of power failure and shuts down collection after pre-determined number of tubes are served.
LKB design—LKB precision—LKB know-how has resulted in LKB making and marketing more fraction collectors than any other Company in the World—why not prove LKB reliability by writing TODAY for full particulars of the LKB 7000 UltroRac Fraction Collector with the LKB 7017A UltroRac Valve.



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New Books & New Editions from Saunders

Davidsohn & Henry: Todd-Sanford Clinical Diagnosis by Laboratory Methods

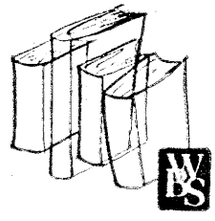
The *New 14th Edition* of this widely used volume describes the broad range of diagnostic tests now at your disposal. It records all the latest advances in laboratory diagnosis, from new *hepatic and pancreatic evaluation tests* to the use of *atomic absorption spectrophotometry.*

Edited by Israel Davidsohn, M.D., and John Bernard Henry, M.D. 27 contributors. 1308 pp. 698 figs. $24. Jan. 1969.

Strandness: Collateral Circulation in Clinical Surgery

In this unique new sourcebook, the circulatory system of every body area is fully examined with special emphasis on normal anatomy, physiology, congenital variations, clinical syndromes, diagnostic methods, results of treatment, and available collateral pathways.

Edited by D. E. Strandness, Jr., M.D. 9 contributors. 633 pp. 242 illust. $18.50. Feb. 1969.



Kaplan: Weitbrecht's Syndesmology, A Description of the Ligaments of the Human Body

This remarkable classic, originally published in Russia in 1742, has been translated from Latin to English in its entirety for the first time. It includes 82 detailed engravings of the ligaments, most of them in life size. Each ligament is thoroughly described.

By Josias Weitbrecht (1702-1747). Translated by Emanuel Kaplan. 197 pp. 26 tables with 82 figs. $30. March, 1969.

Moore et al.: Post-Traumatic Pulmonary Insufficiency

Here is a superb new guide to specific methods of clinical prevention and treatment of respiratory failure following major surgery, trauma, hemorrhage, burns and shock. This excellent book includes the first extensive description of the new "Drinker valve."

By Francis D. Moore, M.D., and 6 eminent authorities. 234 pp. 125 figs. $12.50. March, 1969.

Gardner, Gray & O'Rahilly: Anatomy—A Regional Study of Human Structure

The *New 3rd Edition* of this highly respected work is an ideal guide for the student or physician who wants to review, refresh and update his concepts of anatomy. The book is arranged regionally—following the main natural subdivisions of the body (thorax, upper limb, head and neck, etc.)

By Ernest Gardner, M.D., Donald J. Gray, Ph.D., and Ronan O'Rahilly, M.D. 812 pp. 549 figs. and 67 plates. $19. April, 1969.

Kleinsasser-Hoffmann: Microlaryngoscopy and Endolaryngeal Microsurgery

In this new book, the author shows you how he has adapted the surgical microscope used so successfully in otologic surgery and applied it to the difficult problems of microdiagnosis and microsurgery in the larynx. Special emphasis is placed on the early diagnosis and evaluation of all types of laryngeal cancer.

By O. Kleinsasser, M.D. Translated by Paul W. Hoffmann, M.D. 128 pp. 133 figs. $12.50. April, 1969.

Healey: Synopsis of Clinical Anatomy

This new text-atlas fully examines those aspects of clinical anatomy which are most essential to the actual practice of medicine and surgery. Handsome drawings display clinically important points such as structural relationships—arterial supply—congenital anomalies.

By John E. Healey, Jr., M.D. In collaboration with William D. Seybold, M.D. 324 pp. 671 figs. on 139 plates. $18. May, 1969.

Morgan & Engel: The Clinical Approach to the Patient

Here is a brilliantly executed new book that helps develop the student's skills in acquiring, analyzing and reporting clinical information from patients. Some of the topics discussed include: initial interviewing, eliciting a history, reporting clinical data, sequence and flow of the physical examination.

By William L. Morgan, Jr., M.D., and George L. Engel, M.D. 314 pp. Illustd. $9.75. May, 1969.

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25 July 1969
Vol. 165, No. 3891

SCIENCE

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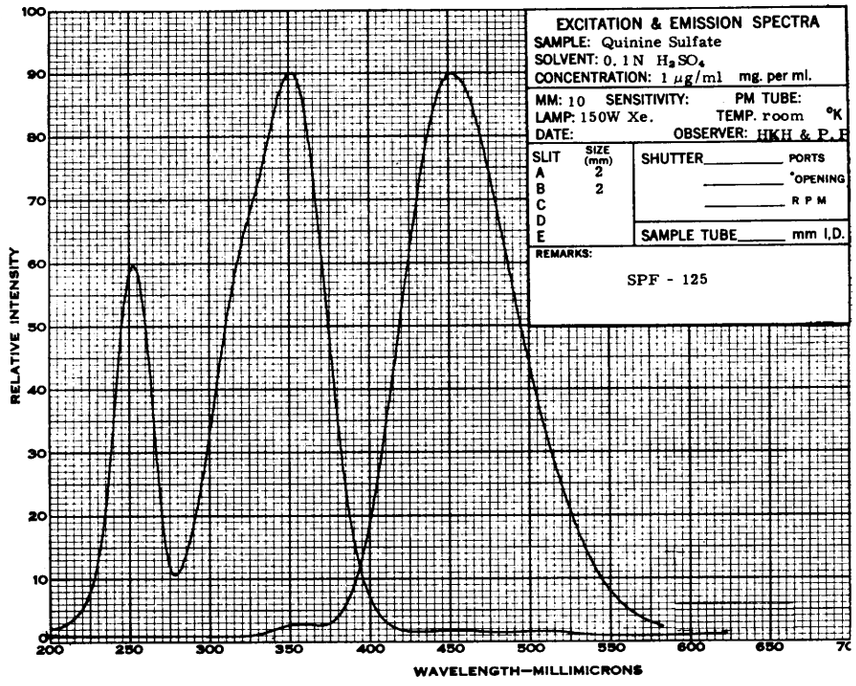
AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

COVER

Area devastated by pumice and scoria that fell from lava fountains during the 1959 eruption of Kilauea Volcano, Hawaii. See page 341. [Richard S. Fiske, U.S. Geological Survey]

Curve demonstrates SPF-125S high performance characteristics

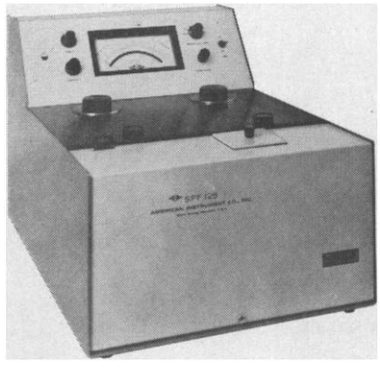


NEW SPF-125S

A LOW-COST, EASY-TO-USE SCANNING SPECTROFLUOROMETER

With Outputs for Timebase and X-Y Recording

Whether you are considering the use of fluorometry as a technique, doing routine fluorescence analyses, or involved in original research utilizing fluorescence, you should consider the multiple advantages of the new SPF-125 and -125S (with scanning capability): EASE OF OPERATION — Solid--state design in a convenient single package; sample compartment is located up front; easily adjustable disc-mounted fixed slits may be varied in 6 steps of 1.5 through 44 nm.



For ROUTINE ANALYSES, choose the SPF-125 with manual scanning capability. The monochromator design concept of the SPF-125 eliminates the need for filter selection and changing usually required with filter fluorometric procedures, and the increased specificity associated with monochromators simplifies sample manipulation procedures. Many accessories, including flow cells, make the instrument ideal for automatic chemical systems. As a RESEARCH INSTRUMENT, the SPF-125S offers high performance at a low price. Check these specifications: SENSITIVITY: Parts-per-trillion range; RESOLUTION: 1.5 nm; STABILITY: 0.3% short-term fluctuation, 1%/hr long-term drift with temperature control, 2%/hr long-term drift without temperature control (the cell compartment is channeled to permit circulation of a controlled temperature fluid); SCANNING SPEED: 220 seconds for a complete scan (faster or slower speeds are available); SCANNING RANGE: 200-800 nm, each monochromator; FOCAL LENGTH: 125 nm; RECORDER: Any 50 mv, 1 sec. full-scale response recorder; PRICE:* **SPF-125 — $2850** with mercury lamp and manual scanning; **SPF-125S — $3950** includes xenon lamp and automatic scanning.

For complete information, request Bulletin 2424-S7.

At the forefront of Spectrofluorescence Technology since its inception.

AMERICAN INSTRUMENT CO., INC.

8030 Georgia Avenue, Silver Spring, Maryland 20910

* Prices subject to change without notice, FOB Silver Spring, Md.

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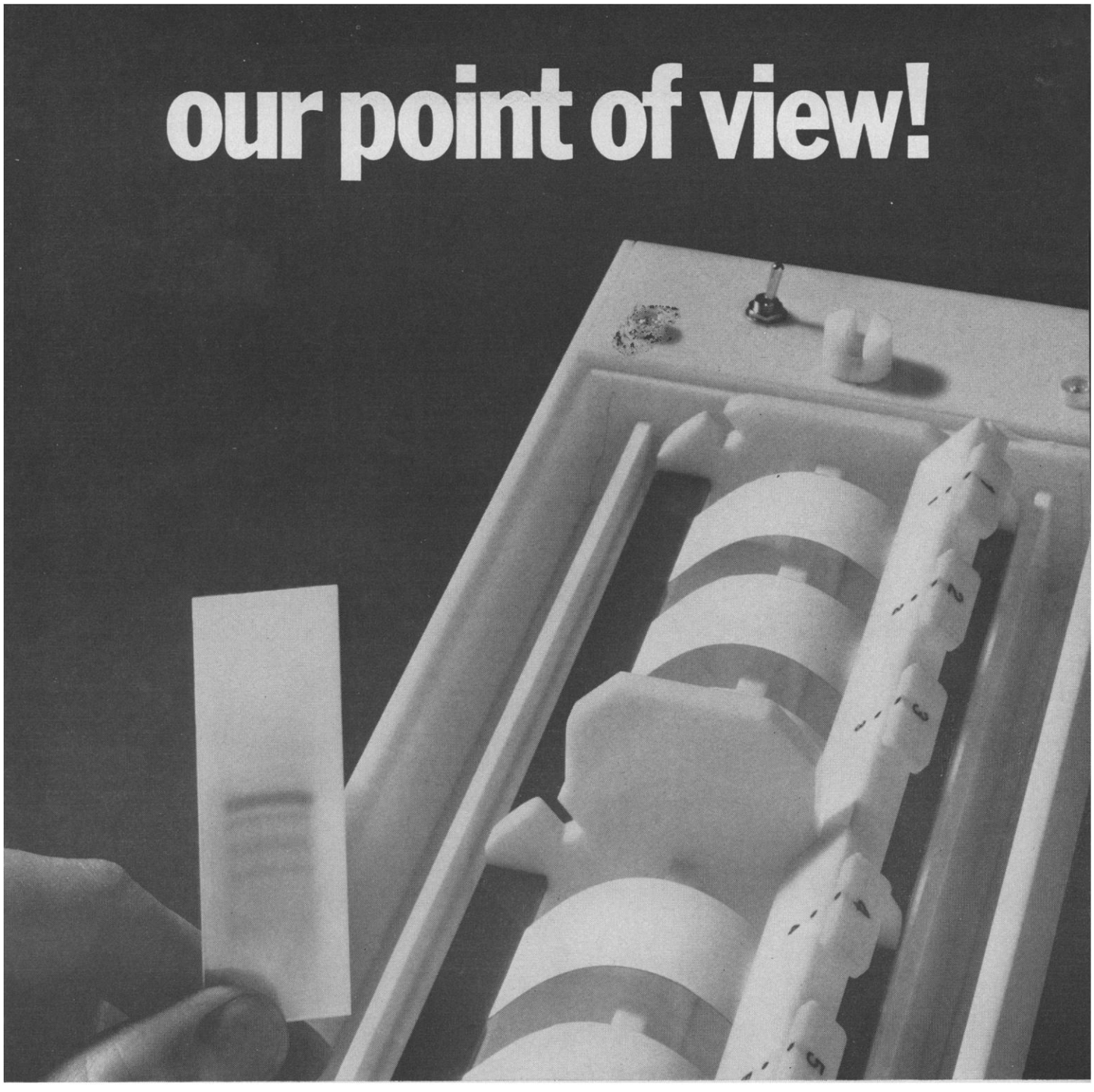
our point of view!



We've taken the fuss out of Electrophoresis.

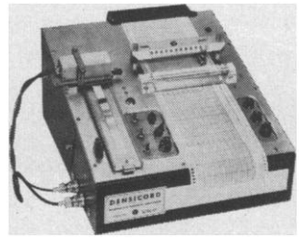
No more floppy strips. Mylar backed acetate makes strips firm, easy to handle.

No more pipetting. New striper* uses capillary action to make sample take-up automatic.

No more variable applications. Built-in guide provides in-chamber application. Sample position, quantity and alignment always the same.

No more jury-rigging—no magnets, clips, tails, sponges or outriggers. Simply mount strips in prepositioned slots and stripe.

No more fishing or finger dipping. Transfer rack permits hands-off batch processing through entire cycle.



No more chemical preparations. Just empty prepackaged containers into appropriate process chamber.

Our point of view is that we've taken the fuss out of the head-end of Electrophoresis. Try it and let us know your point of view.

This head-end combined with our Densicord is a complete system and assures reproducible results regardless of operator fatigue.

*Patent applied for

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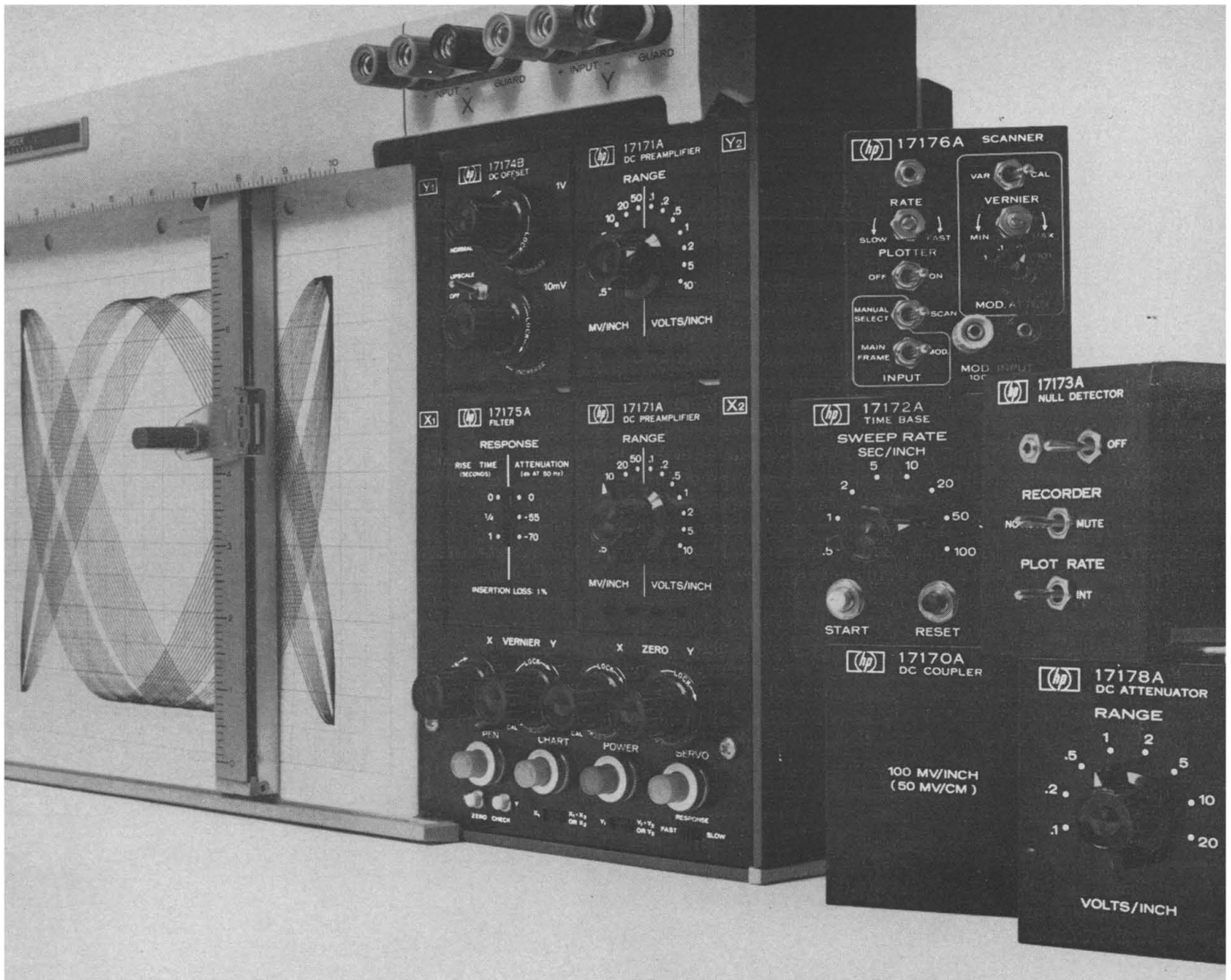

To make our new small X-Y Recorder act big, just plug in a couple of these.

HP's new 7034A is as trim as you can make an 8½"x 11" X-Y recorder. But size is the only thing small about it. The frame has all the features and versatility of our big X-Y Recorder. Such as 1500 in/sec² acceleration and 30 in/sec slewing speed, to catch transients most X-Y recorders miss. Guarded circuits to reject ac and dc common-mode signals. Exclusive, silent electrostatic paper hold-down to eliminate slippage. Disposable ink cartridge to eliminate mess and make color changes easy. And zero set/check for fast verification of zero position without removing or shorting the input signal.

High dynamic performance is matched by the flexibility we've achieved with our unique plug-in concept: two may be used in each axis, and can be cascaded. With eight plug-ins to choose from, you can add to your measurement capabilities as the need arises.

With the Time Base plug-in, you can capture X-T or Y-T data at ½ sec/in to 100 sec/in sweep rates. Expand low-level signals for detailed study with the DC Preamplifier. Suppress steady-state dc to reveal small-signals using the DC Offset plug-in. Plot single channel data at 50 points/sec with the Null Detector and accessory point plotter. Plot two channels independently with the Scanner.

Eliminate ac signal components over 50 Hz with the Filter plug-in. And for more run-of-the-mill recording jobs, try our low-cost DC Attenuator or DC Coupler.

You'll be glad to know that the price on this new X-Y Recorder is also small: just $1195 for the basic instrument. Plug-in prices start at $25. For all the big details, contact your local HP field engineer. Or write to Hewlett-Packard, Palo Alto, California 94304; Europe: 1217 Meyrin-Geneva, Switzerland.

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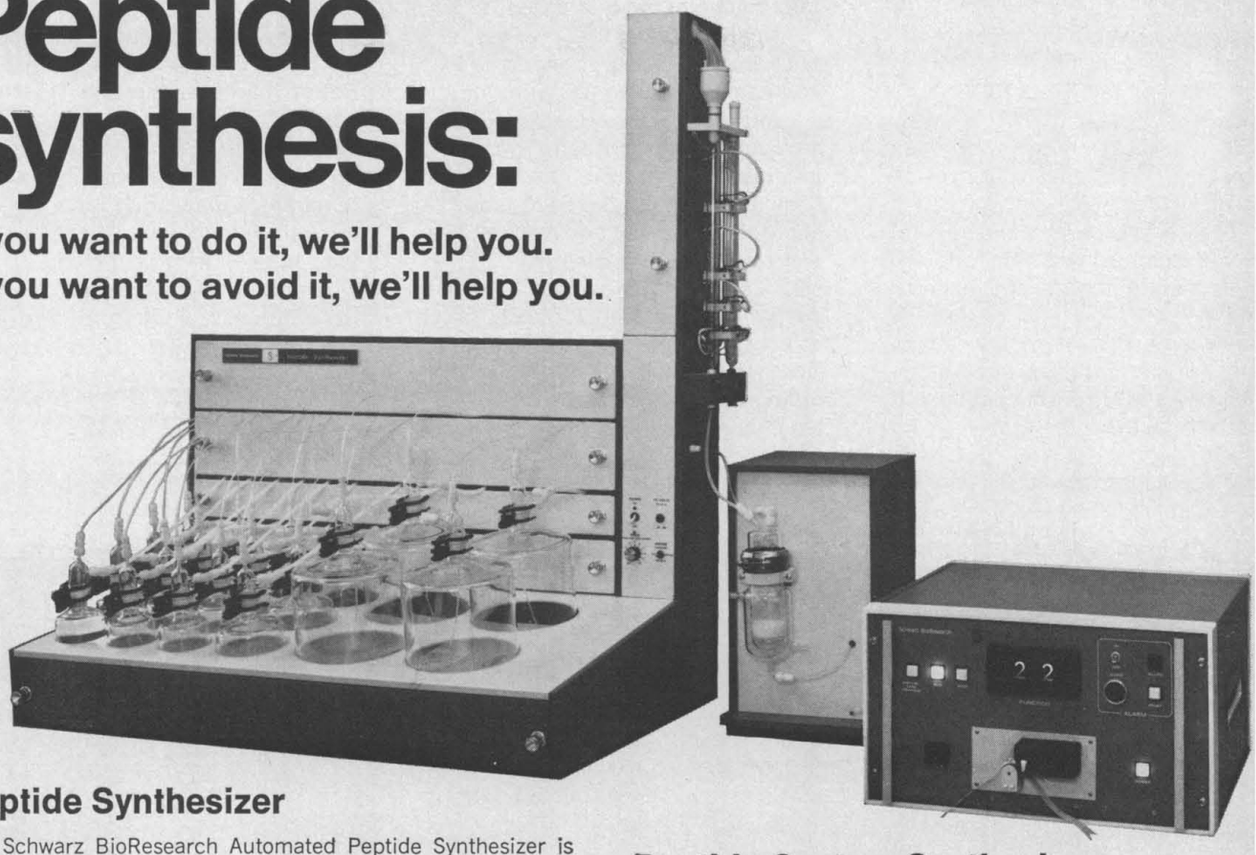
GRAPHIC RECORDERS

11906

Peptide synthesis:

If you want to do it, we'll help you.
If you want to avoid it, we'll help you.



Peptide Synthesizer

The Schwarz BioResearch Automated Peptide Synthesizer is the first commercially-available peptide synthesizer. Under license from the Danish Institute of Protein Chemistry, the synthesizer makes use of Merrifield's solid-phase chemistry. The heart of the unit is an automated control unit which dictates the sequence, volumes, and mixing times for reagents and solvents per the program determined by the operator. And because the instrument can be programmed to run for a full 24-hour day, the time required for peptide synthesis can now be significantly shortened. Please use the coupon to get details.

Peptide "Starters"

We supply virtually every starting material needed for peptide synthesis, 33 Boc-amino acids. 22 ^{14}C and ^{3}H-labeled Boc-amino acids. 12 Boc-amino acid resin esters. Chloromethylated resin. DCC. And dozens upon dozens of unlabeled and ^{14}C, ^{3}H, ^{15}N, and ^{35}S–labeled amino acids, derivatives, and related compounds. Please complete the coupon below for detailed listings, specifications, and prices.

Available Peptides

We now can supply the following biologically active, chemically pure (> 95%) synthetic peptides: [Asp^1, Ile^5] Angiotensin I and II, Bradykinin, Lysl bradykinin, Methionyl lysyl bradykinin.

And these ^{14}C–labeled peptides are also available:

[Leu^{10}–^{14}C (UL)] [Asp^1, Ile^5] Angiotensin I,
[Ile^5–^{14}C (UL)] [Asp^1, Ile^5] Angiotensin II
[Pro^2–^{14}C (UL)] Bradykinin
[Pro^3–^{14}C (UL)] Lysyl bradykinin
[Pro^4–^{14}C (UL)] Methionyl lysyl bradykinin
Please use the coupon for details.

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As is evident from this page, our commitment to peptide synthesis is rather substantial. And supporting the endeavors described here is an unusually competent and innovative group of synthetic organic chemists. This puts us in the position to suggest that you query us about custom synthesis of peptides you'd like to have. Drop us a line, or give us a call at 914-359-2700, or use the coupon for further information.

CPK Atomic Models

These inexpensive, space-filling models are most useful for the study of structure, function, and synthesis of polypeptides. Schwarz supplies CPK Atomic Models, kits, or pre-constructed amino acids. Write for details by using the coupon.

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The Joyce, Loebl Double-Beam Automatic Recording Microdensitometer Mark IIICS provides a quick, easy, reliable way to get a lot more out of film than just a picture. Whereas your eye tells you one spot is relatively "bright", the Microdensitometer tells you exactly how bright, and how much brighter one spot is than another.
It scans a negative or positive along straight or circular lines, accurately measuring and recording optical density throughout the scan . . . prints out graphs of density vs. position on the specimen. Information about brightness, physical density, thickness, temperature, or *any* phenomena that you can record as a variation of photographic density can now be measured and recorded. The reliable double-beam, null balance design makes the Joyce, Loebl Microdensitometer unusually stable and repetitive. It is clearly established as the leading instrument of its kind, for such diverse applications as measuring mountains on the moon — radiography — cell research — high resolution mass spectrography — X-ray diffraction and U.V. absorption studies — air reconnaissance and meteorology. It's available with many helpful accessories including computer interface equipment. **Better than ever through Tech/Ops national sales and service organization.**
To find out exactly what these remarkable measuring tools can do for you, write to Joyce, Loebl & Co., Inc., an affiliate of Technical Operations, Incorporated, Department K-7, Bldg. 3, South Avenue, Burlington, Mass. 01803.

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The Joyce, Loebl Double-Beam Microdensitometer

...for recording a wide range of increments of optical density in film

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The only time you have to stop the new Brinkmann Fraction Collector is when you run out of fractions.

The compact new Brinkmann Fraction Collector collects fractions assembly-line fashion directly into an unlimited number of standard test tubes for chromatography or routine separations. Instead of a conventional round tray with limited capacity, you start with a rectangular tray containing four racks of 40 test tubes each. If 160 test tubes aren't enough, you just attach extension tracks at both ends and add on additional trays of test tubes.

You wouldn't think this versatile instrument would be light enough to be portable, but it is. It is also corrosion-resistant and spill-proof. It can operate at temperatures as low as −20°C. The distributor travels in either of several zig-zag or meandering patterns. With an optional multiple distributor, streams of effluent can be delivered into as many as ten test tubes simultaneously.

Furthermore, this fraction collector practically runs itself. It counts drops or measures volume photoelectrically for any pre-set period of time. An optional programmer can be used to automate the whole procedure. Other accessories include UV monitor, elution pumps, infra-red siphon, refrigeration unit, and of course, extra tracks, trays and test tube racks.

There's a lot to be said for the new Brinkmann Fraction Collector. It's all in our free catalog. Just write: Brinkmann Instruments, Cantiague Road, Westbury, N.Y. 11590.

BRINKMANN

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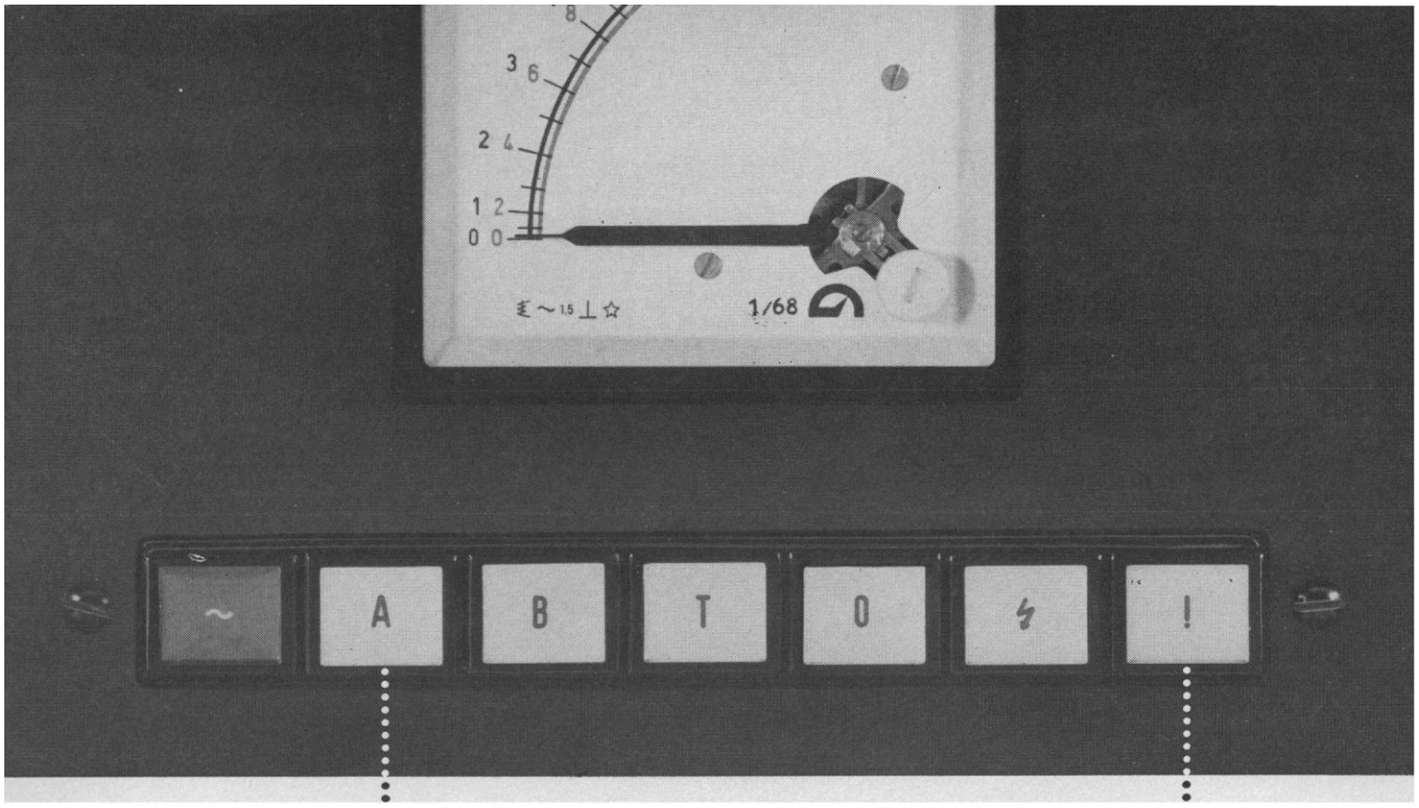
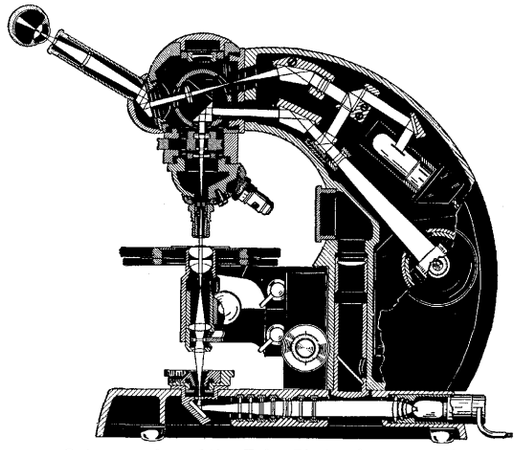


This button does all the work. Push it and...
It opens the shutter.
Exposes the film the proper length of time.
Closes the shutter.
Advances the film to the next frame.
Advances the frame counter.
Recocks the shutter ready for the next exposure.

This is the panic button. It flashes when...
You forgot to load the camera.
You've run out of film.
The film is torn.
You've reached the end of the roll.
You can't push button A while button ! is flashing.

Introducing the Photomicroscope II...

A tale of two buttons.



Cut-away view of the Zeiss Photomicroscope II.

What the other buttons do is give you added versatility. But there are more important things to talk about here.

Such as the stability between camera and microscope only an integrated system can offer.

Such as exposure times from 1/100 sec. to hours, if need be.

Such as automatic exposure control for all films rated from 2½ to 8000 ASA.

Such as a system specifically designed to take optimum advantage of the latest high speed color films.

Such as increased sensitivity for selected-area "spot" readings—particularly helpful for dark-field and fluorescence work.

Such as a whole lot more.

The new ZEISS Photomicroscope II makes photomicrography literally a snap—as easy as using any quality 35mm automatic amateur camera. But it's as professional an instrument as you can get.

For complete information, including what the other buttons do, write Carl Zeiss, Inc., 444 Fifth Avenue, New York, N.Y. 10018.

Nationwide service.

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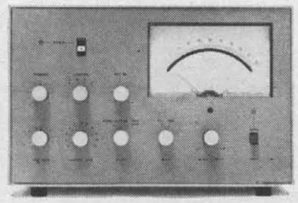
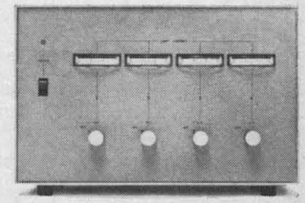
The atomic absorption spectrophotometer for chemists who frustrate easily.

The new Varian Techtron AA-5 was designed for a special kind of chemist. The kind who loves to outwit a spectrophotometer with a never-tried-before technique. Or who always pushes an instrument to its performance limits. Yet gets annoyed when it doesn't perform. For you, the AA-5 will be a welcome relief. It's as flexible as your imagination.

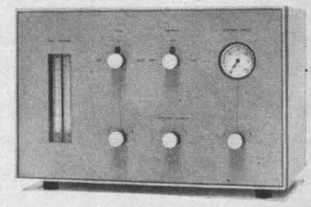
Because the AA-5 is completely modular, it readily adapts to emission or fluorescence studies, or to new sampling requirements and accessories. Each module is a story in itself:



AC AMPLIFIER AND READOUT. In the normal mode, the six-inch meter scale represents a *linear* absorbance range of 0-1.00 or a transmission range of 0-100%. The absorbance scale expansion can be continuously varied by as much as a factor of 10, thus making it possible to read concentration directly. With the new digital indicator accessories or a 1mV recorder, expansions up to 20x and 100x are possible. Using the expansion feature and zero suppression, any portion of the scale can be expanded to full scale. And the new automatic baseline corrector feature re-establishes the baseline between readings. Easily, precisely.

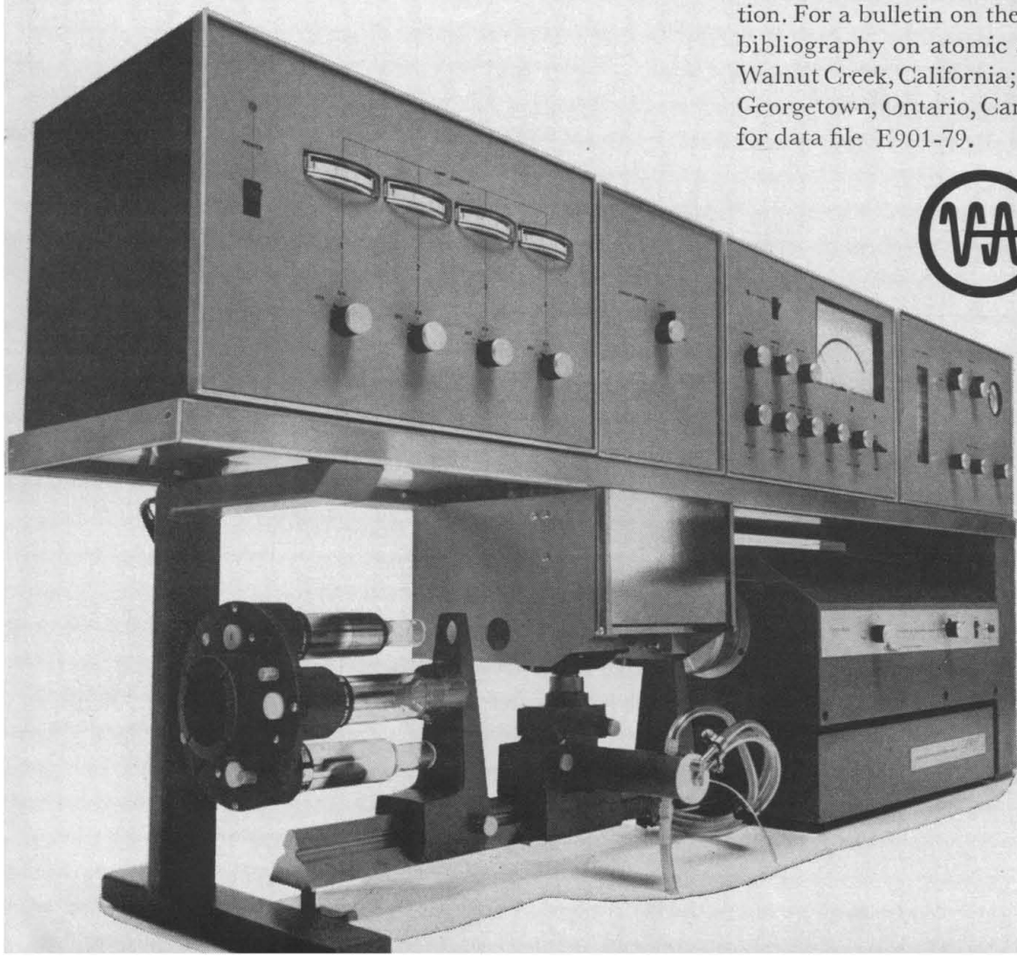


LAMP POWER SUPPLY. Operating current for each of the four hollow cathode lamps is independently controlled and metered with all channels modulated and regulated. The solid-state unit is synchronously modulated with the amplifier to assure "lock-in" amplification and drift-free operation. The lamps themselves mount on a convenient rotating turret. Installing and aligning a lamp takes only a few seconds.



THE GAS CONTROL UNIT. Two separate 2-way valves permit rapid selection of the fuel-oxidant mixture. You can safely switch between air and nitrous oxide. An auxiliary support gas control is convenient for stiffening the flame or for working with organic solvents. Fine metering valves, along with the fuel and support gas flow meters, are used to precisely adjust flame conditions. The grooved titanium burner can be positioned in three planes by external controls to obtain the best sensitivity. And, an electric flame igniter is built-in.

If you'd like to see and test the new Varian Techtron AA-5 in your own lab, just ask us. We'll arrange for a free demonstration. For a bulletin on the instrument, plus a current 64-page bibliography on atomic absorption, write Varian Techtron; Walnut Creek, California; Zug, Switzerland; Sydney, Australia; Georgetown, Ontario, Canada; or your local Varian office. Ask for data file E901-79.



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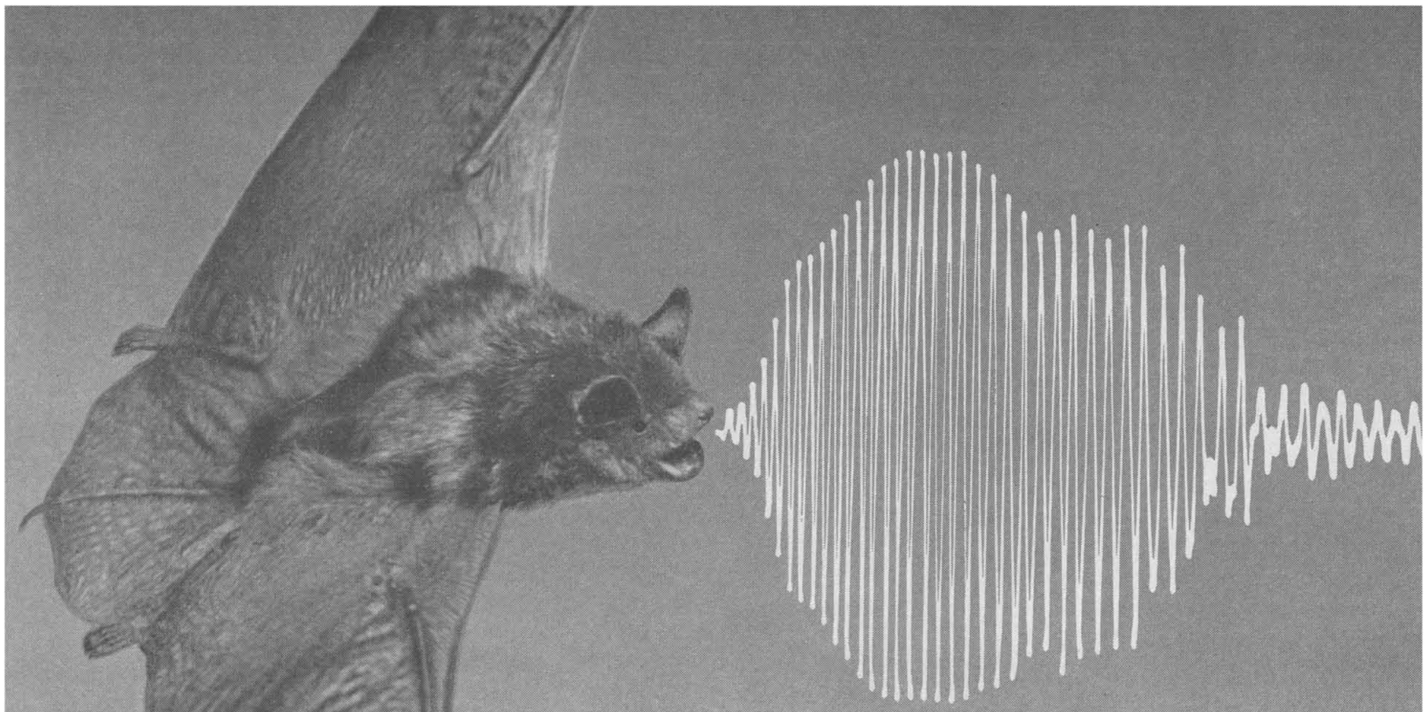
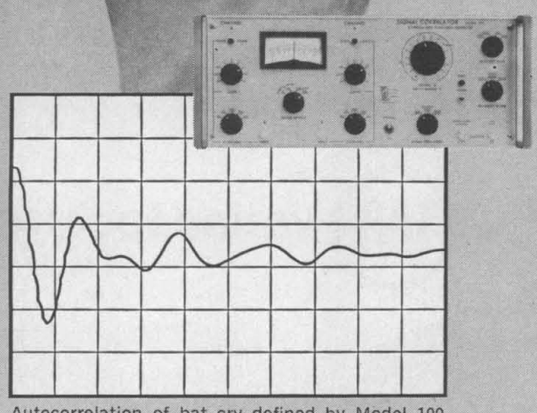
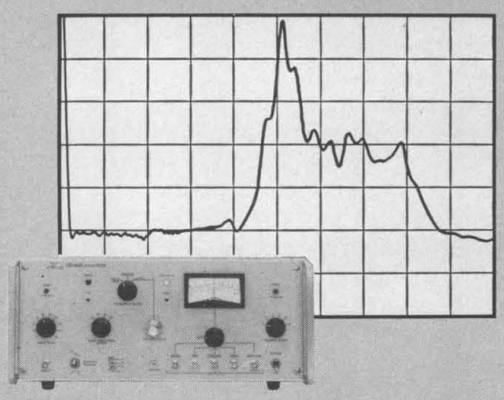


ANALYZE EVEN THE MOST COMPLEX SIGNALS . . .



Autocorrelation of bat cry defined by Model 100 Correlation Function Computer (Price: $8,500.)



Power spectral density of bat cry transformed from autocorrelation function by Model 102 Fourier Analyzer (Price: $2,950.)

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no such sense of loyalty and honor, and they probably don't even read scholarly journals and couldn't care less about her predicament.

BARBARA C. COCHRAN
5095 Kenmoore Drive,
Concord, California 94521

Beattie, Orlans, and Brown seem to assume that there is no generation gap, and then quite logically attack Mead's explanation for one. As a member of the younger generation, I have serious doubts concerning their assumptions.

Probably all three consider themselves scholars, who, according to Brown, "know that their knowledge is reliable and meaningful." Did these three watch the CBS-TV specials, "Generations Apart," broadcast last May? Statistics (supposedly reliable and certainly meaningful) were presented to demonstrate the existence of, among other things, a "generation gap." Have they read the almost daily New York *Times* reports of violence in high schools and colleges here and abroad? On the less factual side, have they analyzed the lyrics sung by Simon and Garfunkel, the Beatles, and Judy Collins? Have they read SDS literature? Have they seen *Hair*? I doubt it.

The expanded version (New York *Times*, 16 Mar., p. 62) of the lecture fragments published in the *Science* editorial over Mead's signature refuted in part the objections of Beattie, Orlans, and Brown. This member of the younger generation can only applaud what Mead has to say, and hopes that her lectures in book form will receive the wide circulation they deserve.

JOHN MICHAEL STRAWN
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Obstructions

DuBridge's comments on the need "to mount research efforts in which scientists, social and political scientists, and engineers work together to seek basic causes, to develop new technologies . . ." concerned me very much ("Science serves society," 6 June, p. 1137). My recent personal experiences have led me to believe that industry and government are not sufficiently interested in interdisciplinary R & D operations to hire available trained people.

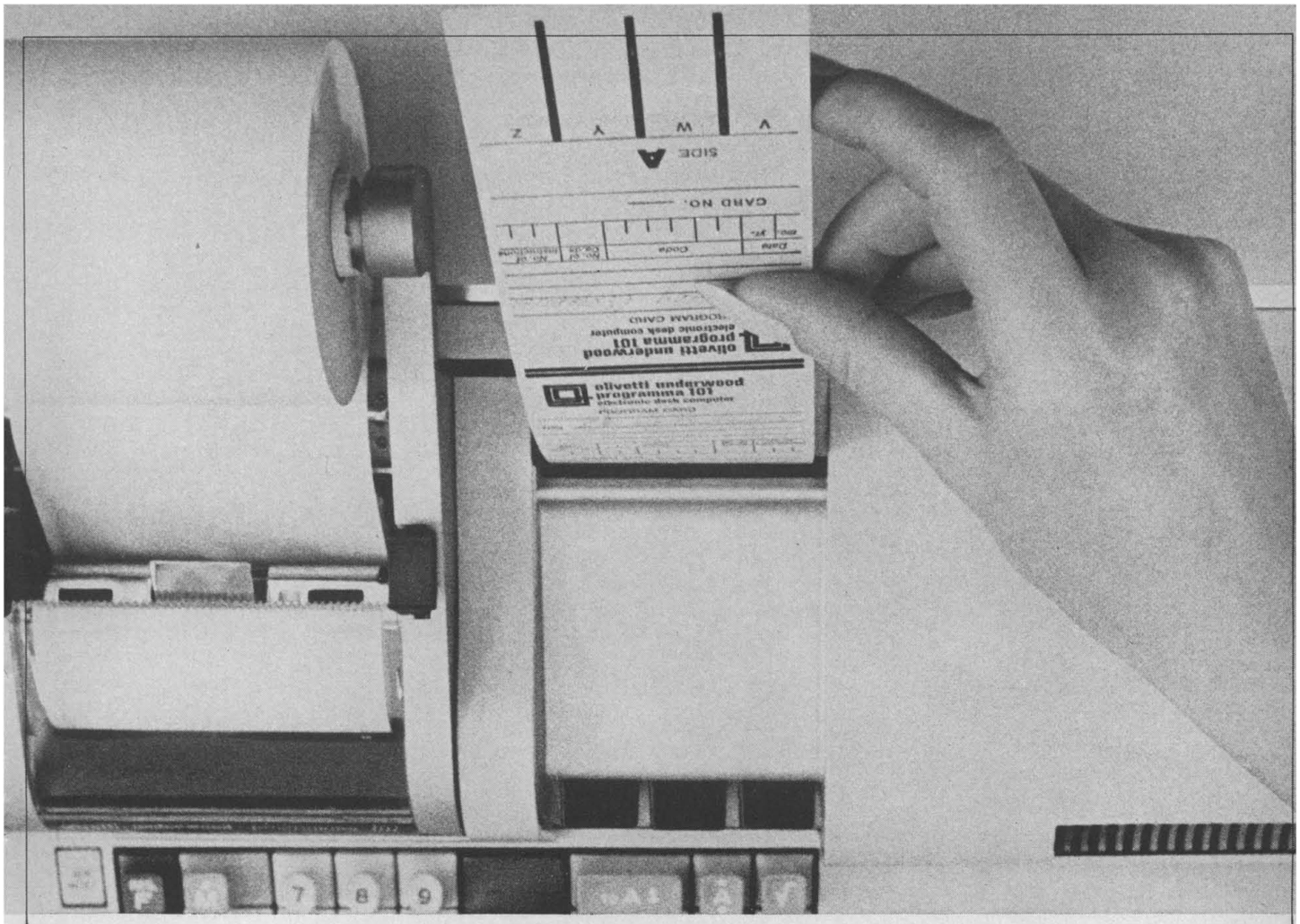
In anticipation of a need for people trained in interdisciplinary R & D, I pursued and completed an academic program leading to three advanced degrees in the fields of mechanical engineering and law. Recently I interviewed some 50 organizations, including most of the nonprofit "think factories," several of the departments and commissions of the federal government, and the R & D departments of many corporations. In all but three cases I was met with complete indifference to my expressed interest in interdisciplinary R & D. Of the three, one was interested only in one of my disciplines to the total exclusion of the other. The second offered a position of little opportunity and no responsibility. Only the last organization initially expressed serious interest in my interdisciplinary training. Unfortunately they also subsequently lost interest.

Knowledge and devotion are not sufficient when opportunities for gainful employment are nonexistent. Out of necessity I have subsequently taken employment in a field where my academic training goes largely unused.

JAMES M. DEIMEN
1870 Independence Boulevard,
Ann Arbor, Michigan 48104

A friend of mine who went back to school after raising a family is now graduating from college as a biology major at age 37. She has an A average, and straight A's in her biology courses. I have been encouraging her toward graduate school and a Ph.D. Despite her grades and a mark of over 700 on her biology graduate record exam, she has already been turned down by one New York university and has been refused financial aid by another, while awaiting word regarding admission. I know of many students with much lower qualifications who have already been accepted and given financial aid by these schools. The only explanation I can think of is prejudice against her age. Since great strides have been taken to eliminate racial and religious prejudice from admissions policy, it is time to eliminate age prejudice as well. It has been shown many times that more mature people perform as well or better than their younger colleagues, and they still have many productive years ahead of them. Let us not close our field to these potential contributors.

JUDITH S. WEIS
Department of Zoology,
Rutgers State University,
Newark, New Jersey 07102



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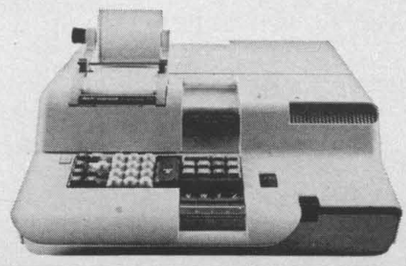

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25 July 1969, Volume 165, Number 3891 **SCIENCE**

German Technological Resurgence

By the end of World War II, most of Germany's major cities, together with its industrial capacity, had been destroyed. Scientific research was crippled. Today, most of the scars of war have vanished. The cities and the industrial complexes have been rebuilt. The Deutsche mark is the world's strongest currency. Only 0.5 percent of Germans are unemployed, and there are nearly eight times as many vacant positions as there are jobless. Science is flourishing. During a period when U.S. expenditures on R & D have been static, German outlays have nearly doubled. At a time when the U.S. public is denigrating technology and has wearied of the effort to maintain world leadership in science, the Germans are moving confidently toward becoming No. 1 in science and technology.

In part, the recovery from World War II was due to assistance from the United States. More important was U.S. protection, which freed Germany from making huge arms expenditures. Perhaps most important have been the energy, foresight, and capacity for organized effort of the German people. In a recent tour of 11 major research establishments, I saw no one goofing off. In a comparable sample of U.S. establishments I would have seen scores of idlers. Most impressive, however, were repeated indications of excellent management, both at the institutional level and in the coordination of national efforts.

Scientific activity in Germany is supported by a number of mechanisms. A major source of funds is the Federal Ministry for Scientific Research. This organization has given considerable thought to priorities. High on its list is research likely to result in new technology 10 to 20 years hence. Two other favored programs are oceanography and nuclear studies.

An example of German resurgence resulting from good management is seen in the field of atomic energy. It was not until 1955 that the Germans were permitted to engage in large-scale civilian nuclear development. They quickly procured research and training reactors. German engineers and scientists trained in the United States and elsewhere were brought back to their native land. Special know-how was obtained through licensing agreements. After careful studies, a limited number of projects were chosen and then supported vigorously. Today the German civilian reactor program has caught up with the U.S. program in many respects and has surpassed it in nuclear propulsion of a merchant ship, the *Otto Hahn*. At the moment, the United States leads quantitatively in the field of water-moderated reactors for production of electric power. However, qualitatively our lead, if any, is narrow. Generating facilities with a capacity of 900 megawatts are on line; two 600-megawatt plants of German design are being constructed; and construction of a 1100-megawatt plant has been authorized. The three new installations are designed to compete economically with conventionally generated power. Nuclear power stations designed and built by German engineers for export are already a factor in world trade. In the extremely important effort to develop sodium-cooled breeder reactors, the Germans are moving rapidly. Some highly placed Americans think the United States is falling behind in this competition.

Germany does not compete well with us in some areas of technology—for example, that of computers. A country of moderate material resources and a population of about 60 million can scarcely be expected to do everything. Nevertheless, by temperament the German people are particularly suited to high technology, and they will enjoy an increasingly important and successful role.—PHILIP H. ABELSON

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vances stemming from them. Label from dimethylnitrosamine attached to the 7-position of guanylic acid in DNA and RNA, and minor amounts also to the 1- and 3-positions in adenylic acid and in cytidylic acid. The significance of these interactions in the carcinogenic process remains to be fully documented, but that carbonium ions produced in vivo may lead to neoplasia has led to other tests. Thus, after a single intravenous injection, methyl methanesulfonate gave brain tumors, and the ethyl ester gave kidney tumors.

Boyland (London) discussed activation processes with chemical carcinogens; he emphasized the intermediates derived from the simple molecule ethyl carbamate. A single electron carbethoxy radical, which reacts with cytidylic acid in DNA, may be involved. Also, epoxides from PAH cannot be disregarded as active intermediates despite unfavorable test data in animals. He concluded that DNA is the primary molecular target with a variety of carcinogens.

A key presentation by Miller (Wisconsin) provided evidence that chemical carcinogens ultimately are converted to electrophilic reactants. Carcinogenic alkylnitrosamines yield carbonium ions; urethane, a one-electron or carbonium ion intermediate; aromatic amines and azo dyes, *N*-oxy compounds (which as esters yield reactive amidonium ions); and pyrrolizidine alkaloids, a carbonium ion (also with an ester-leaving group). Some metals, such as chromium, cadmium, cobalt, lead, and nickel, are electrophilic.

Troll (New York University) showed that melting temperature, buoyant density, and template activity of DNA with respect to RNA polymerase was lower after treatment in vitro with the carcinogens β-propiolactone and *N*-acetoxy-*N*-2-fluorenylacetamide. *N*-Acetoxy-*N*-1-naphthylacetamide, from noncarcinogenic 1-naphthylamine, did not alter the properties of DNA. Kriek (Amsterdam) discovered an interesting difference in the binding of *N*-hydroxy-*N*-2-fluorenylacetamide with RNA and DNA of rat liver in vivo. Whereas the residue combined at C-8 of guanylic acid in RNA was an acetylamino derivative, it was the amino derivative on DNA.

Roberts (London) examined DNA in HeLa cells damaged by alkylating agents such as nitrogen mustard, methyl methanesulfonate, or nitrosomethylguanidine after labeling with bromodeoxyuridine (heavy chains) or thymidine (light chains). Elimination of label gave a clue on repair mechanisms which may also play a role in the carcinogenic process.

Sorof (Philadelphia) spoke on the binding of carcinogens to a specific subfraction of the cell sap of tissues, the h_2 proteins. In several tissues carcinogens labeled proteins with similar charge and molecular size, thus suggesting that the functional consequences of this binding may be alike. Liver h_2 proteins had physical properties like those of arginase, and inhibited certain cells in culture. Heidelberger (Wisconsin) noted that mouse skin had h_2 proteins as found in liver. However, mouse skin arginase had different electrophoretic mobility.

Goldblum (Jerusalem) dealt with viral carcinogenesis, in particular, the incorporation of the genome from SV-40 agent into the DNA of host cells. Infected cells exhibited (i) increased DNA synthesis; (ii) induction of a viral replicase; (iii) induction of an

intranuclear "T" antigen; and (iv) induction of surface transplantation antigens. The purified T antigen had a molecular weight of more than 200,000 and contained RNA. Removal of RNA lowered the molecular weight, thus yielding a pure basic protein containing no sulfur amino acids. The T antigen might be the viral DNA polymerase.

Heidelberger (Wisconsin) reported on a quantitative in vitro system of hydrocarbon carcinogenesis with cells from adult C3H mouse prostate. Transformed cells formed piled-up colonies which gave transformation frequencies related to the carcinogenic potency of eight hydrocarbons, and produced tumors in unconditioned mice.

Clayson (Leeds) found that the mitotic rate in normal bladder measured by direct count or thymidine incorporation was low, and exhibited two peaks—one at 5 hours and one at 18 to 24 hours. Cells were usually diploid, but in bladder tumors they were often heteroploid. After treatment with a new bladder carcinogen, 4-ethylsulfonylnaphthalene-1-sulfonamide, an increased rate of mitotic waves in the epithelial fraction showed peaks at 36 hours. The increased DNA synthesis was preceded by ribosomal RNA synthesis.

Systemic carcinogens were discussed by Weisburger (Bethesda)—in particular the circulatory pathway of carcinogenic *N*-2-fluorenylacetamide and its active metabolite, *N*-hydroxy-*N*-2-fluorenylacetamide. After absorption the compounds were metabolized chiefly in the liver. The many products were transported by blood as loosely and as firmly bound metabolites. Urinary excretion occurred after renal filtration. Passage from liver to bile led to additional metabolism in the gut by bacterial action, particularly splitting of conjugates such as glucuronides and sulfate esters. Resorption of free metabolites from the gut explains enterohepatic circulation. Unresorbed materials constitute fecal metabolites.

Furst (San Francisco) dealt with induction of cancer in rodents by metal and metal ions, in particular the induction of sarcomas at the site of injection of certain nickel and titanium derivatives. Titanium powder also gave rise to lymphomas.

Berenblum (Rehovoth) saw the induction of tumors as a complex process involving many variables such as chemical structure of agent, biochemical activation and detoxification processes, dosage, mode of administration, and host factors such as species or sex.

Thus, quantitative carcinogenic potency is a relative term valid in a controlled experimental setting.

At this symposium important conceptual and practical advances were reported. Theoretical and experimental approaches have led to a consensus that many different types of chemical carcinogens may be considered as electrophilic reagents, produced by synthesis or by biochemical activation. New experimental developments should help pinpoint the target specifically related to carcinogenicity. It need be a cellular or molecular entity with a preference for such electrophilic centers. Additional events in the carcinogenic process leading to tumors deal with host-specific modifying factors, concerned with the multiplication of cells altered by action of an electrophilic reagent with its receptor.

The meeting was held under the sponsorship of the Hebrew University of Jerusalem, the Foundation Edmond de Rothschild of Paris, and the Israel Academy of Sciences and Humanities.

The complete proceedings will appear as a monograph published by the Israel Academy. This first symposium dealing with carcinogenesis will be followed by others in which significant reports on broad multidisciplinary aspects of research develop into advances of an entire field.

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E. D. BERGMANN
Department of Organic Chemistry, Hebrew University of Jerusalem, Jerusalem, Israel

B. PULLMAN
Institut de Biologie Physico-Chimique, 13, rue Pierre Curie, Paris, France

National Meetings

September

2–4. **Comparative Virology**, intern. conf., Montreal, Canada. (K. Maramorosch, Boyce Thompson Inst. for Plant Research, Yonkers, N.Y. 10701)

2–6. **Molecular Structure and Spectroscopy**, 24th annual symp., Columbus, Ohio. (K. N. Rao, Physics Dept., Ohio State Univ., Columbus 43210)

2–6. **Tuberculosis**, intern. conf., New York, N.Y. (J. E. Perkins, Natl. Tuberculosis Assoc., 1790 Broadway, New York 10019)

3–5. **Weather Forecasting and Analysis**, 3rd, Virginia Beach, Va. (E. C. Kindle, Navy Weather Research Facility, Bldg. R 48, Naval Air Station, Norfolk, Va.)

3–6. Conference on **Biogenic Amines as Physiological Regulators**, Woods Hole, Mass. (B. A. Curtis, Tufts Univ. School of Medicine, 136 Harrison Ave., Boston, Mass. 02111)

3–6. American **Political Science** Assoc., New York, N.Y. (E. M. Kirkpatrick, APSA, 1527 New Hampshire Ave., NW, Washington, D.C. 20036)

4–6. American Assoc. of **Obstetricians and Gynecologists**, Hot Springs, Va. (R. B. Wilson, 200 First St., SW, Rochester, Minn. 55901)

4–6. **Parapsychological** Assoc., 12th intern. conv., New York, N.Y. (J. G. Pratt, Box 152, Univ. of Virginia Medical School, Charlottesville 22901)

5–7. Society for the Study of **Amphibians and Reptiles**, 12th annual, Carbondale, Ill. (J. T. Collins, Museum of Natural History, Univ. of Kansas, Lawrence 66044)

7–12. American **Chemical** Soc., 158th natl., New York, N.Y. (Manager, Natl. Meeting and Divisional Activities, 1155 16th St., NW, Washington, D.C. 20036)

7–12. **Experimental Medicine and Surgery in Primates**, 2nd conf., New York, N.Y. (J. Moor-Jankowski, New York Univ. Medical Center, 550 First Ave., New York 10016)

8–9. Symposium on **Turbulence Measurements in Liquids**, Rolla, Mo. (G. K. Patterson, Dept. of Chemical Engineering, Univ. of Missouri, Rolla 65401)

8–10. **Agriculture Meteorology** Conf., 9th, Seattle, Wash. (R. J. Hanks, Dept. of Soils and Meteorology, Utah State Univ., Logan 84321)

8–10. **Metallurgy and Materials Science**, intern. conf., Philadelphia, Pa. (G. R. Belton, School of Metallurgy and Materials Sciences, Univ. of Pennsylvania, Philadelphia 19104)

8–10. **Standards Engineers** Soc., 18th annual, Washington, D.C. (J. M. Ward, 11208 Long Pine Trail, Potomac, Md. 20857)

8–11. **Electrical Insulation** Conf., 9th, Boston, Mass. (H. P. Walker, Code 6158D, Naval Ship Engineering Center, Washington, D.C. 20360)

8–12. **Dietetics**, 5th intern. congr. (American Dietetic Assoc., 52nd annual), Washington, D.C. (Public Relations, The Association, 620 N. Michigan Ave., Chicago, Ill. 60611)

8–12. American Soc. of **Limnology and Oceanography**, La Jolla, Calif. (G. H. Lauff, W. K. Kellogg Biological Station, Michigan State Univ., Hickory Corners, 49060).

8–13. **High Energy Physics and Nuclear Structure**, intern. conf., New York, N.Y. (S. Devons, Dept. of Physics, Columbia Univ., New York 10027)

9–10. Society of **Logistics Engineers**, 4th annual, Cape Canaveral, Fla. (G. Dill, Aerospace Services Div., Pan American World Airways, Inc., Patrick AFB, Fla. 32925)

11–12. Symposium on **Sulphur in Nutrition**, Corvallis, Ore. (J. E. Oldfield, Dept. of Animal Science, Oregon State Univ., Corvallis 77331)

14–17. Association of **Medical Illustrators**, Washington, D.C. (B. J. Melloni, AMI, Georgetown Univ., Washington, D.C. 20007)

14–20. College of American **Pathol-**

ogists and American Soc. of **Clinical Pathologists**, joint annual mtg., Chicago, Ill. (O. Neibel, CAP, 230 N. Michigan Ave., Chicago 60601)

15–17. **Woodhandling**, 2nd symp., Ottawa, Ont., Canada. (Technical Section, Canadian Pulp and Paper Assoc., 2280 Sun Life Bldg., Montreal 110, P.Q.)

17–19. American **Science Film** Assoc., Washington, D.C. (B. J. Melloni, ASFA, Georgetown Univ., Washington, D.C. 20007)

17–19. **Blood and Tissue Antigens**, intern. symp., Ann Arbor, Mich. (D. Aminoff, Simpson Memorial Inst., Univ. of Michigan, Ann Arbor 48104)

17–19. **Industrial Research**, 5th natl. conf., Chicago, Ill. (V. J. Danilov, Industrial Research Bldg., Beverly Shores, Ind. 46301)

18–20. **Chemical Marketing Research Assoc.**, Lake Placid, N.Y. (P. E. Levesque, FMC Corp., 633 Third Ave., New York 10017)

18–20. Symposium on **Coniferous Forests of the Northern Rocky Mountains**, Missoula, Mont. (Center for Natural Resources, Univ. of Montana, Missoula 59801)

21–24. American Assoc. of **Medical Clinics**, New York, N.Y. (E. M. Wurzel, Executive Director, The Association, 421 King St., Alexandria, Va. 22314)

21–24. **Petroleum Mechanical Engineering Conf.**, Tulsa, Okla. (H. E. Broadbent, Atlantic Richfield Co., P.O. Box 8138, Philadelphia, Pa. 19101)

21–25. **Comparative Leukemia Research**, 4th intern. symp., Cherry Hill, N.J. (R. M. Dutcher, School of Veterinary Medicine, Univ. of Pennsylvania, New Bolton Center, Kennett Square 19348)

22–24. National Conf. on **Packaging Wastes**, San Francisco, Calif. (M. Li, Food Protection and Toxicology Center, Univ. of California, Davis 95616)

22–26. **Combustion-Generated Air Pollution**, Berkeley, Calif. (Continuing Education in Engineering, University Extension, Univ. of California, Berkeley 94720)

22–26. International **Simulation and Training** Conf., Montreal, Canada. (W. I. Marble, SAE Hq., Meetings Manager, 2 Pennsylvania Plaza, New York 10001)

23–25. **Physics and Nondestructive Testing**, 9th annual, Chicago, Ill. (W. J. McGonnagle, Symp. Coordinator, P.O. Box 554, Elmhurst, Ill. 60126)

24–26. IEEE **Ultrasonics** Symp., St. Louis, Mo. (D. I. Bolef, Inst. of Electrical and Electronics Engineers, Ultrasonics Symp., Dept. of Physics, Washington Univ., St. Louis 63130)

26–3. American Acad. of **General Practice**, Philadelphia, Pa. (M. F. Cahal, The Academy, Volker Blvd. at Brookside, Kansas City, Mo. 64112)

28–1. Society of **Petroleum Engineers of AIME**, 44th annual, Denver, Colo. (J. R. Dempsey, Northern Natural Gas Co., P.O. Box 308, Omaha, Neb. 68102)

29–1. International Conf. on **Bioelectrical Impedance**, New York, N.Y. (S. E. Marovich, The Conference, 1150 NW 14th St., Miami, Fla. 33136)

29–3. American Soc. of **Photogrammetry**, Portland, Ore. (L. P. Jacobs, 105 N. Virginia Ave., Falls Church, Va. 22046)

Foreign Meetings

September

1–4. International Soc. of **Geographical Pathology** Conf., Jerusalem, Israel. (I. S. Levij, Dept. of Pathology, Hebrew Univ., Hadassah Medical School, P.O. Box 1172, Jerusalem)

1–5. British **Pharmaceutical** Conf., Belfast, Northern Ireland. (Secretary, The Conference, 17 Bloomsbury Sq., London, W.C.1, England)

1–5. International Soc. of **Neurochemistry**, 2nd, Milan, Italy. (R. Paoletti, Scientific Secretary, Inst. of Pharmacology, Univ. of Milan, via Andrea del Sarto 21, 20129 Milan)

1–5. **Phenomena in Ionized Gases**, 9th intern. conf., Bucharest, Rumania. (E. Badareu, Inst. of Physics, Acad. of Science, Bucharest)

1–10. **Non-Linear Continuum Theories in Mechanics and Physics and Their Applications**, Padua, Italy. (D. H. Rivlin, Center of Applied Mathematics, Lehigh Univ., Bethlehem, Pa. 18015)

1–12. International Assoc. of **Geomagnetism and Aeronomy**, Madrid, Spain. (P. A. Romana, Observatorio del Ebro, Apdo 9, Tortosa, Spain)

1–19. **Geophysical Fluid Dynamics**, Bangor, N. Wales. (G. E. R. Deacon, Natl. Inst. of Oceanography, Wormley, Godalming, Surrey, United Kingdom)

2–4. **Hyperbaric Medicine**, 4th intern. congr., Sapporo, Japan. (T. Iwa, Dept. of Thoracic and Cardiovascular Surgery, Sapporo Medical College and Hospital, So. 1. West 16, Sapporo 060)

3–11. International Assoc. of **Statistics in Physical Sciences**, London, England. (J. Neyman, Dept. of Statistics, Univ. of California, Berkeley 94720)

4–9. **Ferroelectr'city**, 2nd intern. conf., Tokyo, Japan. (H. Takahashi, Faculty of Science, Univ. of Tokyo, 7 Hongo, Bunkyo-ku Tokyo, Japan)

4–12. Symposium on **Periodic Orbits, Stability and Resonances**, São Paulo, Brazil. (G. E. O. Giacaglia, Caixa Postal 8174, São Paulo)

5–10. International **Clay** Conf., Tokyo, Japan. (S. Iwao, Secretary General, Organizing Committee, The Conference, Science Council of Japan, Ueno Park, Tokyo 110)

7–12. Conference on **Atomic Collision Phenomena in Solids**, Brighton, England. (Meetings Office, Inst. of Physics and the Physical Soc., 47 Belgrave Sq., London, S.W.1, England)

7–12. **Pharmaceutical Sciences**, 29th intern. congr., London, England. (J. C. Bloomfield, Pharmaceutical Soc. of Great Britain, 17 Bloomsbury Sq., London, W.C.1)

7–14. International Symp. on **Unproven Methods of Cancer D'agnosis and Treatment**, São Paulo, Brazil. (A. C. C. Junqueira, % Hospital A.C. Camargo, P.O. Box 5217, São Paulo)

8–12. **Congen'tal Malformations**, 3rd intern. conf., The Hague, Netherlands. (Local Secretary, % Holland Organizing Centre, 16, Lange Voorhout, The Hague)

8–12. **Fiscal Assoc.**, 23rd intern. congr., Rotterdam, Netherlands. (Local Secretary, Holland Organizing Centre, 16, Lange Voorhout, The Hague, Netherlands)

BOOKS RECEIVED

(Continued from page 385)

A History of Japanese Astronomy. Chinese Background and Western Impact. Shigeru Nakayama. Harvard University Press, Cambridge, Mass., 1969. xvi + 334 pp., illus. $10. Harvard-Yenching Institute Monograph Series, vol. 18.

Houdini. The Untold Story. Milbourne Christopher. Crowell, New York, 1969. vi + 282 pp. + 32 plates. $6.95.

How To Manage Your Information. Bart E. Holm. Illustrated by Ned Beard. Reinhold, New York, 1968. viii + 296 pp. $10.

How To Teach Mathematics in Secondary Schools. Herbert Fremont. Saunders, Philadelphia, 1969. xviii + 574 pp., illus. $10.50. Saunders Science Teaching Series.

Importance of Fundamental Principles in Drug Evaluation. Proceedings of a symposium of the American Pharmaceutical Association, 1968. David H. Tedeschi and Ralph E. Tedeschi, Eds. Raven, New York, 1968. xvi + 496 pp., illus. $18.95.

Induction and Intuition in Scientfic Thought. Peter Brian Medawar. American Philosophical Society, Philadelphia, 1969. xii + 64 pp. $2. Jayne Lectures for 1968. Memoirs of the American Philosophical Society, vol. 75.

An Introduction to Chemical Energetics. J. J. Thompson. Houghton Mifflin, Boston, 1968. x + 110 pp., illus. Paper, $1.75. Concepts in Chemistry.

An Introduction to Hominology. The Study of the Whole Man. Theodore C. Kahn, Thomas, Springfield, Ill., 1969. xvi + 368 pp., illus. $12.50.

Introduction to Probability Theory and Statistical Inference. Harold J. Larson. Wiley, New York, 1969. xii + 388 pp., illus. $10.95. Wiley Series in Probability and Mathematical Statistics.

Introduction to the Thermodynamics of Charged Polar'zed Layers. A. Sanfeld. Interscience (Wiley), New York, 1968. xxiv + 264 pp., illus. $11. Monographs in Statistical Physics and Thermodynamics, vol. 10.

Invention, Discovery, and Creativity. A. D. Moore. Anchor (Doubleday), Garden City, N.Y., 1969. xiv + 186 pp. + 10 plates. Cloth, $4.95; paper, $1.45 Science Study Series.

Invention of the Meteorological Instruments. W. E. Knowles Middleton. Johns Hopkins Press, Baltimore, 1969. xiv + 370 pp., illus. $12.

Isoenzymes in Biology and Medicine. Albert L. Latner and Andrew W. Skillen. Academic Press, New York, 1968. x + 290 pp., illus. $11.50.

Laboratory Manual for General Botany. Lawrence C. Bliss, Margaret K. Balbach, and Harry J. Fuller. Holt, Rinehart and Winston, New York, ed. 4, 1969. xvi + 288 pp., illus. Paper, $4.95.

Laminar Motion of Multiphase Media in Conduits. Dzharulla F. Faizullaev. Translated from the Russian edition (Tashkent, 1966). Consultants Bureau, New York, 1969. vi + 146 pp., illus. Paper, $22.50.

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