SCIENCE

15 June 1973

Vol. 180, No. 4091

AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

Meet the L-5 Preparative Ultracentrifuges --four superb performers from Beckman

We've taken the best features of our Model L2-65/75B and L3-40/50 preparative ultracentrifuges . . . added the latest in high-speed drive technology . . . built in even more operating conveniences and safeguards . . . to bring you the Model L-5 Series—four advanced instruments from 40,000 to 75,000 rpm that provide whatever you need in the application of high forces to biochemical research.

The L-5's feature rapid acceleration/deceleration, precise speed and temperature control, and the containment capability necessary to run new high energy rotors. They do the large volume work, the delicate density gradient separations, the most advanced continuous-flow and zonal runs.

There are 30 Beckman high-performance rotors to choose from, plus accessories like the new Prep UV Scanner which give a preparative instrument many of the capabilities of an analytical ultracentrifuge.

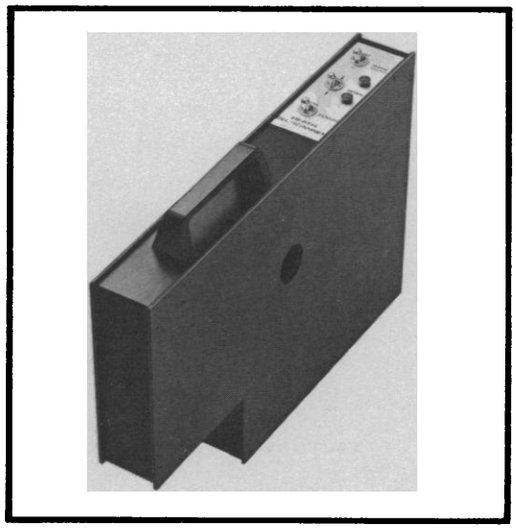
With Beckman you also get a wealth of applications experience, and prompt service—no matter where you are—from our factory-trained service staff numbering in the hundreds.

Beckman: the confident name in Ultracentrifuges for a quarter century. For the new L-5 Brochure, SB-400, write Beckman Instruments, Inc., Spinco Division, 1117 California Avenue, Palo Alto, Calif. 94304.

Beckman®
INSTRUMENTS, INC.

Circle No. 3 on Readers' Service Card

Gel scanning made easy.



If you're looking for an easy and accurate way to quickly scan acrylamide gel columns, the new Heath/Schlumberger Gel Scanner is the answer. As an accessory for our single-beam UV-visible spectrophotometers, it offers a high performance, low-cost approach to scanning gel separations.

The EU-705-11 Gel Scanning Module easily mounts as part of any Heath/Schlumberger single-beam spectrophotometer system. All systems are linear in absorbance and have 0.001 Absorbance accuracy with 0.1 nm wavelength resolution. Wavelength range is from 200 to 700 nm or 185 to 1000 nm with accessory detectors. **The cost of a complete gel scanning spectrophotometer system can be as low as $3945*, including recorder.**

The EU-705-11 accepts 5 to 10 mm gels up to 150 mm in length. Two scanning speeds of 5 mm/min and 20 mm/min are provided with a one-to-one relation established between gel scanning speed and chart recorder speed for easy correlation of absorbance with gel position. Scanning apertures of 0.2 mm and 0.05 mm provide excellent resolution. The module can be used for a UV or visible scan in both directions with an automatic shut-off at the end of each scan. Manual override of the scanning system is possible at any time during the scan for specific positioning of the carrier. Gels may be positioned dry on the teflon-coated holder provided or placed in a cuvette. An additional holder is included for scanning of thin negatives. And the price is only $750.*

To find out how easy gel scanning can be, simply circle the reader service number or contact us directly using the coupon below. Also available is the latest Heath/Schlumberger catalog which gives complete descriptions and specifications for all spectrophotometer systems and accessories.

Heath/Schlumberger — the group to watch in scientific instrumentation

HEATH
Schlumberger

Heath/Schlumberger
Scientific Instruments
Benton Harbor, Michigan 49022

Circle No. 24 on Readers' Service Card

HEATH
Schlumberger

Heath/Schlumberger Scientific Instruments
Dept. No. 511-196
Benton Harbor, Michigan 49022

Please send

☐ Information describing the new EU-705-11 Gel Scanner.

☐ 1973 Heath/Schlumberger Spectrophotometer Catalog.

Name_____

Title_____

Address_____

City_____ State_____ Zip_____

*Mail order prices; FOB factory. EK-380

15 June 1973

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SCIENCE

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AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

COVER

Computer processed block pictures reveal existence of two-dimensional spatial frequency analysis in vision. Block-averaged portrait at top is perceived more readily if middle and high frequencies are removed by blurring. Selective removal of high frequencies alone, as at lower left, leads to little improvement. But selective removal only of frequencies immediately above original portrait's spectrum, as at lower right, is more effective. See page 1194. [L. D. Harmon and B. Julesz, Bell Laboratories, Murray Hill, New Jersey]

"Animal News That's Fit to Print."

The New City Times

Late City Edition

NEW CITY, ROCKLAND COUNTY, N.Y.

THE NEW CARWORTH CATALOGS

MYTH OR REALITY?

In the course of this newspaper's investigations into the new Carworth guinea pigs, our reporters have also uncovered the fact that Carworth is about to release two new catalogs.

The first of these catalogs presumably deals with Carworth rats and mice and, we suspect, the "secret" guinea pigs, too.

The second catalog seems to cover Carworth's extensive line of laboratory animal care equipment including: animal housing systems, contamination control products like laminar flow devices, bedding, cleaning materials and other accessories and supplies.

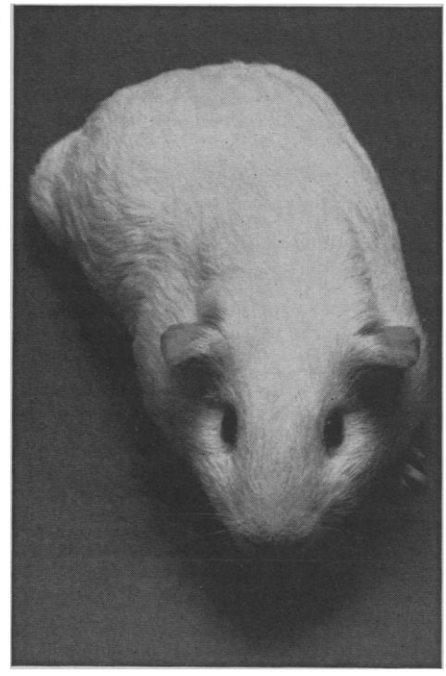
We queried the Carworth advertising agency about the existence of these new catalogs and were told by a representative that they know nothing (Editor's Note: an unusual agency admission!), but that if Carworth *were* to issue new catalogs soon, "they would be likely to be beauties," they stated with characteristic immodesty.

The New City Times can't help but wonder what other surprises these Carworth people have in store for us. In any event, for now we suggest that you write Carworth, New City, (Rockland County), N.Y. 10956 (or call 914/634-8931) and say: "if these new catalogs are not a myth, please send!"

CARWORTH INTO GUINEA PIGS

RESEARCH COMMUNITY PLEASED

Surprisingly, Company Says "No Comment"



The guinea pig, believed to be a tame form of the cavy, *Cavia cutleri*. The capybara, the largest rodent alive (or even dead, for that matter), is also a well-known cavy.

The New City Times today learned from an unidentified but usually reliable source, that Carworth, a leading supplier of high quality rats and mice since 1935, has expanded its service to the research community by adding guinea pigs to its line.

Calls by this newspaper to a random selection of research people indicate that the guinea pig, always a popular animal for bacteriologic and vitamin C work, is now also being widely used in immunologic, pharmacologic, virologic, and endocrinologic studies of all types.

Thus, it seems obvious to this paper that the entry into this field of a quality house like Carworth provides researchers with a valuable new source for this important laboratory animal.

Our investigative reporters have also uncovered the fact that the Carworth guinea pigs are actually Dunkin/Hartley animals from a closed colony meticulously maintained for over 15 years.

Carworth personnel have routinely responded to our inquiries about this development with enigmatic smiles and "no comment" and will neither affirm nor deny any of the above allegations.

Despite this uncharacteristic reticence, our reporters are firm in their conviction that all researchers interested in Carworth-quality guinea pigs are entitled to know more. The New City Times suggests, therefore, that interested parties demand more data. Write CIA (Carworth Information Agency), c/o Carworth, New City, (Rockland County), New York, 10956 (or call 914/634-8931). They'll get the message.

Rats and Mice by the Thousands

THOSE OTHER CARWORTH ANIMALS

Surreptitious investigation of the multiple Carworth facilities indicates that the company's apparent entry into guinea pigs has in no way diminished their activity in—or apparent enthusiasm for—supplying researchers with quality rats and mice.

Carworth mice include the well-known CF 1, CFW, and BALB/c CF inbred strain. The Carworth rats are the widely-used CFN and CFE strains.

Rumor also has it that Carworth supplies researchers with surgically-modified mice and rats at prices far below that which can be achieved by the purchaser in his own institution. (Can that be?)

The New City Times has learned that if you write to Carworth, New City, (Rockland County), New York 10956 (or call 914/634-8931) and ask for further information on their rats and mice, you'll get it.

Varian, the optics company, makes NMR, GC, LC, and more!

First, a distinguished family of UV-Vis spectrophotometers

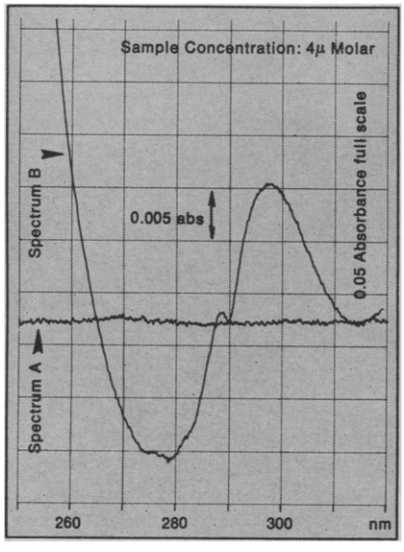
Protein difference spectroscopy needs the Cary 118's accuracy

With difference spectroscopy the life scientist has a valuable probe for investigating the structure of protein macromolecules. It is a very sensitive method for detecting small, discrete changes in a sample which could not be observed with standard absorption procedures, where strong overlapping bands obscure many weaker peaks.

To measure these small absorbance changes, the scientist must have a good spectrophotometer.

Because of its unmatched photometric accuracy, the Cary 118 Spectrophotometer is the ideal instrument for difference measurements (at 0.1 abs the accuracy is 0.00035 abs). Such performance is necessary, since even very small errors can sometimes lead to incorrect interpretation of the spectrum.

In practical terms the 118's exceptional performance frees the scientist from concern about the quality of the data. He knows that any peaks recorded on the spectrum result from sample absorption, and not from an instrument artifact.



These spectra of oxidized cytochrome C, recorded on the Cary 118, illustrate one effect of pH on this protein. Spectrum A was recorded with identical sample and reference solutions (both pH 7). For Spectrum B the sample was increased to pH 11, while the reference was unchanged. Perturbation of the tyrosine residues becomes readily apparent.

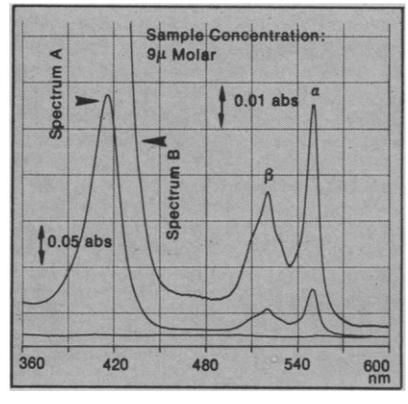
To obtain further information about the Cary 118's capabilities for difference spectroscopy, kinetics, determining concentration in small-volume samples, quantitative analyses, or even recording derivative spectra, circle Reader Service No.17.

With the Cary 17 changing absorbance ranges makes a mountain out of a mole hill

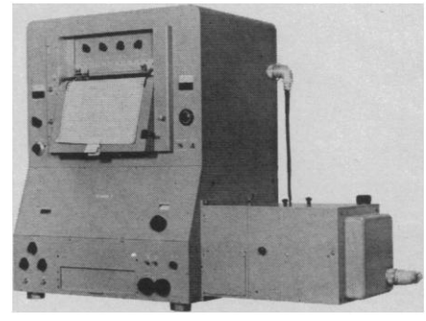
Often when recording a UV-Vis spectrum, a particular wavelength region of interest may produce only a small hump on the spectrum, because the sample's absorption is not very great in that area. In such a situation, changing the absorbance range expands the chart scale and makes it possible to see more spectral detail.

With the Cary 17 Spectrophotometer, switching absorbance ranges is convenient and rapid. The instrument is equipped with a universal absorbance/%T slidewire so that any of eight absorbance ranges or a 0-100 %T range may be selected. This feature, along with the coupled wavelength, scan and chart drive, makes it easy to back up the chart and rescan a particular area using expanded scale to increase the sensitivity of the recording. A small, smooth hump becomes a detailed peak.

A second advantage of the range change capability is that absorbance bands with widely divergent molar absorptivities can be recorded on the same chart, a more convenient presentation for most purposes. Too, it requires less sample preparation because no sample dilution is necessary to bring absorbance values on scale.



To demonstrate the advantages of changing absorbance ranges, these spectra of cytochrome C reduced with ascorbic acid were recorded on the Cary 17. Spectrum A (0-0.5 abs range) fully resolves the Soret band at 415 nm, but shows little detail on the peaks at the longer wavelengths. The expanded presentation in Spectrum B (0-0.1 abs range) gives better detail of the α and β bands at 550 and 520 nm.



Circle Reader Service No.18 for more information on the Cary 17.

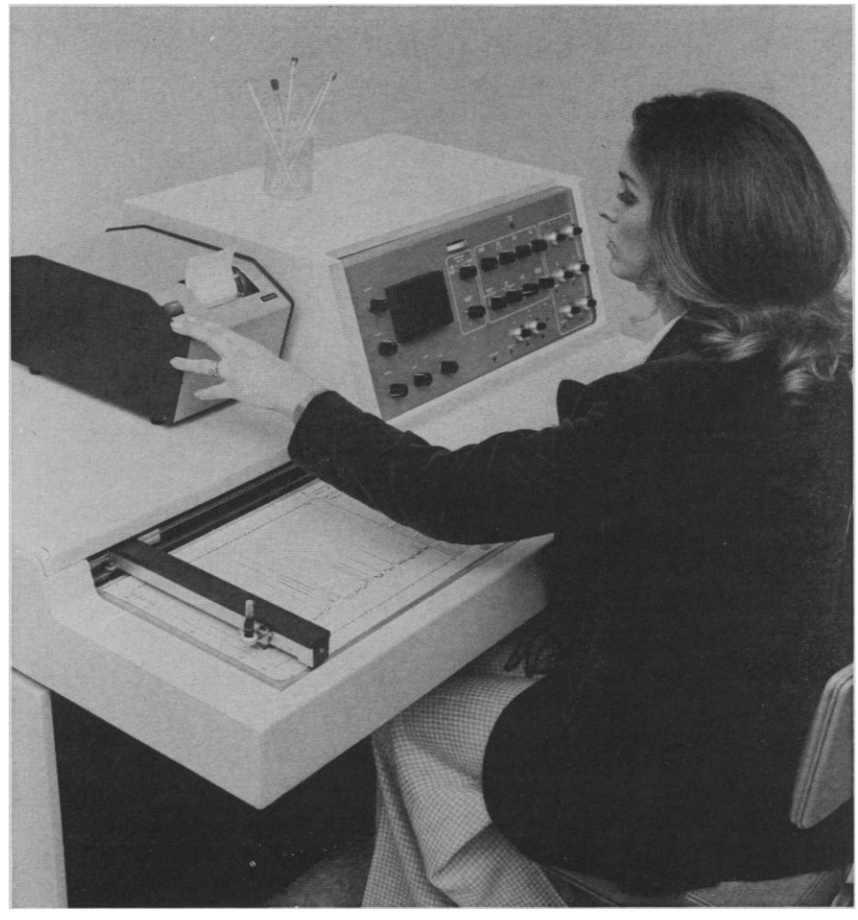
Techtron 635 Spectrophotometer

For life science projects such as gel scanning, kinetics, or thermal denaturation of DNA, the Techtron 635 UV-Vis Spectrophotometer offers exceptional performance at a very low cost. Its ease of operation, large sample compartment, and numerous accessories make it adaptable to almost any routine or research application.

For more information, circle Reader Service No. 19.

varian instruments

When you need an NMR system, see Varian first



Presenting the routine ^{13}C machine

The CFT-20 NMR Spectrometer has two really revolutionary aspects. First, it makes ^{13}C operation routine. Next, it's inexpensive. And if you're currently running ^{13}C spectra, or want to, you know precisely how revolutionary that makes it. Because ^{13}C NMR has never been particularly easy, or low in cost, before. But it is, now.

Let's start with easy operation.

Controls are conveniently grouped. But you don't have to twiddle a lot of dials or monitor a lot of meters — every function that could possibly be automated, has been. The magnet has a low profile design to provide maximum accessibility to the air gap for rapid sample changing. All of which results in faster, more efficient throughput.

Now, don't get the idea that just because the CFT-20 is easy to operate and not very expensive, that it's a stripped-down system. Quite to the contrary. It features the most up-to-date innovations in NMR technology.

For instance.

The CFT-20 comes with a built-in 8K 620L-100 central processing unit. While you can't see it, you'll know it's there because it's loaded with the most straightforward, easy-to-use software you've ever encountered.

You interface with the instrument through use of a built-in teletype equivalent keyboard and an alpha-numeric oscilloscope display. Simply type out a command, and away you go. Oh, and the oscilloscope will also show you the free induction decay, Fourier transformed spectra, and your pulsed lock signal, as well.

The magnet is double-thermally-insulated for long-term stability. And the air gap is wide enough to handle a 10 mm sample at room temperature, or an 8 mm sample at variable temperature.

There's a built-in magnetic tape cassette for rapid program loading.

And those are only a few examples of the CFT-20's many innovative standard features.

Finally, the price. It's incredibly low. Far less than you'd expect to have to pay for a spectrometer that makes ^{13}C NMR analysis an everyday operation.

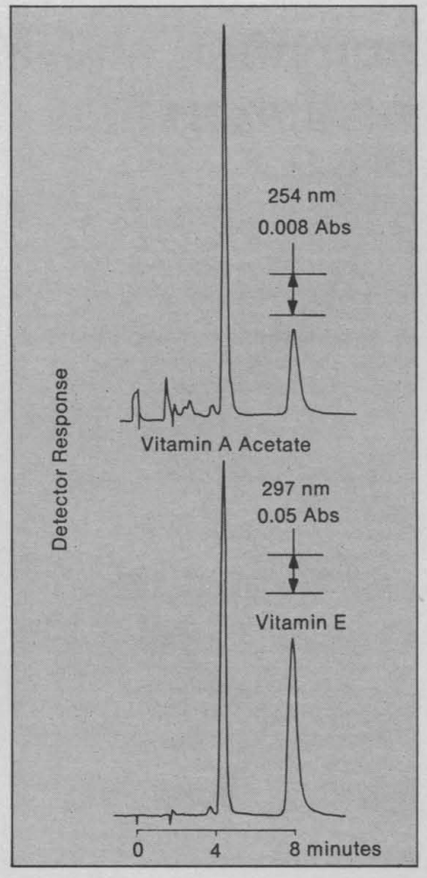
For more information, including a brochure and price list, see your local Varian representative, or circle Reader Service No. **20**.

The latest in liquid and gas chromatography

New LC/UV chromatograph features selectable detector wavelength

Now you can make LC measurements at the maximum absorption wavelength of virtually any compound, because the detector on this new system operates between 210-780 nm with no sacrifice in efficiency. Versatile, it is almost a universal detector that can be used with gradient elution. Minimum detectable quantities are nanogram amounts as shown in the adjacent chromatogram. Cell volume is small, only 8 microliters, so that peak spreading is minimized.

Two well proven instruments are combined in this LC-UV system. The liquid chromatograph may be one of Varian's high performance models such as the 4200, 4100, or 4000. The spectrophotometer portion of the system is a Varian Techtron 635 fitted with special thermostatted flow cells for HPLC. These cells are actually a matched pair, one containing the sample solution, the other the reference solution.



Analysis of Vitamin A Acetate and Vitamin E: Sample, vitamin A 1.5×10^{-6} gm; vitamin E 17.3×10^{-6} gm; MicroPak® column 0.24 x 50 cm; eluent, hexanes (98.8), CH_2Cl_2 (1.1), isopropanol (0.1); upper record detector, Varian 254 nm, 0.08 Abs; lower record detector, Techtron 635 at 297 nm, 0.5 Abs.

The Techtron 635 has a carefully matched optical path with a common plane focal point in both sample and reference beams. In addition to helping minimize noise and drift, this also allows wavelength scanning. Precise thermostatting with the water-jacketed cell is also important in decreasing noise and drift. Overall system noise is less than $\pm 5 \times 10^{-4}$ absorbance unit from 210 to 780 nm. Drift is lower than 10^{-2} absorbance unit/hour, highly respectable performance for any LC detector!

Wavelength scanning. An additional capability of the LC-UV system is the wavelength scanning provided by the Techtron 635. A chromatographic analysis can be stopped at a peak by placing the pump in idle without shutting off the system. The Techtron 635 can then be used as a scanning spectrophotometer to obtain an absorption spectrum which is adequate for positive qualitative analysis. When the scan is completed, the separation can be instantaneously started up as if there had been no interruption.

Systems synergism. This new LC-UV system is analogous to GC-MS (gas chromatography-mass spectrometry) where the sample separating ability of chromatography is supplemented by the higher sensitivity, flexibility and qualitative ability of the spectrometer.

Details, including chromatograms and instrument specifications, are yours for the asking. Just circle Reader Service No. **21**.

Make your GC automatic with Varian's NOW generation, multi-mount sampler

. . . 60-sample capacity

. . . vertical or horizontal mounting

. . . mount two samplers on many GCs

Actually, we call this a second generation automatic sampler because the first generation died before it reached our drawing boards. Euthanasia. We knew scientists didn't need another "me-to" product, so we leap-frogged into the future.

Now, with this new automatic sampler, you can run your gas chromatograph overnight, unattended, and have chromatograms from 60 samples (contained in four 15-vial quadrant holders which fit into a carrousel unit) by morning. Or, if you'd like to run it continuously for longer periods, each 15-vial holder can be easily removed after its samples are analyzed and replaced with new samples—all while the unit is operating!

Reproducibility is excellent. For example, on the raw peak areas of a paraffin sample, percent standard deviations of 0.42% have been obtained. On normalized areas, percent standard deviations of better than 0.18% have been achieved. Precision which not even a skilled operator can attain.

Here are other reasons why the Aerograph sampler becomes the new standard:

Versatile mounting. Use the same unit for horizontal or vertical injection, right- or left-hand carrousel. Many GCs can accommodate two of these compact samplers (see photo).

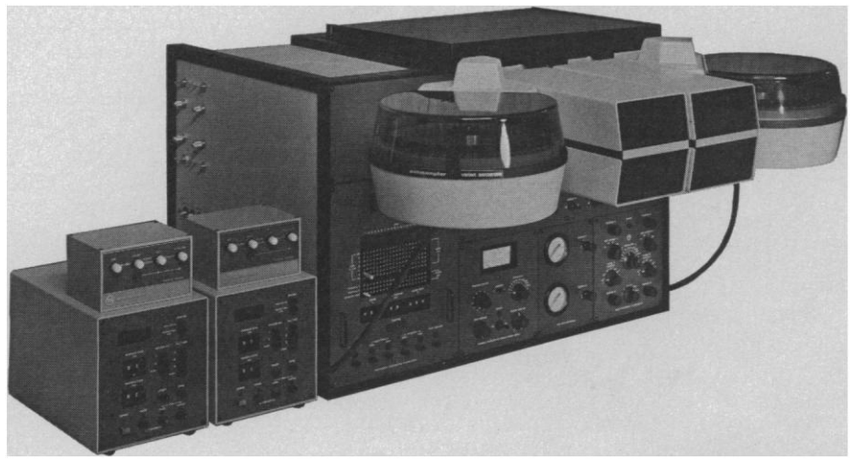
Choice of sample sizes. You can inject either of two adjustable sample sizes.

Repetitive injections. Make 1, 2, or 3 injections from each sample vial.

The latest in electronics. Using second generation electronics for autosampling gives total automation capability, including external commands from computers or other sources.

And this new Autosampler fits the standard injector inlet of virtually all Aerograph gas chromatographs and many others also.

For details on this versatile new automatic sampler, circle Reader Service No. **22.**



New, easiest-to-use digital integrator... Aerograph Model 485

With only four controls to adjust, the new Model 485 Integrator is the easiest one yet to use. It produces accurate and reliable peak area and retention time measurements with minimum set-up time and is designed for liquid as well as gas chromatography and for unattended automated analyses.

A built-in printer and extensive use of integrated circuits and state-of-the-art design combine reliability with convenience. Key features include: continuously variable filtering, 0.1 μV/sec slope sensitivity, 20mV (±10mV) baseline correction range, 4 digits of retention time, 8 digits of peak area, and 10 digits of total area for large peaks. Automatic separation of small peaks high on a solvent peak tail, area reject and integrate delays, and peak start and stop marks round out the 485's capability.

Analyze the easy way with the new Model 485. For details, circle Reader Service No. **23.**

Additional Varian instruments include atomic absorption spectrophotometers, EPR spectrometers, laboratory research electromagnets, laser Raman spectrophotometers, spectropolarimeters, and accessories for major instruments. Write for more information.

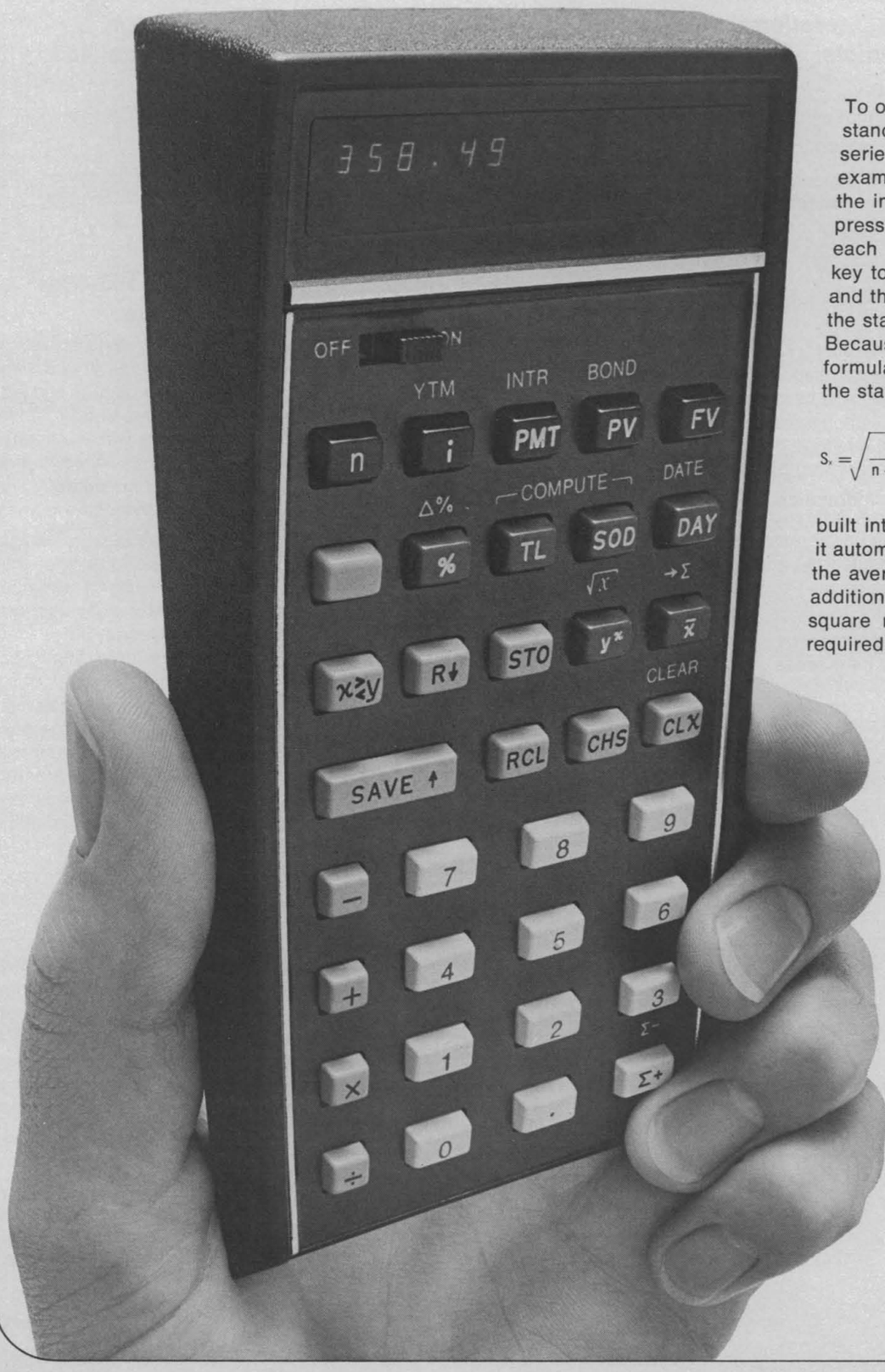
Varian Associates, Instrument Division
611 Hansen Way
Palo Alto, Ca 94303

varian instruments

Brand names: ANASPECT™ • CARY® • MAT • VARIAN®
VARIAN AEROGRAPH® • VARIAN TECHTRON

HP MEASUREMENT/COMPUTATION: changing things for the better

100 reasons to invest $395* in the time and money machine:



To obtain the mean and standard deviation of a series of numbers, for example, you simply key in the individual numbers, press the $\boxed{\Sigma+}$ key after each entry, then the $\boxed{\bar{x}}$ key to display the mean, and the $\boxed{x \gtrless y}$ key to display the standard deviation. Because the HP-80 has the formula for calculating the standard deviation

$$S_x = \sqrt{\frac{1}{n-1}\left(\sum_{i=1}^{n} x_i^2 - n\bar{x}^2\right)}$$

built into its logic circuitry, it automatically performs all the averaging, subtraction, addition, squaring and square root extraction required by the formula.

The HP-80 Business Calculator.

The 9-ounce HP-80 has 40 specific capabilities built into its internal circuitry, which combine to perform more than 100 different financial calculations involving a relationship between time and money. All necessary programs, including a 200-year calendar, are built into the HP-80's solid-state memory.

It used to require up to 20 minutes to solve such time and money problems as bond calculations, figuring compound interest, loan repayments, depreciation amortization, investment analysis, sinking fund and statistics. To make matters worse, they required constant reference to cumbersome tables. You'll notice this is all in the past tense.

With the advent of the new HP-80, the financial counterpart of the pocket-sized HP-35, these problems can be solved literally in seconds, and without reference to any tables.

You just enter the data, push a few keys, and read the answer – accurate to within the last penny on a million-dollar transaction.

Since it can perform most financial calculations in about 10 seconds, a user can save up to 20 minutes on a single problem. The price is $395 (*U.S. only, plus tax).

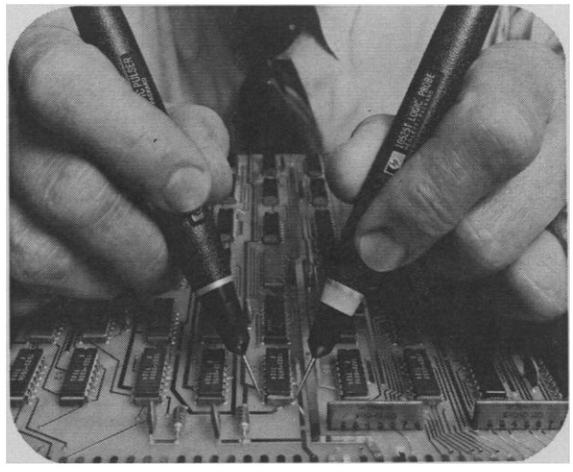
If you're in business, you can't afford to be without it. Ask for full information.

How to live happily in an increasingly digital world.

Most electronic products have changed drastically in the last few years. Everywhere you look, digital logic is displacing the familiar analog circuitry. And you'll be deceived if you believe that trouble-shooting these new products is the same as it was before the advent of the ubiquitous integrated circuit (IC). There are at least two important differences.

In the first place, you can easily check if any of the discrete components in an analog circuit are functioning properly by testing its input and output leads, usually two or, at worst, three. In a digital circuit, on the other hand, each IC has 14 or 16 leads and you may need to know what's going on at all the leads simultaneously.

Furthermore digital circuits are intentionally designed with low output impedances to make them insensitive to noise . . . perhaps their greatest single virtue. Unfortunately for circuit troubleshooters, this means that each IC input is clamped in either



a high or a low logic state; hence the only way to perform a stimulus/response test on an IC has been to unsolder its input lead before injecting a test pulse and observing the output.

We're happy to report that things have changed for the better in the world of digital logic testing, with HP's IC Troubleshooters.

First there's the Logic Clip which instantaneously indicates the logic state of all 14 or 16 nodes on an IC without cables or power connections. Or the Logic Comparator which compares an in-circuit test IC with a duplicate IC known to be good and identifies any dissimilarities.

For testing individual IC nodes, there is a series of Logic Probes covering the various IC families which immediately indicate logic states and pulse activity. New partner to the Logic Probes is the Logic Pulser which automatically injects a single pulse that drives a logic-low node high and a logic-high node low for 300 nsec. These are an effective stimulus/response test team – without unsoldering leads and despite low IC output impedances.

We've told the full story in an easy-to-read booklet that's yours for the asking.

For more information on the products described in these pages, fill out the coupon or write to: Hewlett-Packard, 1507 Page Mill Road, Palo Alto, Calif. 94304.

00312

Please send me information on the following:
( ) HP-80 Business Calculator
( ) IC Troubleshooters

Name_____

Title_____

Company_____

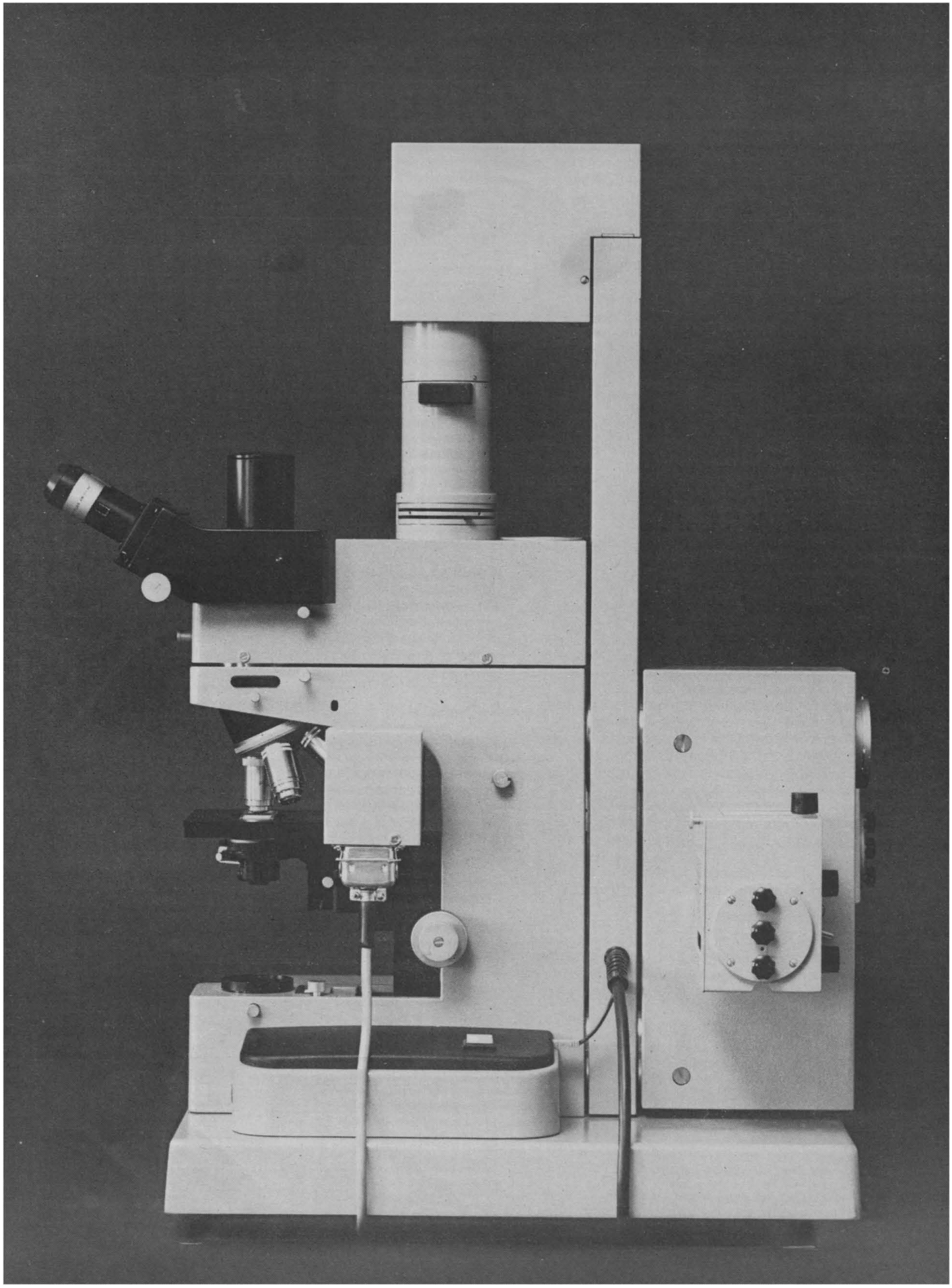
Address_____

City_____ State_____ Zip_____

Circle No. 16 on Readers' Service Card

HEWLETT hp PACKARD

Sales, service and support in 172 centers in 65 countries.
Palo Alto, California 94304. Offices in principal cities throughout the U.S.



How to turn a square microscope into a photometer system.

You do it with the Leitz MPV-2, a building block system that becomes an integral part of the Leitz Orthoplan microscope. The MPV-2 is automated so that measurements can be made quickly and conveniently. And it is stable and sensitive with good long-time constancy.

A host of accessories is available for virtually unlimited applications. Here are some of the major functions this instrument performs:

Absorption measurements. In the visible portion of the spectrum, specific wavelengths can be selected with filters or a new grating monochromator with two-speed wavelengths scan.

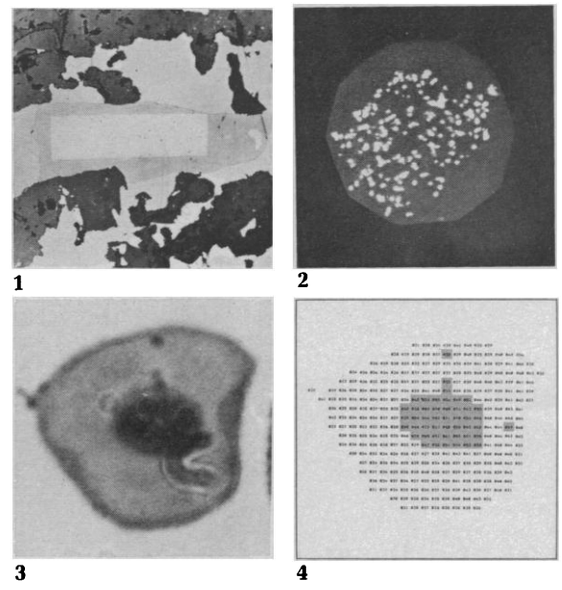
Autoradiography. You can quickly determine the number of silver grains in an autoradiograph by automatic silver grain count.

Microfluorometry. Excitation and emission spectra of a fluorescing specimen can be analyzed using the unique vertical fluorescence illuminator.

Reflection measurement. Reflectivity can be measured against wavelength, using the grating monochromator or, at fixed wavelength, using interference filters.

Intensity profiles. With the attachment of a synchronous motor and pen recorder, density profiles can be measured, as for example, the banding patterns in chromosomes.

Photometric scanning features. Two highly accurate scanning stages are available (coarse and fine). Photometer and stage are interfaced for computer-assisted pattern analysis.



1 2 3 4

The area being measured is displayed superimposed on the object being observed.

1. An ore section with adjustable rectangular diaphragm. **2.** Auto-radiograph with measuring diaphragm superimposed. **3.** Shows a scanned cell. **4.** Is the print-out of this same cell for computer-assisted pattern analysis.

In short, applications are limited largely by the user's imagination.

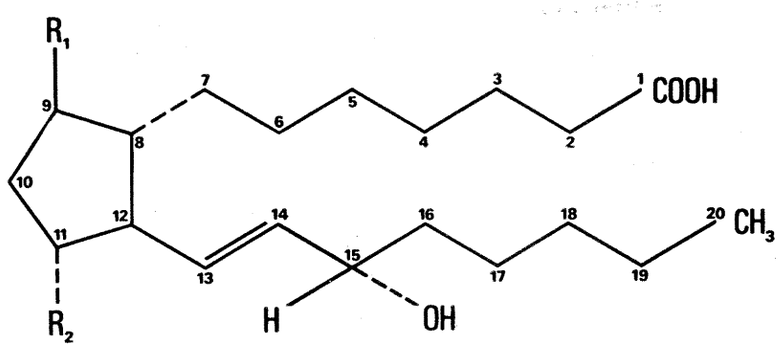
Leitz also offers the MPV-1, a photometer that operates on the same measuring principles as the MPV-2, but without the automatic features.

If you are considering a photometer, consider the Leitz MPV systems. For a detailed brochure, write to E. Leitz, Inc. Rockleigh, N.J. 07647.

Leitz®

Where most new developments start.

Amersham/Searle announces the immediate availability of four tritium labelled prostaglandins at High Specific Activity.



Prostaglandin-E_1,[5,6-^{3}H(n)]-	40-60 curies/mmol TRK.426
Prostaglandin-E_2-5,6,8,11,12,14,15-^{3}H(n)	>100 curies/mmol TRK.431
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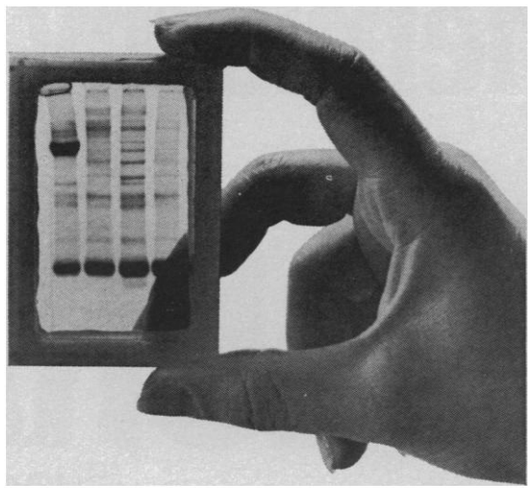

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- A fluorescent dye that stains at neutral pH. 8-Anilino-1-Naphthalenesulfonic Acid Magnesium Salt (EASTMAN 10990).

  This dye rapidly binds with proteins at neutral pH producing a yellow fluorescence. Since acid conditions are not required for staining and destaining, protein denaturation is minimal. This visualization technique is useful for preparative electrophoresis, where further study or analysis of the purified proteins is desirable. [*Anal. Biochem., 30,* 391 (1969) and *Neurospora Newsletter,* No. 15, 16 (December 1969).]

- A dye for differential staining of DNA and RNA. 1-Ethyl-2-[3-(1-ethylnaphtho[1,2d]-thiazolin-2-ylidene)-2-methylpropenyl]-naphtho[1,2d]-thiazolium Bromide (EASTMAN 2718).

  This dye is reported to stain RNA bluish-purple, DNA blue, protein red, and is also useful for staining acid polysaccharides. Because of the versatility of this dye by virtue of its differential staining ability, the reagent has been called "Stains-All." [*J. Mol. Biol., 41,* 139 (1969).] The dye has also been used for estimating lipopolysaccharides. [*FEBS Letters, 16,* 343 (1971).]

- A dye to stain gels for quantitative densitometric analysis. Fast Green FCF (Cert.) (EASTMAN C8686).

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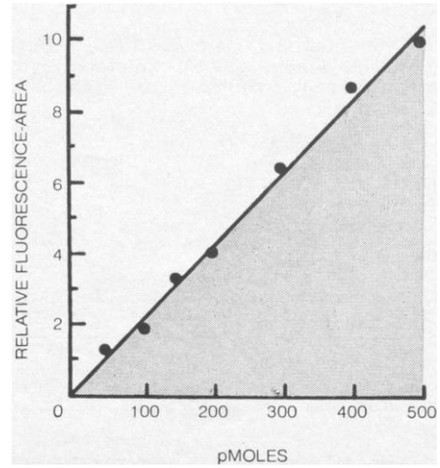

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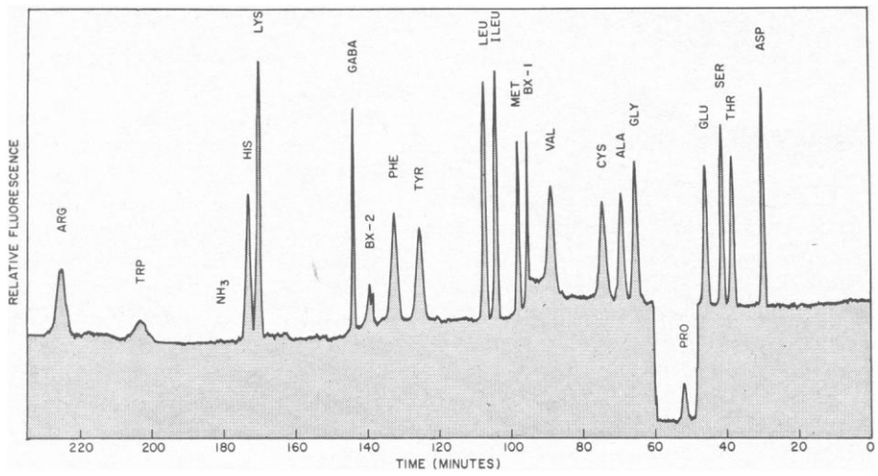

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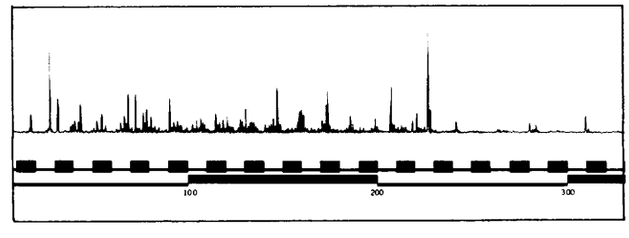

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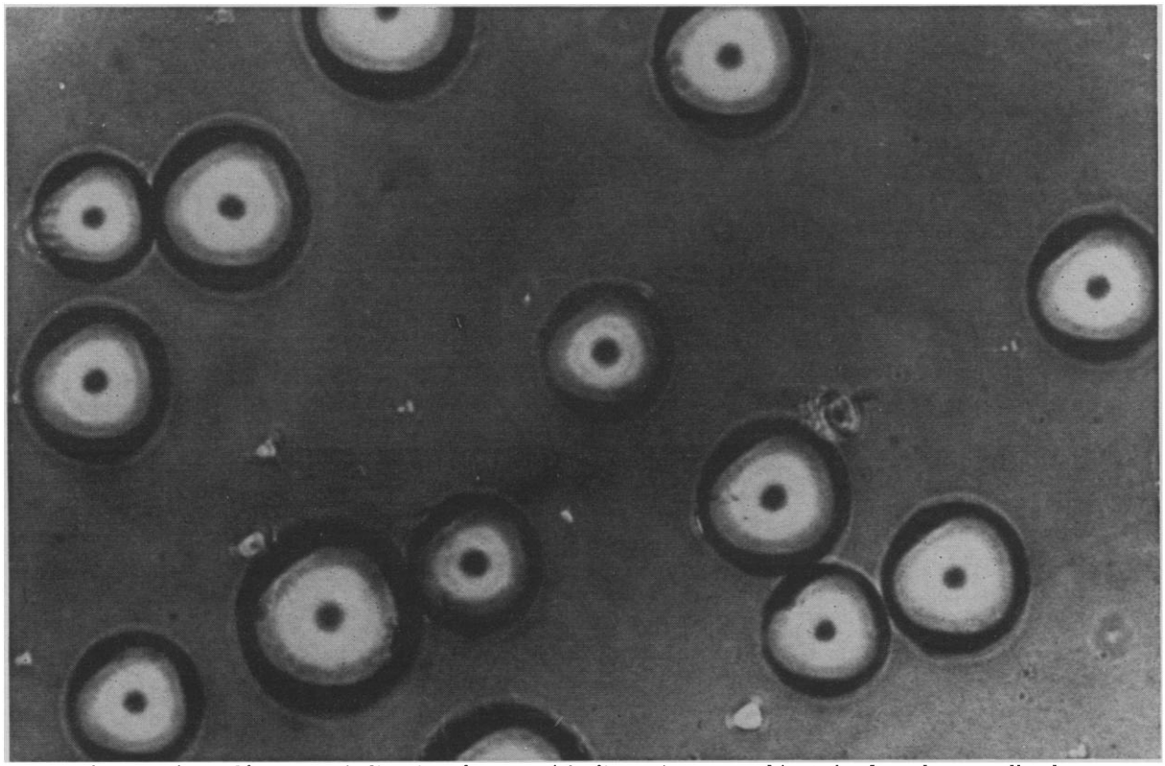

White fat cells, obtained by enzymatic digestion of parametrial adipose tissue as used in study of membrane mediated responses.

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

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

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

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

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

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

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discussion, Newton apparently postulated some physical effects in air which might account for the inadequacy of his calculations of the velocity of sound. Such hypotheses were not in themselves unjustified. Scientific progress often takes its beginning from inspired guesses. The burden of disproof rests upon the experimenter. Wrong is only done if the calculator pretends to assign quantitative exactitude to each of several hypothetical effects which together are invoked to account for a total discrepancy. Newton's analysis merely suggests that the individual effects may have magnitudes of the order he assigned, and it should not be read in any other light. Considering the primitive state of the knowledge of thermodynamics in the late 17th century, his speculations about the velocity of waves in damp air were probably the best that could be done.

There is nothing unsound in making hypotheses to bring theory and experiment into agreement; but the hypotheses should be tested out by further investigation, and not presented as the last word.

GERALD MCHUGH
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Akron, Ohio 44314

Readers who found Westfall's article "Newton and the fudge factor," of great interest, as I did, might like to look at what one man, at least, took to be some fudging in Newton's development of calculus—or "fluxions," as he called it. I am referring, of course, to George Berkeley's *The Analyst* (1734) and the additional writing to which it led. This can be found in any collection of Berkeley's works. Not only is it of historical interest, but there are points raised which even now a teacher of introductory calculus, in particular, might do well to ponder.

Incidentally, is there not a moral to be found in all of this? Is it not likely that a time will come when some of the work of which we are now most proud will be seen to contain outrageous fudges? Nor is it too hard to see some places in which this might come about. Our "renormalizations," for instance, may some time be called by a much less charitable name. It seems now to be agreed that some of the early papers on relativity contained actual mistakes, which had the same effect as fudges.

In one sense, we need not make too much of all this. It would appear that

"to fudge is human." But because of that very fact, we should be ready to admit the possibility that we may, perhaps almost unconsciously, have committed a fudge, or overlooked one by someone else. Recently, when Dingle (*1*) and others suggested that there is something wrong—call it a mistake or call it a fudge—with the theory of relativity, what they encountered could scarcely be described by any term other than "persecution." Earlier, O'Rahilly, who had rather similar experiences, said that the heretic is treated worse in physics than in theology. We should remember that a theory which is to a great extent true may still be fudged here and there; those who point this out are in the same position as physicians who tell us that, while we are mainly healthy, we have such and such an illness, which fortunately can be cured.

H. L. ARMSTRONG
Department of Physics,
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Kingston, Ontario, Canada

Reference

1. H. Dingle, *Science at the Crossroads* (Martin Brian and O'Keeffe, London, 1972).

While reading Westfall's article I was reminded of an anecdote told by the late J. C. McLennan during a lecture at the University of Toronto about 40 years ago.

McLennan said, as I remember, "One time I remarked enthusiastically to Nils Bohr, how wonderful it was that his equations yielded such an accurate value of Rydberg's constant. Nils said to me 'Of course, McLennan, I made it come out that way.' "

McLennan then said to us, "Perhaps that is the difference between Nils Bohr and me."

ARTHUR H. BOULTBEE
70 Bush Avenue,
Greenwich, Connecticut 06830

In reply to McHugh, I am unable to find in Newton's language any grounds for the assertion that he offered the two corrections to the velocity of sound as hypotheses to account for the discrepancy. He did not present them in such a manner. Moreover, he assigned "quantitative exactitude" to them, and did so without any evidence external to the calculation that such "side effects" even exist.

RICHARD S. WESTFALL
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Cambridge, CB3 9AL, England

Effects of Marijuana Use

John Kaplan's review (12 Jan., p. 167) of the recent American and Canadian government-sponsored reports (*1*, *2*) on cannabis does justice to neither.

Like the British Wootton Report of 1968 (*3*), these North American studies did, indeed, recommend a more humanitarian approach to the legal issues. What Kaplan fails to mention is that the reports contain much cautionary clinical material which led both the American commission (*1*, p. 134) and the Canadian commission (*2*, p. 301) to conclude, as had the British committee (*3*, Section 71), that the use of marijuana was to be discouraged for various individual and public reasons.

These reasons are perhaps best stated by the Canadian commission (*2*, p. 274):

> To sum up, then, it seems to us that there are at least four major grounds for social concern: the probably harmful effect of cannabis on the maturing process in adolescents; the implications for safe driving arising from impairment of cognitive functions and psychomotor abilities, from the additive interaction of cannabis and alcohol, and from the difficulties of recognising or detecting cannabis intoxication; the possibility suggested by reports in other countries and clinical observations on this continent, that the long-term heavy use of cannabis may result in a significant amount of mental deterioration and disorder; and the role played by cannabis in the development and spread of multidrug use by stimulating a desire for drug experiences and lowering inhibitions about drug experimentation.

A number of people have discontinued the use of cannabis because of these and other problems, and even continuing users are becoming more willing to admit that—as Gabriel Nahas demonstrates in his excellent coverage of the subject (*4*)—marijuana is a "deceptive weed."

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Department of Psychiatry,
University of British Columbia,
Vancouver 8, Canada

References

1. National Commission on Marihuana and Drug Abuse, *Marihuana: A Signal of Misunderstanding* (Government Printing Office, Washington, D.C., 1972).
2. Commission of Inquiry into the Non-Medical Use of Drugs, *Cannabis* (Information Canada, Ottawa, 1972).
3. Advisory Committee on Drug Abuse, *Cannabis* (Her Majesty's Stationery Office, London, 1968).
4. G. G. Nahas, *Marihuana: The Deceptive Weed* (Raven, New York, 1972).

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reflects a very narrow view of "science" and is wrong on two counts. First, it has been shown in a recent paper (*1*) that there are subgroups in the human population that are highly susceptible to low levels of radiation—levels which have no demonstrable effect on the vast majority of persons. It is doubtful whether it is "scientific" to study radiation effects in human populations that are not inbred by doing experiments on inbred mice. Second, it is possible to do studies of human beings which are every bit as scientific as in vivo or in vitro laboratory studies (*2*) and which are directly relevant to the protection of the public against environmental hazards.

The real issue is whether scientists are willing to face up to their responsibilities as scientists, or whether they will play language games to escape these responsibilities. Are we going to debate whether an issue is "trans-scientific" or not, or are we going to go out and get hard data which will settle the issue? The need is not for "trans-scientific debate," but for effective measures to protect the public against low level radiation.

An immediate need is an adequate surveillance system (*1*). This system would be expensive, and entail inconvenience. For instance, a card might have to be filled out to report every diagnostic x-ray, every SST flight, every visit to installations of the Atomic Energy Commission (AEC), and so forth. Annual surveys of all persons living near nuclear power plants might be needed. Leukemia and other diseases might have to be made "reportable" throughout the United States and monitored as infectious diseases currently are throughout the United States.

This "committment in perpetuity" to protecting the public is part of the cost of nuclear and other technology. The sooner we recognize this and get down to the scientific task of setting up protective systems, the better.

IRWIN D. J. BROSS
Roswell Park Memorial Institute, Buffalo, New York 14203

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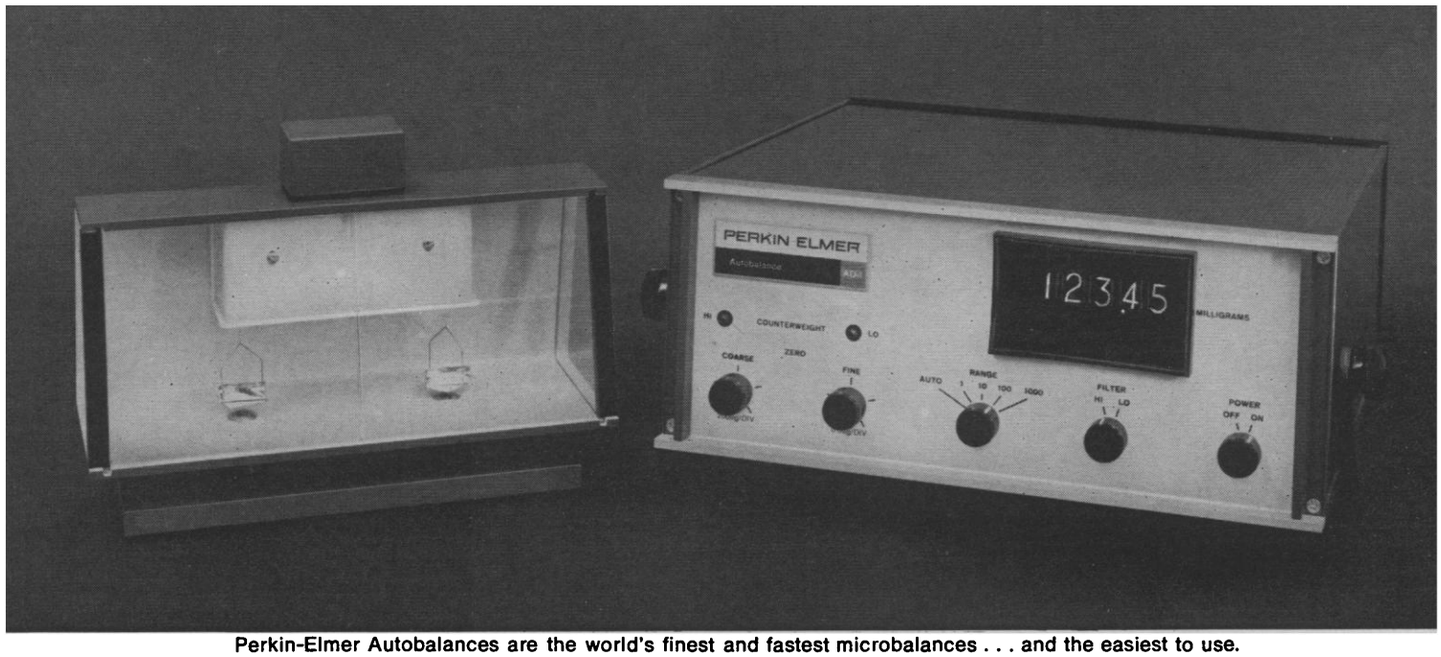
1. I. D. J. Bross and N. Natarajan, *N. Engl. J. Med.* **287**, 107 (1972).
2. I. D. J. Bross, *Trans. N.Y. Acad. Sci.* **34**, 187 (1972).

I am prepared to concede that an issue which appears to be trans-scientific at one stage of scientific development may, at a later stage, be susceptible to resolution by a more sophisticated science. I doubt whether most experts in either radiobiology or epidemiology would agree at this time that the effects of radiation doses of about 10 millirads per year (the present AEC standard for reactor emissions), or even the 170 millirads per year previously accepted, can be shown to have an unequivocal effect on humans. On the other hand, if the sample is large enough and if the studies can be successfully carried out over a long enough time, then I agree there is no reason *in principle* why the issue cannot be resolved. The disagreement then is mainly one of deciding whether the enormous effort required for such studies is an appropriate allocation of resources. The evidence Bross presents in his paper in the *New England Journal of Medicine (1)* on incidence of leukemia in children exposed to intrauterine diagnostic radiation of around 1000 millirads hardly seems relevant to the issue of chronic exposure at a rate of 10 millirads per year.

ALVIN M. WEINBERG
Oak Ridge National Laboratory, Oak Ridge, Tennessee 37830

Reference

1. I. D. J. Bross and N. Natarajan, *N. Engl. J. Med.* **287**, 107 (1972).



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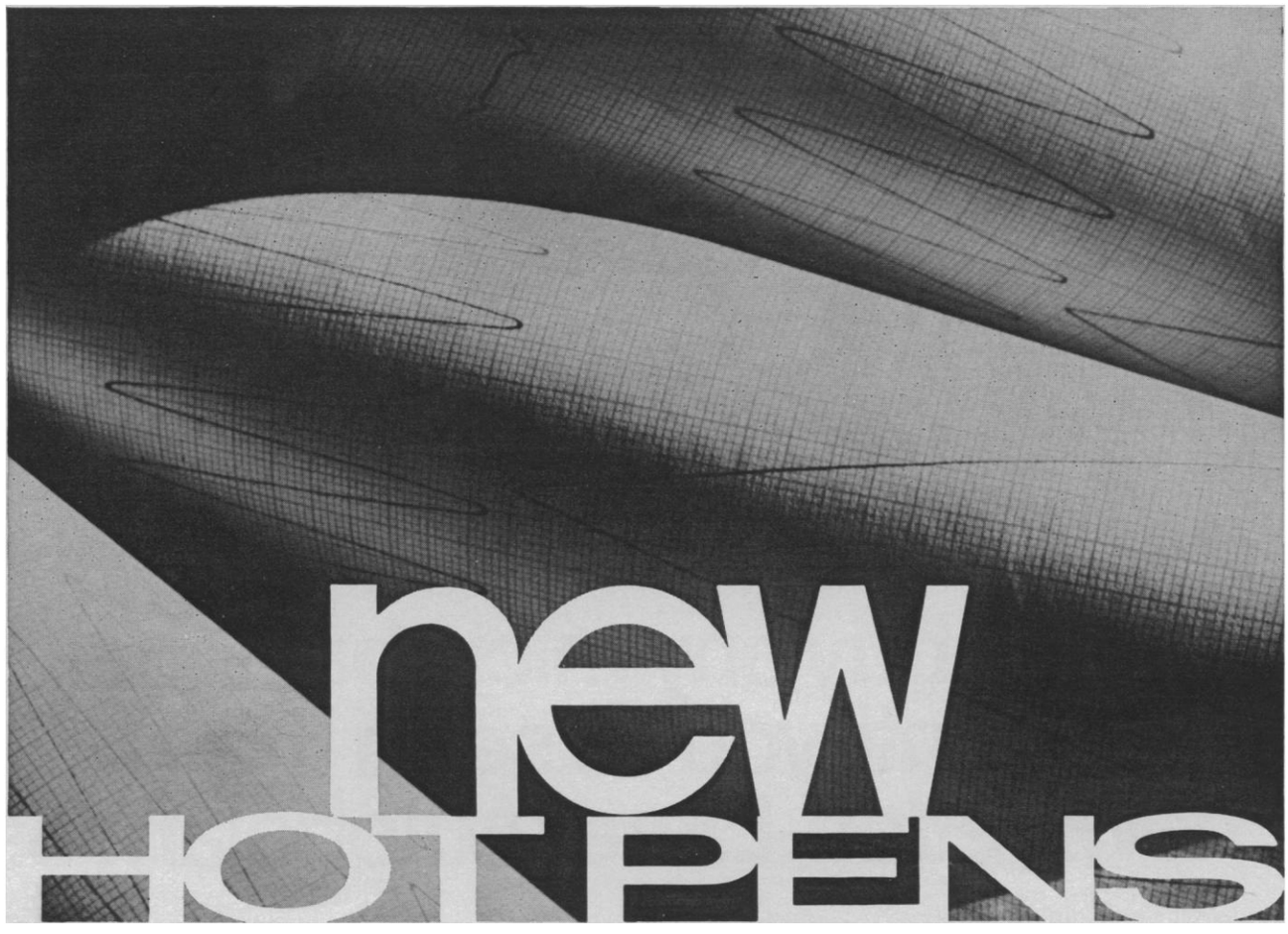

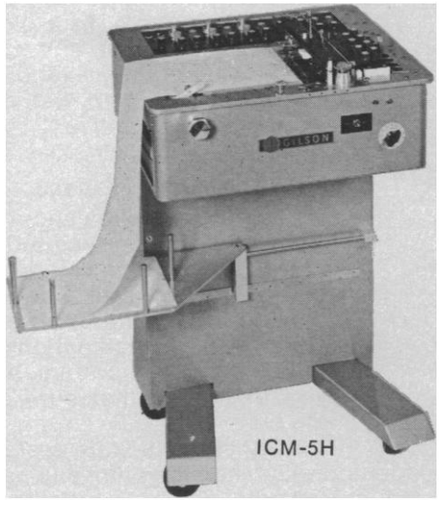

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15 June 1973, Volume 180, Number 4091 **SCIENCE**

Importation of Petroleum

The United States, with 6 percent of the world's population, uses a third of the energy output. At one time, no special opprobrium was attached to this practice—we were squandering our own resources. The situation has changed. We are now importing a third of the petroleum that we consume. Our huge imports will eventually deprive others of a key commodity and are now forcing upward the price of oil for all, while undermining the value of the dollar.

This year, imports of oil and oil products will exceed those of 1972 by about 35 percent. They will cost about $9 billion. A minor part of this sum will flow back into the United States in the form of profits of the international oil companies, but the imbalance of payments adds a heavy burden to an unstable dollar, with the situation exacerbated as imports continue to climb.

Elsewhere peoples are striving to enjoy some of the things that are commonplace to us. Governments everywhere are under pressure to provide more things and comforts for their peoples; this, in turn, translates into a demand for energy—largely in the form of hydrocarbons. In Western Europe, one encounters tremendous numbers of automobiles, seemingly darting in all directions. In Japan, with a population about half of ours, there are now 20 million cars. In many of the cities of Latin America, the automobile seems almost as ubiquitous as it is here.

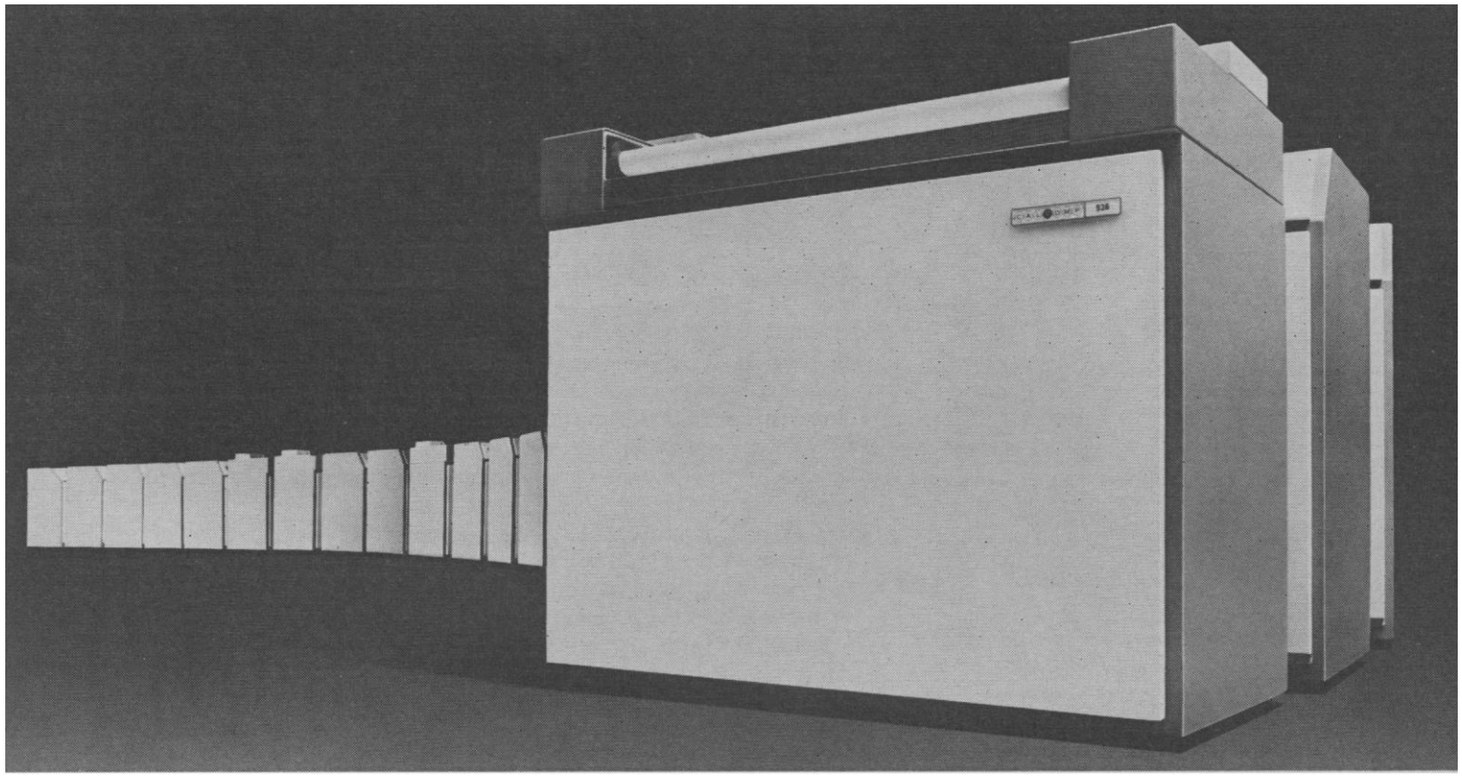
Motor vehicles are, of course, only one mode of using energy. In many countries the consumption of hydrocarbons is essential to industrial activity and to meeting many basic human needs, such as that for space heating.

With time, some of the essential needs will probably be met by nuclear energy. Perhaps technology will supply needs in the year 2000, but what do we do to meet the problems of the next 5 or 10 years? If the United States is willing to endure a continuing series of dollar devaluations, with attendant inflation, it can probably continue for a while to import increasing amounts of petroleum. But our image abroad will surely suffer as we scramble to take more than our share of vanishing resources. We will earn the ill wishes of the rest of the world in the process, for there are many actions we could take to reduce our demand and increase domestic supplies.

We have only half-heartedly begun to think in terms of conservation. Some of the measures, such as better insulation for houses and the use of lighter motor vehicles, can only be effective after the passage of years. However, other measures could be helpful quickly. For example, wasting gasoline could be reduced through enforcement of highway speed limits. A sharp rise in the gasoline tax, now being discussed in Washington, would also tend to lower consumption. Demand for electricity this summer could be lessened if excessive air conditioning were avoided.

On the supply side, there are many measures that could be taken. The oil companies will continue to press for Alaskan oil and off-shore drilling, while improving secondary recovery. With current production practice, two-thirds of the oil in place is left in the ground.

Where we are curiously inert is in the utilization of our huge reserves of coal and oil shale. In comparison with the billions we spend on oil imports, the millions the government is devoting to liquefaction of coal is trivial. It can best be described as a phony commitment—a cosmetic effort whose purpose is to give the appearance, but not the reality, of action. A goal worthy of the world's leader in technology would be to construct in 2 years several plants, each costing about $1 billion and each capable of supplying 1 percent of the liquid hydrocarbons we consume.—PHILIP H. ABELSON



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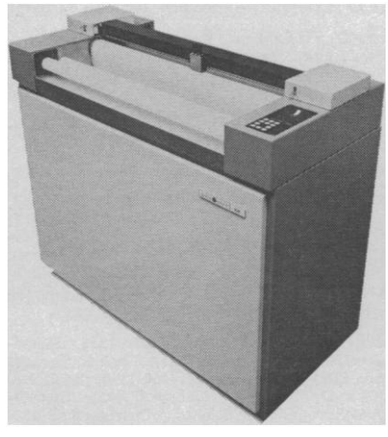

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Collections, Rio de Janeiro, State of Guanabara, Brazil. (J. S. Furtado, Caixa Postal 4005, São Paulo, Brazil)

15–20. International **Diabetes** Federation, 8th congr., Brussels, Belgium. (J. Pirart, Belgian Diabetes Assoc., 234B Ave. Churchill, 1180 Brussels)

15–20. Institute of **Electrical and Electronics Engineers**, summer power mtg., Vancouver, B.C., Canada. (Technical Activities Board, 345 E. 47 St., New York 10017)

15–20. Conference on **Energy Research —Alternatives for Policy and Management to Meet Regional and National Needs**, Engineering Foundation, Henniker N.H. (W. C. Ackerman, Illinois State Water Survey, Urbana 61801)

15–20. American Soc. of **Pharmacognosy**, joint with Pharmacognosy and Natural Products Section, Acad. of Pharmaceutical Sciences, Jekyll Island, Ga. (J. M. Cassady, School of Pharmacy and Pharmacal Sciences, Purdue Univ., West Lafayette, Ind. 47907)

15–20. Conference on **Use of Shotcrete for Underground Structural Support**, Engineering Foundation, South Berwick, Maine. (J. R. Graham, Bureau of Reclamation, Denver, Colo.)

17–19. Summer **Computer Simulation** Conf. Montreal, Canada. (L. Sashkin, SCSC, Aerospace Corp., P.O. Box 92957, Los Angeles, Calif. 90009)

17–19. **Oceans and National Economic Development** Conf., Natl. Oceanic and Atmospheric Administration, Seattle, Wash. (Seattle–King County Economic Development Council, Suite 1900, 1218 Third Ave., Seattle 98101)

18–20. International Symp. on **Acoustical Holography and Imaging**, 5th, jointly by the Sonics and Ultrasonics Group, Inst. of Electrical and Electronics Engineers, Acoustical Soc. of America, and Stanford Research Inst., Palo Alto, Calif. (P. S. Green, Room K1088, Bldg. 30, Stanford Research Inst., Menlo Park, Calif. 94025)

18–20. **Electronic Crime Countermeasures** Conf., Institute of Electrical and Electronics Engineers and Aerospace and Electronic Systems Soc., Edinburgh, Scotland. (J. S. Jackson, Office of Continuing Education, College of Engineering, Univ. of Kentucky, Lexington 40506)

20–23. Pan American Cancer Cytology Soc. and the World Assoc. for Gynecological Cancer Prevention, joint European assembly on **Cytology** and **Cancer Prevention**, Salzburg, Austria. (J. E. Ayre, PACCS, 150 Broad Hollow Rd., Melville, N.Y. 11746)

21. American Soc. of **Hospital Pharmacists**, Boston, Mass. (J. A. Oddis, 4630 Montgomery Ave., Bethesda, Md. 20014)

21–27. American **Pharmaceutical** Assoc., Boston, Mass. (W. S. Apple, APA, 2215 Constitution Ave., NW, Washington, D.C. 20037)

22–27. Research Conf. on **Instrumentation Science**, 32nd, Scientific Instrumentation and Research Div., Instrument Soc. of America, Geneva, N.Y. (M. W. Cochran, ISA, 400 Stanwix St., Pittsburgh, Pa. 15222)

22–27. Symposium on **Man-Machine Communication for Scientific Data Handling**, CODATA Task Group on Com-

puter Use, intern. and interdisciplinary mtg., Bresigau, Germany. (Secretary, CODATA Task Group on Computer Use, c/o M. K. Ward, Intern. Conf. Office, National Research Council of Canada, Ottawa K1A OR6, Canada)

22–27. Conference on **Performance of Full-Scale Structures,** Engineering Foundation, Henniker, N.H. (J. Janney, Wiss, Janney, Elstner & Associates, Northbrook, Ill. 60062)

23–26. Postgraduate Symp. on **Current Concepts in Medical Mycology,** Stanford, Calif. (P. H. Jacobs, Dept. of Dermatology, Stanford Univ. Medical Center, Stanford 94305)

23–26. **Nuclear and Space Radiation Effects,** Inst. of Electrical and Electronics Engineers, Logan, Utah. (J. S. Nichols, AFWL/ELT, Kirtland Air Force Base, N.M. 87117)

23–26. **Rural Sociological** Soc., College Park, Md. (J. E. Bunkelberger, 306A Comer Hall, Auburn Univ., Auburn, Ala. 36830)

23–27. **Hydrology of Lakes,** intern. symp., Intern. Assoc. of Hydrological Science of the Intern. Union of Geodesy and Geophysics, Helsinki, Finland. (A. P. Pinsak, Lake Survey Center, National Oceanic and Atmospheric Administration, 630 Federal Bldg., Detroit, Mich. 48226)

23–28. **Global Impacts of Applied Microbiology,** 4th intern. conf., American Soc. for Microbiology, São Paulo, Brazil. (A. F. Langlykke, ASM, 1913 I St., NW, Washington, D.C. 20006)

24–28. National **Environmental Health** Assoc., 37th annual, Atlanta, Ga. (N. Pohlit, NEHA, 1600 Pennsylvania, Denver, Colo. 80203)

27–29. **Electronic Materials,** 15th conf., American Inst. of Mining, Metallurgical and Petroleum Engineers, Las Vegas, Nev. (A. J. Strauss, Lincoln Lab., Massachusetts Inst. of Technology, Lexington 02173)

27–31. **Nuclear Techniques in Comparative Studies of Food and Environmental Contamination** Conf., Intern. Atomic Energy Agency, Food and Agriculture Organization of the U.N., and World Health Organization, Otaniemi (near Helsinki), Finland. (J. H. Kane, Office of Information Services, U.S. Atomic Energy Commission, Washington, D.C. 20545)

30–2. American Soc. of **Animal Science,** Lincoln, Neb. (G. P. Lofgreen, Imperial Valley Field Station, 1004 East Holton Rd., El Centro, Calif. 92243)

30–2. American Assoc. of **Physicists in Medicine,** San Diego, Calif. (J. Hilbert, Dept. of Radiology, University Hospital, 220 Dickenson St., San Diego 92103)

30–4. **Observation and Measurement of Atmospheric Pollution,** World Meteorological Organization and World Health Organization, Helsinki, Finland. (V. D. Rockney, Code W13, U.S. National Weather Service, 8060 13th St., Silver Spring, Md. 20910)

August

4–11. **Systematic and Evolutionary Biology,** intern. congr., Boulder, Colo. (J. L. Reveal, Dept. of Botany, Univ. of Maryland, College Park 20742)

4–12. American Soc. of **Plant Taxonomists,** Boulder, Colo. (D. M. Porter, Dept. of Botany, Natl. Museum of Natural History, Smithsonian Institution, Washington, D.C. 20560)

4–12. Society of **Systematic Zoology,** Boulder, Colo. (T. L. Erwin, Dept. of Entomology, Natl. Museum of Natural History, Smithsonian Institution, Washington, D.C. 20560)

5–10. **Engineering Foundation** Conf., Henniker, N.H. (L. B. Wingard, Jr., EF, 345 E. 47 St., New York 10017)

6–10. **Poultry Science** Assoc., Brookings, S. D. (C. B. Ryan, Texas A & M Univ., College Station 77843)

7–10. **Phi Beta Kappa,** Nashville, Tenn. (C. Billman, PBK, 1811 Q St., NW, Washington, D.C. 20009)

8–10. **Cryogenic Engineering,** Atlanta, Ga. (J. E. Jensen, Brookhaven Natl. Lab., 1 E. Fourth, Upton, N.Y. 11973)

9–11. **Salinity:** A Critical Review of Causes and Control, 15th western resources conf., Boulder, Colo. (Bureau of Conferences and Institutes, Div. of Continuing Education, Univ. of Colorado, Boulder 80302)

12–15. American Soc. for **Horticultural**

Science, Raleigh, N.C. (C. Blackwell, ASHS, P.O. Box 109, 914 Main St., St. Joseph, Mich. 49085)

12–17. Conference on **Making Service Industries More Productive through Computers and Automation**, Engineering Foundation, Henniker, N.H. (A. McAdams, Chairman, Cornell Univ., Ithaca, N.Y. 14850)

12–17. **Organometallic Chemistry**, 6th intern. conf., Amherst, Mass. (M. D. Rausch, Univ. of Massachusetts, Amherst 01002)

12–17. International **Ornithological** Congr., 16th, Canberra, Australia. (Secretary-General, IOC, P.O. Box 84, Lyneham, A.C.T., Australia 2602)

12–18. **Mechanical, Electrical, and Allied Engineering Branches**, 5th Pan American Congr., Bogotá, Colombia. (E. T. B. Gross, Rensselaer Polytechnic Inst., Troy, N.Y. 12181)

13–16. **Potato** Assoc. of America, Guelph, Ont., Canada. (H. J. Murphy, 114 Deering Hall, Univ. of Maine, Orono 04473)

13–16. Society for the **Study of Reproduction**, 6th annual, Athens, Ga. (C. Cruse, 113 N. Neil St., Champaign, Ill. 61820)

13–17. Australian and New Zealand Assoc. for the **Advancement of Science**, 45th congr., Perth, Western Australia. (E. Underwood, 45th ANZAAS Congr., Univ. of Western Australia, Nedlands 6009)

13–17. International Workshop Conf. on **Laser Interaction and Related Plasma Phenomena**, Troy, N.Y. (M. Clark, Office of Continuing Studies, Rensselaer Polytechnic Inst., Troy 12181)

13–17. **Physics and Chemistry of Fission**, 3rd, Intern. Atomic Energy Agency, Rochester, N.Y. (J. H. Kane, Office of Information Services, Atomic Energy Commission, Washington, D.C. 20545)

13–17. National Council of **Teachers of English** (college section summer conf.), Kalamazoo, Mich. (J. Malmstrom, Dept. of English, Western Michigan Univ., Kalamazoo 49001)

13–18. **Mechanisms of Regulation of Plant Growth**, intern. plant physiology symp., Royal Soc. of New Zealand, Palmerston North. (G. W. Markham, RSNZ, 6 Halswell St., P.O. Box 12249, Wellington, N.Z.)

15–17. **Canadian High Polymer Forum**, 17th, St. Jean, P.Q., Canada. (E. G. Lovering, Pharmaceutical Chemistry Div., Health Protection Branch, Tunney's Pasture, Ottawa, Ont., K1A OL2, Canada)

15–18. National Council of **Teachers of Mathematics**, Fargo, N.D. (NCTM, 1201 16th St., NW, Washington, D.C. 20036)

16–18. National **Wildlife Federation**, Washington, D.C. (T. L. Kimball, NWF, 1412 16th St., NW, Washington, D.C. 20036)

16–30. **Cosmic Ray** Conf., 13th intern., Denver, Colo. (R. L. Chasson, Dept. of Physics, Univ. of Denver, Denver 80210)

19–21. **Symmetry, Similarity and Group-Theoretic Methods in Mechanics**, conf., American Acad. of Mechanics, Calgary, Alberta, Canada. (P. G. Glockner, Dept. of Civil Engineering, Univ. of Calgary, Calgary T2N 1N4)

19–22. American Soc. for **Horticultural Science**, Raleigh, N.C. (C. Blackwell, ASHS, P.O. Box 109, St. Joseph, Mich. 49085)

19–23. American Soc. for **Pharmacology and Experimental Therapeutics**, East Lansing, Mich. (E. B. Cook, ASPET, 9650 Rockville Pike, Bethesda, Md. 20014)

19–24. **Career Guidance for Women Entering Engineering**, Conf., Engineering Foundation, Henniker, N.H. (N. Fitzroy, General Electric Co., Schenectady, N.Y.)

19–24. Conference on **Energy Conservation at Point of Use**, Engineering Foundation, Henniker, N.H. (J. Denton, Univ. of Pennsylvania, Philadelphia, Pa. 19104)

19–24. Society for **Industrial Microbiology**, Evanston, Ill. (W. M. Stark, Lilly Research Labs., Eli Lilly & Co., Indianapolis, Ind. 46206)

19–24. International Symp. on **Microchemical Techniques**, sponsored by American Microchemical Soc., Intern. Union of Pure and Applied Chemistry, Commission on Microchemical Techniques, and Div. of Analytical Chemistry, University Park, Pa. (H. J. Francis, Jr., Pennwalt Corp., 900 First Ave., King of Prussia, Pa. 19406)

19–29. International Assoc. of **Agricultural Economists**, 15th intern. congr., São Paulo, Brazil. (V. J. Pellegrini, Rua Xavier Silveria H 57, Apr 102, Copacabana, Rio de Janeiro, Brazil)

20–21. **Spectroscopy**, 15th, Soc. for Applied Spectroscopy, Denver, Colo. (R. H. Heidel, U.S. Geological Survey, Bldg. 25, Denver Federal Center, Denver 80225)

20–24. **Texturization Theory, Determination and Control of Physical Properties of Food Materials**, Amherst, Mass. (C. Rha, Agricultural Engineering Bldg., Univ. of Massachusetts, Amherst 01002)

20–25. American **Physiological** Soc., Rochester, N.Y. (Mrs. G. Hamilton, APS, 9650 Rockville Pike, Bethesda, Md. 20014)

20–26. **Leprosy** Congr., 10th intern., Bergen, Norway. (S. G. Browne, 16 Bridgefield Rd., Sutton, Surrey, England)

20–29. **Genetics**, 13th intern. congr., Berkeley, Calif. (S. W. Brown, Dept. of Genetics, 345 Mulford Hall, Univ. of California, Berkeley 94720)

21–22. Society of **Logistics Engineers**, Hunt Valley, Md. (R. R. Harvey, SOLE, P.O. Box 164, Hunt Valley)

21–24. International **Chemistry Teachers** Conf., Chemical Education Divs. of the Chemical Inst. of Canada and the American Chemical Soc., Waterloo, Ont. (L. H. Sibley, St. Catharines Collegiate Inst. and Vocational School, 34 Catherine St., St. Catharines, Ontario, Canada)

21–24. Symposium on **Zirconium in Nuclear Applications**, American Soc. for Testing and Materials and American Inst. of Mining, Metallurgical and Petroleum Engineers, Portland, Ore. (Meetings Officer, ASTM, 1916 Race St., Philadelphia, Pa. 19103)

22–24. **Applications of X-ray Analysis**, 22nd annual conf., Denver, Colo. (C. O. Rudd, Metallurgy and Materials Science Div., Denver Research Inst., Univ. of Denver, Denver 80210)

22–25. National Council of **Teachers of Mathematics**, Fort Worth, Texas. (NCTM, 1201 16th St., NW, Washington, D.C. 20036)

25–26. **Mathematical Psychologists**, 6th annual, Montreal, Canada. (A. A. J. Marley, Dept. of Psychology, P.O. Box 6070, Montreal 101, P.Q.)

25–28. American **Astronomical** Soc.,

Columbus, Ohio. (H. M. Gurin, AAS, 211 FitzRandolph Rd., Princeton, N.J. 08540)

26–31. International Soc. of **Neurochemistry**, 4th intern., Tokyo, Japan. (Y. Tsukada, Dept. of Psychology, School of Medicine, Keio Univ., Shinjuku, Tokyo)

27–29. **Comparative Virology**, 2nd intern. conf., Mont Gabriel, P.Q., Canada. (E. Kurstak, Univ. of Montreal, P.O. Box 6128, Montreal 101, P.Q., Canada)

27–30. American **Sociological** Assoc., New York, N.Y. (N. J. Demerath, ASA, 1001 Connecticut Ave., NW, Washington, D.C. 20036)

27–31. NATO Conf. on **Cybernetic Modeling of Adaptive Organizations**, Porto, Portugal. (D. Howland, College of Administrative Science, Ohio State Univ., 1775 S. College Rd., Columbus 43210)

27–1. **Leucocyte Culture** Conf., 8th, Uppsala, Sweden. (K. Lindahl-Kiessling, Inst. for Medical Genetics, Univ. of Uppsala, V. Agatan 24, S-752-20 Uppsala)

28–30. Association for **Computing Machinery**, Atlanta, Ga. (G. Smith, ACM, 1133 Ave. of the Americas, New York 10036)

28–31. International Assoc. of **Human Biologists** and Soc. for the Study of Human Biology, Detroit, Mich. (E. B. Watts, Dept. of Anthropology, Tulane Univ., New Orleans, La. 70018)

29–31. Conference and Workshop on **Primate Karyology**, Wayne State Univ., Detroit, Mich. (A. L. Koen, Mott Center, 275 E. Hancock, Detroit 48201)

September

1–7. **Electroencephalography and Clinical Neurophysiology**, 8th intern. congr., Marseille, France. (G.-C. Lairy, Laboratoire d'EEG, Hôpital Henri Rousselle, 1, rue Cabanis, Paris 14e France)

2–6. **Victimology**, intern. symp., World Psychiatric Assoc., Jerusalem, Israel. (I. Drapkin, Organizing Committee of Criminology, Faculty of Law, Hebrew Univ. of Jerusalem, P.O. Box 4051, Jerusalem)

2–7. **Bacteriology**, intern. congr., American Soc. for Microbiology, Jerusalem, Israel. (A. F. Langlykke, ASM, 1913 I St., NW, Washington, D.C. 20006)

2–7. International Congr. on **Mercury**, sponsored by the Inst. Tecnologico Metalurgico Emilio Jimeno–Univ. of Barcelona, and the Consejo de Administracion de las Minas de Almaden y Arrayanes, Barcelona, Spain. [Secretaria del Congreso, Facultad de Ciencias (Pedralbes), Univ. of Barcelona, Barcelona-14]

2–8. **Birth Defects**, 4th intern. conf., National Foundation–March of Dimes, Vienna, Austria. (Intern. Medical Congr., Ltd., c/o National Foundation, 1275 Mamaroneck Ave., White Plains, N.Y. 10605)

2–10. Society of **Protozoologists**, Clermont-Ferrand, France. (D. M. Hammond, Dept. of Zoology, Utah State Univ., Logan 84321)

2–14. **Tropical Medicine and Malaria**, 9th intern. congr., Athens, Greece. (E. M. H. Mofidi, School of Public Health, Univ. of Tehran, Tehran, Iran)

3–6. **Chemical Thermodynamics**, 3rd intern. conf., Intern. Union of Pure and Applied Chemistry, Baden, Vienna, Austria. (F. Kohler, Inst. of Physical Chemistry,

Univ. of Vienna, Wahringerstr. 42, A-1090 Vienna)

3–6. **Stress Analysis** Group, annual conf., Inst. of Physics, Bath, England. (Meetings Officer, IP, 47 Belgrave Sq., London, SWIX 8QX, England)

3–7. Symposium on **Isotopes and Radiation Techniques in Studies of Soil Physics, Irrigation and Drainage in Relation to Crop Production**, Intern. Atomic Energy Agency, Nicosia, Cyprus. (J. H. Kane, Office of Information Services, U.S. Atomic Energy Commission, Washington, D.C. 20545)

3–7. **Molecular Sieves**, 3rd intern. conf., Eidgenossische Technische Hochschule and the Swiss Chemical Soc., Zurich, Switzerland. (W. M. Meier, Inst. für Kristallographie der ETH, Sonneggstr. 5. 8006 Zurich)

3–7. **Pharmaceutical Sciences**, 33rd intern. congr., Stockholm, Sweden. (FIP-Congr. 1973, Box 1142, S-111 81 Stockholm)

3–7. International Union of **Pure and Applied Chemistry**, 24th intern. congr., Hamburg, Germany. (Secretariat, 7 Via Cornelio Celso, 00161 Rome. Italy)

3–9. Symposium on **Photoelastic Effects and Its Applications**, Intern. Union of Theoretical and Applied Mechanics, Brussels, Belgium. (J. Kestens, Laboratoire d'Analyse des Contraintes, Universite Libre de Bruxelles 87, Avenue Ad. Buyl, Brussels 5)

4–8. American **Political Science** Assoc., New Orleans, La. (E. M. Kirkpatrick, APSA, 1527 New Hampshire Ave., NW, Washington, D.C. 20036)

4–12. International Assoc. for the **Scientific Study of Mental Deficiency**, 3rd congr., The Hague, Netherlands. (M. I. I. Goldberg, Box 83, Teachers College, Columbia Univ., New York 10027)

4–14. International **Radiation Protection** Assoc., 3rd intern. congr., Washington, D.C. (R. J. Catlin, U.S. Atomic Energy Commission, Washington, D.C. 20545)

5–7. **Marine Technology** Soc., Washington, D.C. (R. W. Niblock, MTS, 1730 M St., NW, Washington, D.C. 20036)

5–7. **Nuclear Structure: Heavy Ions** Conf., Inst. of Physics, Manchester, England. (Meetings Officer, IP, 47 Belgrave Sq., London, SWIX 8QX, England)

5–8. Society of **General Physiologists**, Woods Hole, Mass. (C. Edwards, Dept. of Biological Sciences, State Univ. of New York, Albany 12222)

5–8. International Conf. on **Magnetic Structures in Superconductors**, American Physical Soc., Argonne Natl. Lab., Intern. Inst. of Refrigeration, Intern. Union of Pure and Applied Physics, and Natl. Science Foundation, Argonne, Ill. (R. P. Huebener, Solid State Science Div., Argonne Natl. Lab., Argonne 60439)

5–12. American **Phytopathological** Soc., 65th mtg., Minneapolis, Minn. (R. J. Green, Jr., Dept. of Botany and Plant Pathology, Purdue Univ., Lafayette, Ind. 47907)

5–12. **Plant Pathology**, 2nd intern. congr., Intern. Soc. for Plant Pathology, Minneapolis, Minn. (J. E. Mitchell, Dept. of Plant Pathology, Univ. of Wisconsin, Madison 53706)

6–8. **Parapsychological** Assoc., 16th mtg., Charlottesville, Va. (R. L. Morris, Psychical Research Foundation, Duke Station, Durham, N.C. 27706)

6–10. **Plasma Chemistry** Symp., Intern. Union of Pure and Applied Chemistry, Kiel, Germany. (J. R. Hollahan, NASA-Ames Research Center, M/S 239-4 Moffett Field, Calif. 94035)

7–9. **More Learning: Less Teaching** Conf., Inst. of Physics, Guildford, England. (Meetings Officer, IP, 47 Belgrave Sq., London, SWIX 8QX, England)

8–11. American **Fisheries** Soc., Orlando, Fla. (R. A. Wade, AFS, 1319 18th St., NW, Washington, D.C. 20036)

8–15. **Chemotherapy**, 8th intern. congr., Athens, Greece. (P. Kontomichalou, P.O. Box 1554, Athens)

8–15. **Neurology**, 10th intern. congr., Barcelona, Spain. (J. M. Espadaler, Consejo de Ciento, 318, Barcelona-7)

9–12. American **Ceramic** Soc. (Electronics Div.), Atlanta, Ga. (F. P. Reid, ACS, 4055 North High St., Columbus, Ohio 43214)

9–13. **Marine Plankton and Sediments**, 3rd planktonic conf., Intern. Council of Scientific Unions, Scientific Committee on Oceanic Research, Working Group 37, Kiel, Germany. (E. Seibold, Geologisches Institut der Universitat, Olshausenstr. 40/60, 23 Kiel)

9–13. International Assoc. on **Water Pollution Research**, 7th, Paris, France. (B. B. Berger, Room 211, Graduate Research Center, Water Resources Research Center, Univ. of Massachusetts, Amherst 01002)

9–14. American **Chemical** Soc., 166th natl. mtg., Chicago, Ill. (Meetings Manager, ACS, 1155 16th St., NW, Washington, D.C. 20036)

9–14. International **Radiation Protection** Assoc., 3rd congr., Washington, D.C. (R. J. Vatlin, U.S. Atomic Energy Commission, Washington, D.C. 20545)

9–21. International Assoc. of **Geomagnetism and Aeronomy**, Kyoto, Japan. (Prof. Rikitake, Earthquake Research Inst., Univ. of Tokyo, 2-11-16, Yayoi, Bunkyo-ku, Tokyo, Japan)

10–11. **Turbulence in Liquids**, 3rd symp., Univ. of Missouri–Rolla, Rolla. (J. L. Zakin, Dept. of Chemical Engineering, Univ. of Missouri–Rolla, Rolla 65401)

10–12. **Exploration of the Planetary System**, Copernicus conf., Intern. Astronomical Union, Torun, Poland. (P. Swings, Inst. of Astrophysics, Univ. of Liége, Leon Souguenet Ave., 23, B-4050, Esneux, Belgium)

10–12. **Irradiation Experimentation in Fast Reactors**, American Nuclear Soc., Jackson Hole, Wyo. (J. G. Crocker, 2309 Arctic Ave., Idaho Falls, Idaho 83401)

10–12. **Marine Technology** Soc., 9th annual conf., Washington, D.C. (R. A. Frosch, MTS, 1730 M St., NW, Washington, D.C. 20036)

10–13. European Conf. on **Pediatric Nephrology**, Strbske Pleso, Czechoslovakia. (F. Demant, Clinic of Pediatrics of the Faculty Hospital, Kosice, Czechoslovakia)

10–14. International Symp. on **Macromolecules**, Intern. Union of Pure and Applied Chemistry, Aberdeen, England. (J. R. Keene, Chemical Soc., Burlington House, Piccadilly, London, England)

10–14. **Mass Spectrometry** Conf., 6th intern. conf., Intern. Union of Pure and Applied Chemistry, Edinburgh, Scotland. (C. H. Maynard, Inst. of Petroleum, 61 New Cavendish St., London, W1M 8AR, England)

10–14. Symposium on **Radioimmunoassay and Related Procedures in Clinical Medicine and Research**, Intern. Atomic Energy Agency, Istanbul, Turkey. (E. J. Garcia, IAEA, Karntner Ring 11-13, A-1010 Vienna, Austria)

10–15. International Assoc. for **Cybernetics**, 7th, Namur, Belgium. (J. Lemaire, Place Andre Ryckmans, Palais des Expositions, B-5000, Namur)

12–14. American **Ceramic** Soc. (Electronics Div.), Atlanta, Ga. (F. P. Reid, ACS, 4055 North High St., Columbus, Ohio 43214)

12–14. **Physics of Semimetals and Narrow-Gap Semiconductors**, Univ. of Wales and Inst. of Science and Technology, Cardiff, Wales. (J. E. Aubrey, Dept. of Applied Physics, UW and IST, King Edward VII Ave., Cardiff CF1 3NU)

12–17. American **Medical Writers** Assoc., Bethesda, Md. (E. Stahl, Ayerst Labs., Montreal, P.Q., Canada)

13–14. Society for **Management Information Systems**, 5th annual conf., Chicago, Ill. (A. Suter, SMIS, 221 North La Salle St., Chicago 60601)

13–15. International Congr. on the **Knee Joint**, 75th, Dutch Orthopaedic Assoc., Rotterdam, Netherlands. (Secretariat, Holland Organizing Centre, 16 Lange Voorhout, The Hague, Netherlands)

16–20. American **Oil Chemists Soc.**, Chicago, Ill. (J. Lyon, AOCS, 508 S. Sixth St., Champaign, Ill. 61820)

16–20. American Acad. of **Ophthalmology and Otolaryngology**, Dallas, Texas. (C. M. Kos, 15 Second St., SW, Rochester, Minn. 55901)

24–28. **Noble Gases** Symp., jointly by U.S. Environmental Protection Agency, Natl. Environmental Research Center, and Univ. of Nevada, Las Vegas. (D. S. Barth, NERC, P.O. Box 15027, Las Vegas 89114)

October

1–3. Hanford **Biology** Symp., 13th, sponsored by U.S. Atomic Energy Commission and Battelle Memorial Inst., Richland, Wash. (J. A. Harrison, Biology Dept., Battelle Pacific Northwest Labs., Richland 99352)

1–3. International Conf. on **Land for Waste Management**, Canadian Soc. of Soil Science, Ottawa, Ont. (M. K. Ward, Natl. Research Council, Ottawa, Ont. K1A OR6)

1–4. American Acad. of **Family Physicians**, Denver, Colo. (R. Tusken, AAFP, Volker Blvd. at Brookside, Kansas City, Mo. 64112)

1–4. American Soc. for **Metals**, Chicago, Ill. (A. R. Putnam, ASM, Metals Park, Ohio 44073)

1–5. American Assoc. for **Laboratory Animal Science**, 24th annual, Miami Beach, Fla. (Joseph J. Garvey, AALAS, 2317 W. Jefferson St., Joliet, Ill. 60435)

1–5. Symposium on **Remote Sensing in Oceanography**, American Soc. of Photogrammetry, Orlando (Disney World), Fla. (J. S. Beazley, 330 Ponce St., Tallahassee 32303)

1–6. International Congr. of **Rheumatology**, 13th, Kyoto, Japan. (S. Sasaki, Japan Rheumatism Assoc., Shimbunkaikan 63, 3-8-4 Ginza, Chuo-ku, Tokyo, Japan)

3–5. **Clinical Orthopedic** Soc., Cleveland, Ohio. (M. L. Clayton, COS, 2045 Franklin St., Denver 80205)

4–6. Refractories Div., American **Ceramic** Soc., Bedford, Pa. (F. P. Reid, ACS, 4055 N. High St., Columbus, Ohio 43214)

4–10. **Chemistry of Sea/Air Particulate Exchange Processes**, intern. symp., Intern. Assoc. for the Physical Sciences of the Ocean, Intern. Union of Geodesy and Geophysics, Nice, France. (R. A. Duce, Dept. of Oceanography, Univ. of Rhode Island, Kingston 02881)

5–6. **Psychopharmacology** Symp., World Psychiatric Assoc., Wroclaw, Poland. (A. Bukowczyk, Kraszewskiego 25, Wroclaw)

5–9. **Sigma XI**, Fontana, Wis. (T. T. Holme, SX, 345 Whitney Ave., New Haven, Conn. 06510)

6–12. American **Concrete** Inst., Ottawa, Ont., Canada. (ACI, Box 4754, Redford Stat., 22400 W. Seven Mile Rd., Detroit, Mich. 48219)

6–13. World Federation for **Mental Health**, 25th congr., Sydney, Australia. (A. Stoller, Mental Health Authority, 300 Queen St., Melbourne C1, Australia)

7–11. **Clay Minerals** Soc. (10th mtg.) and Clay Minerals Conf. (22nd), Banff, Alta., Canada. (J. E. Gillott, Dept. of

Civil Engineering, Univ. of Calgary, Calgary 44, Alberta)

7–11. International **Iron and Steel** Inst., 7th annual conf., Johannesburg, South Africa. (IISI, 5 Place du Champ de Mars, 1050 Brussels, Belgium)

7–11. **Life Assurance Medicine**, 11th intern. congr., Mexico City, Mexico. (J. Rendon, Edificio Bancomer, Aptdo Postal M-7817, Mexico, D.F.)

7–12. **Electrochemical** Soc., 144th natl., Boston, Mass. (E. G. Enck, ES, P.O. Box 2071, Princeton, N.J. 08540)

7–13. **Neurological Surgery**, 8th intern. congr., Tokyo, Japan. (S. Ishii, Dept. of Neurosurgery, Juntendo Univ. Hospital, Hongo, Bunkyi-ku, Tokyo)

7–20. Institute on **Terrestrial and Extraterrestrial Volcanology**, Italian Natl. Research, Regional Sicilian Government, and the Italian Ministry of Public Education, Erice, Trapani, Sicily. (F. Cuttitta, U.S. Geological Survey, Geologic Div., Washington, D.C. 20244), or (M. Carapezza, Istituto di Mineralogia, Via Archirafi 36, 90123 Palermo, Italy)

8–10. National **Electronics** Conf. and Exhibition, 29th, Chicago, Ill. (NEC, Inc., Oakbrook Executive Pl. No. 2, 1211 W. 22 St., Oak Brook, Ill. 60521)

8–10. Society for **Industrial and Applied Mathematics**, Iowa City, Iowa. (J. K. Cullum, IBM-T. J. Watson Research Center, Yorktown Heights, N.Y. 10598)

8–12. International **Drivers' Behaviour Research** Assoc., Zurich, Switzerland. (T. E. A. Benjamin, Room 9C27, 10, quai Paul Doumer, F-92 Courbevoie, France)

8–12. Symposium on **Experience from Operating and Fueling of Nuclear Power Plants**, Intern. Atomic Energy Agency, Vienna, Austria (J. H. Kane, Office of Information Services, U.S. Atomic Energy Commission, Washington, D.C. 20545)

9–12. Association of **Official Analytical Chemists**, 87th, Washington, D.C. (L. G. Ensminger, AOAC, Box 540, Benjamin Franklin Sta., Washington, D.C. 20044)

9–12. **Optical** Soc. of America, 58th annual, Rochester, N.Y. (J. W. Quinn, OSA, 2100 Pennsylvania Ave., NW, Washington, D.C. 20037)

9–12. American **Vacuum** Soc., 20th natl. symp., New York, N.Y. (R. B. Marcus, Bell Telephone Labs., Murray Hill, N.J. 07974)

10–12. Glass Div., American **Ceramic** Soc., Bedford, Pa. (F. P. Reid, ACS, 4055 N. High St., Columbus, Ohio 43214)

10–16. American **Speech and Hearing** Assoc., Detroit, Mich. (K. O. Johnson, 9030 Old Georgetown Rd., Washington, D.C. 20014)

11–12. **Chemical and Physical Processes in Combustion**, 7th technical mtg., Eastern Section, Combustion Inst., Montreal, P.Q., Canada. (F. J. Wright, Corporate Research Labs., Esso Research and Engineering Co., P.O. Box 45, Linden, N.J. 07036)

11–13. American Soc. for **Colposcopy and Colpomicroscopy**, 6th clinical, Key Biscayne, Fla. (A. C. Corzo, Symposia Intern., P.O. Box 580, Tujunga, Calif. 91042)

11–13. American Assoc. for the **Surgery of Trauma**, Chicago, Ill. (J. A. Boswick, AAST, 4200 E. Ninth Ave., Denver, Colo. 80220)

12–14. National Assoc. of **Biology Teachers**, St. Louis, Mo. (J. P. Lightner, NABT, 1420 N St., NW, Washington, D.C. 20005)

12–20. American Soc. of **Clinical Pathologists**, Chicago, Ill. (M. Damron, ASCP, 710 S. Wolcott Ave., Chicago 60612)

14–17. American **Chemical** Soc., 5th Northeast regional, Rochester, N.Y. (P. Tingue, Bldg. 81, Room 254, Research Labs., Eastman Kodak Co., Rochester 14650)

14–17. Association of **Life Insurance Medical Directors**, New York, N.Y. (A. E. Brown, ALIMD, 501 Boylston St., Boston, Mass. 02117)

14–18. American Inst. of **Ultrasound in Medicine**, Ann Arbor, Mich. (M. A. Wainstock, Dept. of Ophthalmology, Univ. of Michigan Medical Center, Ann Arbor)

14–19. Society of **Motion Picture and Television Engineers**, New York, N.Y. (D. A. Courtney, SMPTE, 9 E. 41 St., New York 10017)

14–20. **Allergology**, 8th intern. congr., Tokyo, Japan. (Japanese Soc. of Allergology, c/o Dept. of Microbiology and Immunology, Nippon Medical School, 1-1 Sendagi, Bunkyo-ku, Tokyo)

14–20. World **Medical** Assoc., Munich, Germany. (A. Z. Romualdez, WMA,

10 Columbus Circle, New York 10019)

14–21. International Congr. on **Tropical Medicine and Malaria**, 9th, Hellenic Ministry of Social Services and Hellenic Ministry of Culture and Sciences, Athens, Greece. (J. Papavassilious, ICTMM, P.O. Box 1373, Athens)

15–16. **Environmental Geologic Mapping · Colloquium**, Austin, Tex. (E. G. Wermund, Bureau of Economic Geology, Univ. of Texas, Box X, University Station, Austin 78712)

15–17. National **Electronics** Conf., Inst. of Electrical and Electronics Engineers, Chicago, Ill. (IEEE, 345 E. 47 St., New York 10017)

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

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

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

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

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

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

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

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

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

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

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

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

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

RESEARCH NEWS

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produced a variant with increased resistance to the antibodies. This new variant was isolated and grown in the presence of antibodies specific for it.

After several such cycles of growth and mutation, Hannoun isolated a variant that no longer mutated under the experimental conditions. This variant, he postulates, represents the end point of evolution within the A_3 subtype, and is thus a virus that would be expected to appear in the late 1970's. Support for this postulate was provided by the discovery that the London influenza variant first isolated in 1972 was antigenically quite like the first mutant Hannoun had produced in his laboratory a year earlier.

As a result of an only partially understood aspect of the mutation process, the Pasteur group believes, antibodies specific for any one influenza mutant also provide protection against all antecedent mutants within that subtype. Vaccines produced from Hannoun's final variant should thus provide protection against all A_3 variants that might appear within this decade—although the emergence of the next major variant will necessitate beginning all over again. Limited studies have already shown that a killed virus vaccine produced from the Pasteur variant is effective against current strains of influenza, and the French government has licensed it for use as soon as possible. It is unlikely that the vaccine will be licensed for use in the United States for at least another year, however, because of the need for more data on its efficacy.

Because the Pasteur vaccine is made with inactivated viruses, it is expected to be no more effective than current killed virus vaccines. If Hannoun's methodology is proved correct, then, the best approach might involve a combination of techniques. That is, the final variant isolated by Hannoun could be used to produce attenuated virus vaccines by the method of Chanock, Davenport, or Kilbourne. In that fashion, almost complete protection could be provided from shortly after the appearance of a major new subtype until the appearance of the next subtype. Given adequate funding for the development and application of these techniques, some investigators argue, there need never be another influenza pandemic.

—THOMAS H. MAUGH II