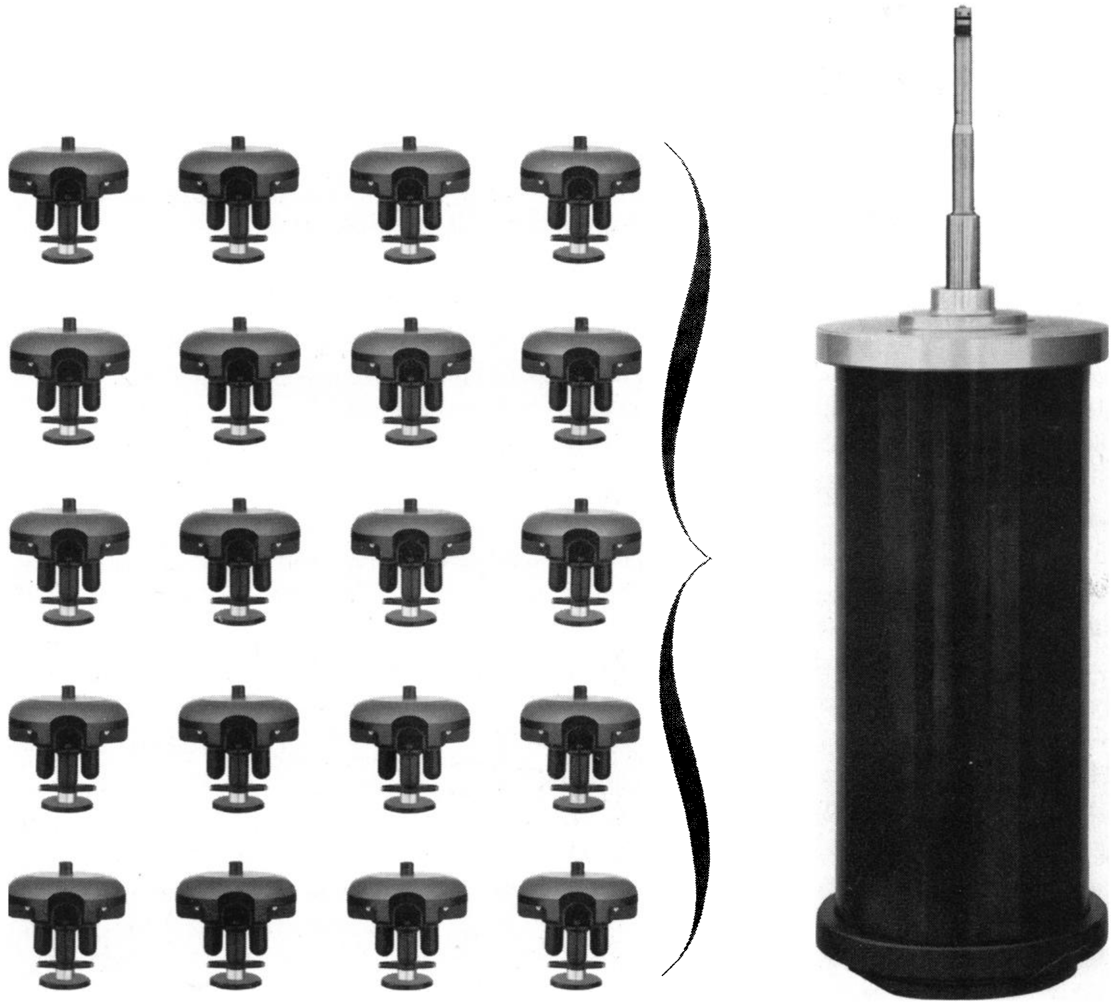
SCIENCE

13 January 1967

Vol. 155, No. 3759

AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

PRE-COLOMBIAN WARRIOR



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SCIENCE

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AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

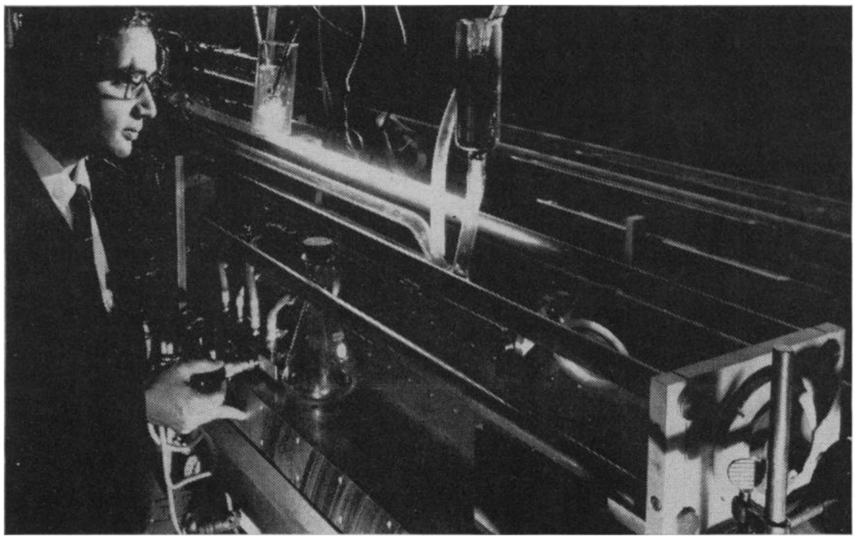
COVER

Pre-Colombian painted pottery from Ecuador, in contrast to Peru, rarely depicts the human figure. This warrior, or chief, decorates the interior of a bowl from the later period of the north Ecuadorian highlands where tradition records that local armies withstood Inca conquest for 17 years. See review of *Ecuador*, page 185. [Sketch prepared by George Robert Lewis, Smithsonian Institution]

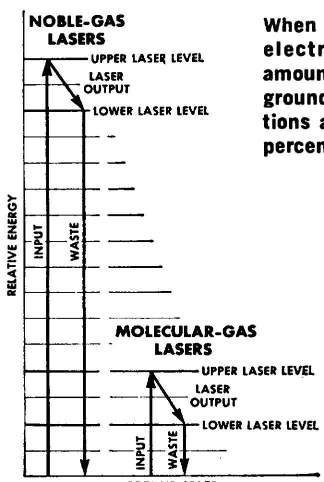
Report from

BELL LABORATORIES

Molecular-gas lasers

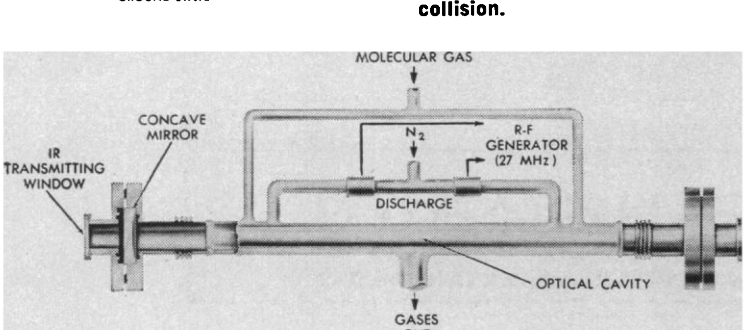


Bell Laboratories research physicist C. K. N. Patel with his experimental "flowing gas" laser. The glowing tube contains nitrogen in which electrical discharge is taking place. The active gas flows through the other, similar-sized tube and the gases meet in the optical cavity. Here, energy is transferred to the active gas through collision.



When a laser operates through energy stored in electron orbits (left), a comparatively large amount is wasted through the long return to ground state. But, when energy is stored in vibrations and rotations within a molecule (right), the percent wasted is much smaller.

The experimental setup which led to development of today's most powerful and efficient CW laser. Nitrogen, carrying vibrational and rotational excitation, mixes with the active gas within the optical cavity. Here, energy is transferred to the active gas through collision.



To produce a photon in a gas laser, an atom or molecule reduces its energy by dropping from the "upper laser level" to the "lower laser level" (graph). From the lower level, the energy usually decreases to absolute minimum—"ground state"—before the atom or molecule can emit another useful photon. This second drop is waste: incoherent light and heat.

Lasers using noble (atomic) gases, like helium-neon or argon, are particularly wasteful in this respect. But a laser using molecular gases, such as carbon dioxide, would operate at lower energy levels and produce less waste radiation.

In investigating new infrared lasers, therefore, scientist C. K. N. Patel of Bell Laboratories employed molecular gases. To experiment with them, he invented a new kind of laser (photo and figures) in which the active (radiation-emitting) gas flows continuously into the optical cavity. There it meets a flow of nitrogen, which is excited by an electrical discharge in a separate tube. In this way, molecules in the active gas are raised to an upper laser level by the transfer of vibrational energy from nitrogen molecules. This prevents the electrical discharge from breaking down the active gas.

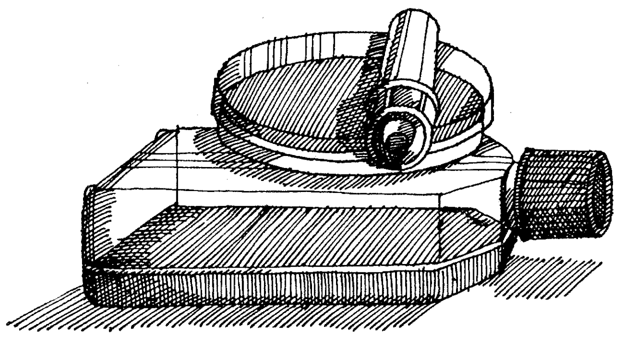
With this technique, Patel demonstrated lasers based on carbon monoxide, carbon dioxide, nitrous oxide, and carbon disulphide. He found that carbon dioxide has the highest efficiency, about 15 percent compared with less than 0.1 percent from previous gas lasers.

Carbon dioxide has another advantage. It is the only known molecular gas that is chemically stable enough to function even if the discharge takes place within it. So in this instance, the "flowing-gas" technique is not required.

Patel also found that the addition of certain gases, such as helium, increases the efficiency of the carbon dioxide laser. Such lasers have been built with continuous outputs of more than 1000 watts at wavelengths of 10.6 microns (infrared).

Bell Telephone Laboratories
Research and Development Unit of the Bell System

Salmagundi*



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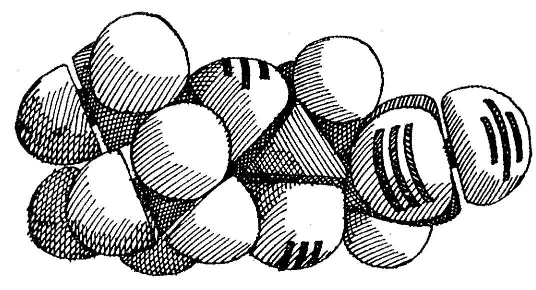
Schwarz BioResearch's pre-eminence in the research, development and production of high quality research biochemicals (hundreds of them) has led to a perfectly understandable bit of diversification: tissue culture media. But with a difference. These are stable, homogeneous, unexpectedly inexpensive mixtures of pre-weighed dry powders which are easily reconstituted to yield chemically-defined tissue culture media. And, hence, the trade name imMEDIAte. Certainly better than belaboring you with fast, fast, fast. So if you now use tissue culture media, you ought to know more about our new offerings. (Examples: MEM, #199, NCTC #109-135 Modified.) For an immediate reply, drop us a postcard with the name "imMEDIAte" and your name, address and zip code.



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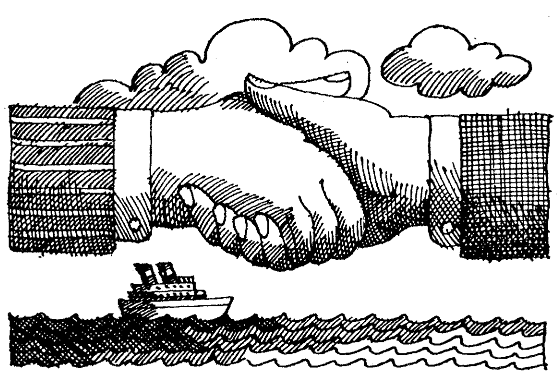
We could easily trot out the traditional superlatives to describe these atomic models. But more pertinent and persuasive is the listing of the blue ribbon sponsorship behind this development. Accordingly: these are improved versions of the original Corey-Pauling space-filling models with new Koltun connectors; which development came from the Atomic Models Subcommittee of the Biophysics and Biophysical Chemistry Study Section of the National Institutes of Health (or, in more human terms, a working committee consisting of scores of scientists from several dozen institutions); and with subsequent implementation by the American Society of Biological Chemists with the financial support of the National Science Foundation. And now available from Schwarz! Request complete details by writing "CPK" on a postcard. Remember your zip code.



The French, Belgian, and Italian Nuclear Research Agencies make their labeled compounds available to U.S. researchers. (Through Schwarz exclusively.)

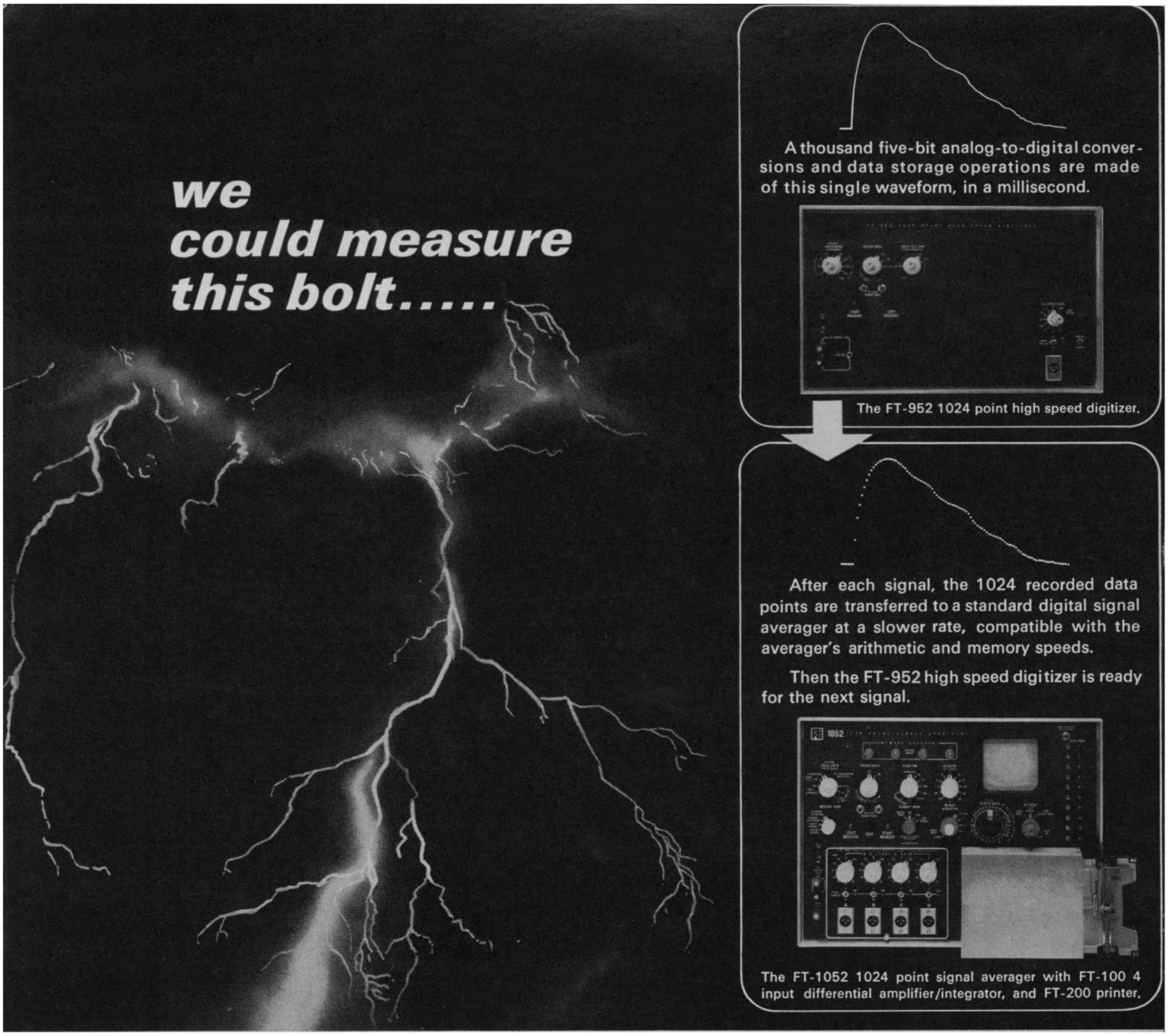
Which latter fact begets pride. Le Commissariat a l'Energie Atomique of France, Le Centre d'Etude de l'Energie Nucléaire of Belgium, and La Societa Ricerche Impianti Nucleari of Italy are engaged in ambitious fundamental and applied nuclear research programs. Hardly surprising then that a wide variety of labeled compounds are made for in-house use. But these are *also* available to outside researchers. As a matter of fact, tens of thousands of such deliveries are now made annually. Fantastic. And little wonder we're proud to be the exclusive U.S. distributor. Though there's no room here to do justice to this list, we'd like to mention that it does include: δ-amino levulinic acid-4-C^{14}, orotic acid 6-C^{14}, cholesterol-4-C^{14} and DL-arginine-guanido-C^{14}. For the complete listing of these compounds (as well as the rest of our line), write "Isotopes" on a postcard.

Now let us tell you about the rest of the family.

The neighboring panels serve to highlight some of the things we wish you to note especially. Good and well but terribly limiting. We also make many hundreds of labeled and unlabeled biochemicals—it takes an 80 page catalog to present our story effectively. Examples: labeled and unlabeled ribonucleotides, deoxyribonucleotides, polynucleotides, ribonucleosides, deoxyribonucleosides, purine and pyrimidine bases, enzymes, antimetabolites, sugars and sugar phosphates, amino acids and derivatives. And: labeled steroids and sterols, lipids and fatty acids, alcohols and ethers, aldehydes and ketones, amines and imines. And on and on and on. This panel, then, hopefully redresses the imbalance created by its neighbors and invites your request for our complete catalog. So write "Catalog" on a postcard. With your address, of course.

*A somewhat pretentious way of suggesting that this is the first of a series of miscellany designed to acquaint you with some of our products—often quite unrelated. Such medleys, such potpourris, such salmagundis will come to you whenever we feel that we have something of possible interest.

Schwarz BioResearch, Inc.
Orangeburg, N.Y. 10962



...with the lightning speed of

THE NEW FT-952 WAVEFORM DIGITIZER

A lightning discharge measurement, though an easy task for this system, is really not an appropriate one, we must admit. There are simpler ways of measuring lightning discharge current. We resorted to the use of lightning for illustration because of its dramatic speed; we wanted to emphasize that this digitizer is indeed remarkable in its ability to handle short signals. The lightning stroke illustration also helps to emphasize another fact. Unlike earlier speed-up devices for digital signal averaging systems the model FT-952 does not use sampling methods. A set of 1024 data points can be obtained during a single stroke! Sampling methods, by contrast, involve "looking" at only small parts of each of many recurrent, identical signal waveforms, and reconstruction of the complete picture from these many brief looks.

When the Fabri-Tek system is used for what it is intended (measurement of recurrent signals in noise) it is far more efficient than any system which gets around the speed problem by sampling just a tiny bit of each signal. By use of digital signal averagers, errors due to noise are reduced by an amount proportional to the square root of the number of *complete* signals measured. Here is how long it takes to reduce noise errors by a factor of about 100, if the signal recurs once a second, for two cases. Case one, in which each signal is completely measured: three hours. Case two, in which only 2% of each signal is digitized each occurrence: six days. Few samplers are as efficient as 2%. Some are only 0.1% efficient. Using one of these, the 100:1 noise reduction process would require months! In less time than that, you can order and receive one of our efficient model FT-952 digitizers.

For complete specifications, delivery and prices, write Fabri-Tek Incorporated Instrument Division, P. O. Box 4218, Madison, Wisconsin. Or call us, (608) 238-8476.

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Instrument Division

See Fabri-Tek's exhibit at the American Physical Society conference, New York, starting January 30th, 1967.

The hope of doing each other some good prompts these advertisements

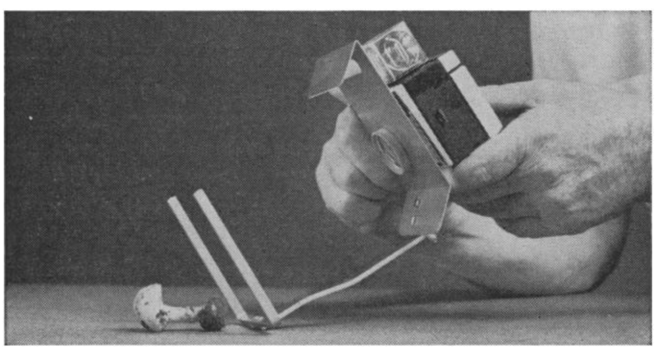
How to see cells by ultraviolet

Snooping around the plant pathology department of a famous eastern university for guidance on how best to serve the biological "market," we were advised to keep our eye on Oregon State University. Looking back on p. 757 of the May 6, 1966 issue of this magazine, we may have found an explanation of why our advisor's mind had linked together photography, O.S.U.'s Cordley Hall, and the principle which holds that quality in research does not necessarily stem from complexity in the tools.

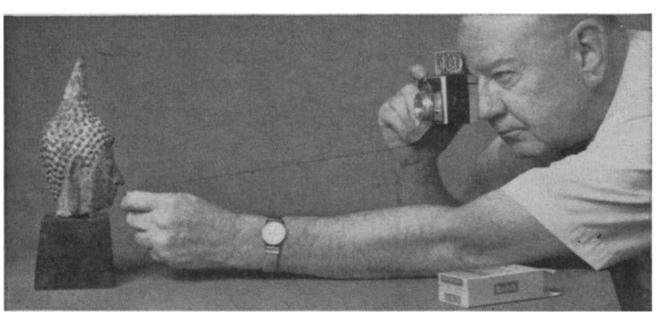
If you missed that item in *Science*, look it up and learn how the Oregon pathologists McWhorter and Leach can afford to forget about quartz optics and depth of focus when using 260μ radiation to see nucleic acid and other ultraviolet absorbers within and around cells.

The item tells how the authors were tipped off to the KODAK *High Resolution Plates that made their technique possible. They heard about them from a man who uses the product for fabricating microelectronic circuits. If your regular supplier seems mystified when asked about these plates, aid is available from Eastman Kodak Company, Photofabrication Sales, Rochester, N.Y. 14650. An earlier market study had established that* KODAK *High Resolution Plates are mainly of interest in microelectronics, and now* this *happens.*

INSTATECH Camera Outfit



Place any work of nature or of man within this frame and press the button.



If it won't fit in the frame, hold the camera this chain's length away and press the button.

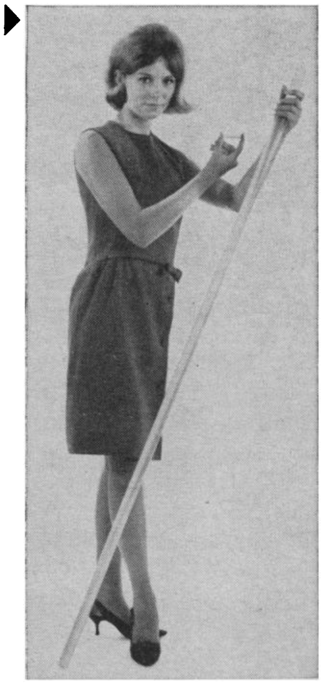
No lighting to arrange. No exposures to calculate. No focusing. No fumbling to load film—just drop in a 126 film cartridge, basis of the incredibly popular system that makes photography cheap by cutting out mistakes. Even less chance for mistakes here than when snapshooting places and people.*

You may be less than pleased to learn about this. You may feel that vivid slides and prints that capture fine details of interesting objects are becoming too easy to make, too common.

The new KODAK INSTATECH *Camera, the above equipment that fits it for its two working distances, 5 flashcubes good for the 20 shots in a* KODAK EKTACHROME-X *Film cartridge, such a cartridge, and a pair of batteries are offered as an outfit for $49.75 by Lester A. Dine, Inc., 2080 Jericho Turnpike, New Hyde Park, N.Y. 11041.*

*Dentists, surgeons, and other professionals whose profession is not photography actually do use this equipment on people—in their own professional way. In fact, it was designed for them.

How one thing leads to another

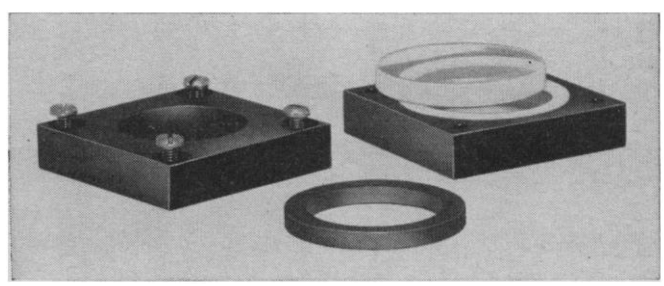


This pretty person is displaying ▶ a large and a small rod of neodymium-doped KODAK Laser Glass. We unwittingly prepared ourselves for this product for a quarter-century by making rare-earth optical glass for photographic lenses.

KODAK *Laser Glass correspondence is handled by Apparatus and Optical Division, Eastman Kodak Company, Rochester, N.Y. 14650.*

Photography is notable among technologies for its spinoffs. The dye chemists who devise photographic sensitizing dyes don't get to color the world their favorite colors, but they are very clever. When told that a dye with absorption mechanism saturable and all concentrated near 1.06μ would Q-switch neodymium glass and enhance its popularity, they produced one. Lasermen rejoiced. Mode-locking was achieved. Power could rise from zero to several gigawatts within a distance of 30 microns and a time around 10^{-13} sec.

EASTMAN *9740 Q-Switch Solution correspondence is handled by Distillation Products Industries, Rochester, N.Y. 14603 (Division of Eastman Kodak Company).*



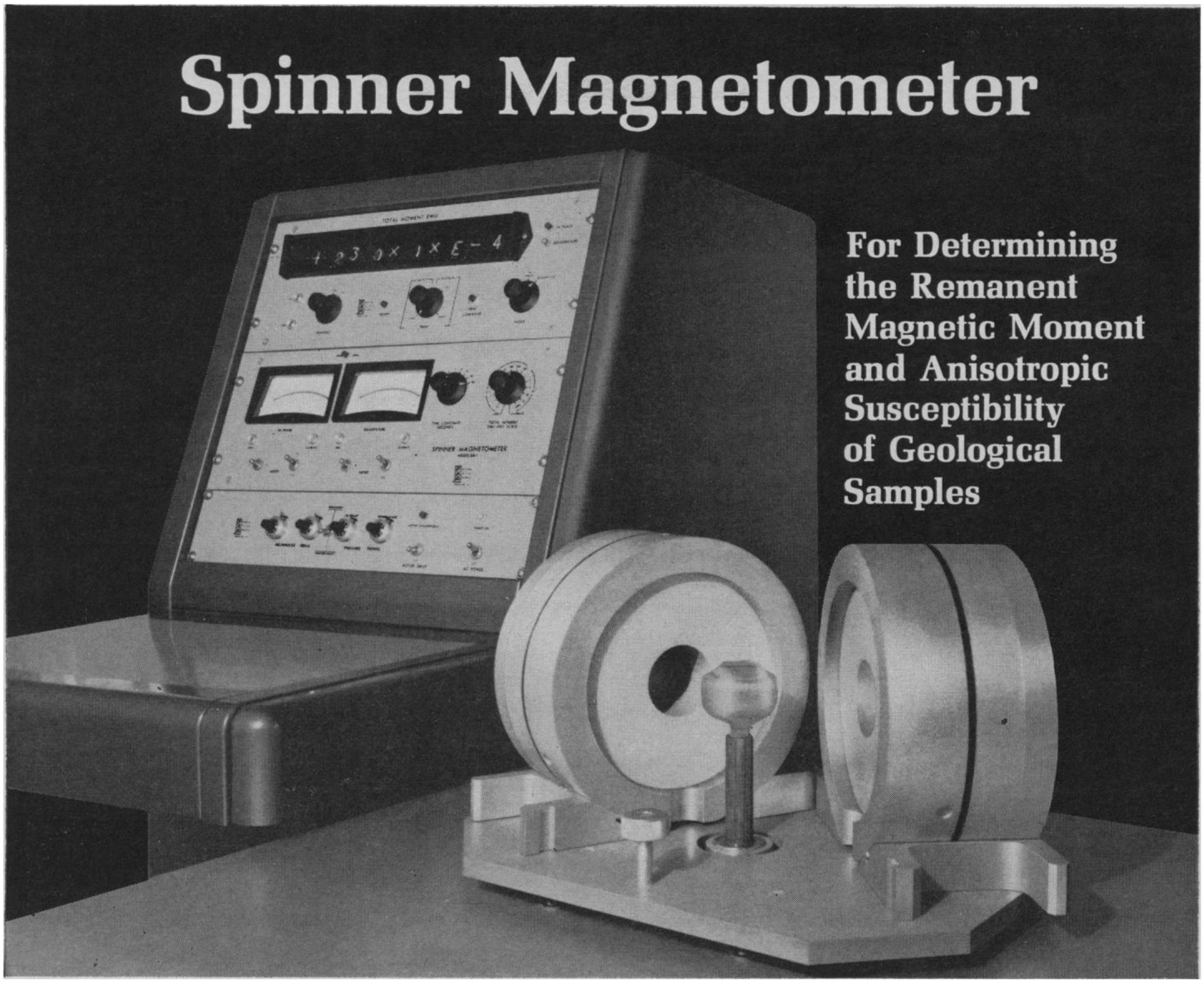
But many lasermen found their Q-switch solution short-lived and were surprised to learn that the epoxy cement in their jerry-built cells was killing it. Few spectrophotometer cells are fit for resonant optical cavities. Help was needed. We have consequently designed a cell that uses simply the pressure of two glass windows against a precision tetrafluoroethylene gasket to keep it leakproof. Selection of the glass for the windows has been guided by a lot of work on damage resistance that the laser glass development has required. It is a borosilicate crown free from striae and bubbles and good to a quarter-wavelength of visible light over the 35mm aperture. Outer surfaces are MgF_2-coated to minimize reflection loss at 1.06μ. Forgetting in the interests of good sense the original motivation to promote neodymium, we also offer a coating tuned to pass the 0.69μ radiation of neodymium's rival, ruby. The wedge angle in the windows is not permitted to exceed 0.012°, or 0.006° on the gasket, and the thickness of the gasket fixes an optical path of 1.651 mm ± 25μ.

EASTMAN *Liquid Q-Switch Cells are available at $150 from the same Distillation Products Industries that supplies their contents. Specify No. 6088 for neodymium, No. 6097 for ruby.*

Kodak

Prices do not include taxes and are subject to change without notice.

Spinner Magnetometer



Recent results in paleomagnetic research have pointed out the importance of remanent magnetic moment studies in dating events in the Earth's history. This new application of remanent moment measurement together with earlier uses in drilling core orientation and studies of continental drift, polar wandering and magnetic anomalies have greatly increased interest in this technique. To facilitate work in these fields, PAR is making available its Model SM-1 Spinner Magnetometer. This instrument, which incorporates the results of PAR's wide experience in small-effect measurement and weak signal processing, has been designed to increase measurement sensitivity to the limits imposed by the thermal noise of the pick-up coils.

The Model SM-1 simultaneously measures and displays two orthogonal components of the magnetic moment in the spin-plane of the sample. Operation is simple and straightforward, and can be carried out by non-technical personnel. Low noise and freedom from drift and spurious pick-up allow quick and accurate measurement of samples having very weak moments. Earth field-canceling Helmholtz coils are included on two axes to eliminate problems associated with anisotropic susceptibility. These coils also allow the determination of the anisotropic susceptibility of the sample.

Brief Specifications:

Minimum Detectable Signal: Will detect changes in magnetic moments smaller than 7 x 10^{-9} EMU/cc.

Sensitivity Ranges: 21 full scale ranges calibrated in TOTAL MOMENT from 0.5 x 10^{-6} to 5 EMU in a 1, 2, 5 sequence.

Calibration Accuracy: The system is factory calibrated to within ±0.5° phase and within 1% magnitude.

Sample Size: Cylinder 2.54 cm diameter, 2.28 cm length. Slightly larger or smaller samples can be accommodated.

Sample Rotational Speed: 105 Hz (52.5 for anisotropic susceptibility measurements).

Price: $8,000 for complete system; with automatic digital readout (as shown in the photograph) to monitor the orthogonal components of the moment alternately, $9,750. Export price approximately 5% higher, except Canada.

Write for Bulletin No. T-133 to Princeton Applied Research Corp., Dept. G, P.O. Box 565, Princeton, N. J. 08540. Telephone: (609) 924-6835.

PAR PRINCETON APPLIED RESEARCH CORP.

should be aware that operating power reactors have utilized less than 1 percent of their permissible discharge rates which are, in themselves, harmless to the general population. This experience can be compared to present emissions from fossil fuel plants which present an identified health hazard to the public in the form of sulphur oxides and other contaminants. The National Academy of Sciences has stated that more is known about the effects of radiation and radioactive materials than of any other toxic materials. This would appear to refute the statement that the effects of radioactive contaminants are comparatively unknown. Similarly, Novick's comment with respect to the "enormous expense of reactor development" is refuted by the rapid rate at which utility organizations are hastening to purchase this replacement for oil- or coal-fired boilers. At the recent National Conference on Air Pollution, both industrial and governmental representatives affirmed the fact that man's environment is improved by replacing fossil-fueled power plants with those powered by the atom.

MORTON I. GOLDMAN

NUS Corporation, 1730 M Street, NW, Washington, D.C. 20036

A Larger Scope for AEC Laboratories

Recently in remarks delivered to the Southern Governors' Conference on 19 September, Representative Chet Holifield, chairman of the Joint Committee on Atomic Energy, proposed that the national laboratories undertake research bearing on urban technology and pollution control.

Many of my colleagues at Argonne National Laboratory, who would be most affected by such a proposal, strongly favor it. We believe if this fact were publicized, swifter action would follow. To this end, I have prepared a declaration, the text of which follows.

As scientists and engineers in the national laboratories of the Atomic Energy Commission, we have a responsibility for assuring that the fruits of science and technology be made available to the public because (i) we are supported by public funds; (ii) our facilities are both expensive and extensive; (iii) professionally we represent unusual diversity; and (iv) under the Atomic Energy Acts our research should strive toward the maximum public benefit.

We take this responsibility seriously. Many of us sought employment in these laboratories because they offered a combination of scientific integrity and work of social importance and impact. Further, we take pride in the achievements of the past 20 years which we believe are significant, both scientifically and socially. However, among the new world problems and emergencies that have developed are pollution, food and water shortages, urban overcrowding, and education in a complex society. Our laboratories have the equipment, personnel, and organization to perform significant researches and develop significant systems in response to these universal needs. Much time and effort would be wasted in forming similar new laboratories to cope with these needs, one specialty at a time. But the current administration of the franchise of the Atomic Energy Commission has not encouraged the expansion or diversion of our programs into such problem areas. We therefore urge the President, Congress, Atomic Energy Commission, and other government agencies to take the appropriate steps to permit us to work to our full capacity on the vital problems of society.

This declaration might form the basis of a petition.

BERNARD I. SPINRAD

845 Wellner Road, Naperville, Illinois

Project Foresight

The report on Project Hindsight (News and Comment, 18 Nov., p. 872) has prompted me to make a similar study which I call Project Foresight for obvious reasons. Project Hindsight studied the contribution made to the national defense by post-1945 science and technology. It was found that, while basic research dating back over 30 years (such as the nuclear physics of the thirties) has had a revolutionary impact on military arms and strategy, the basic research of recent years has made only a small contribution to weaponry.

Project Foresight studied the contribution that has been made to the national defense by various age groups in the population. It was found that while those male citizens born between 18 and 30 years ago have made a very large contribution, children born in recent years have made essentially none. However, unlike Project Hindsight, Project Foresight takes due note of the time scale involved in this problem. Consequently, no recommendation is made to reduce the number of new children being produced.

ALLEN M. LENCHEK

Department of Physics and Astronomy, University of Maryland, College Park

13 January 1967, Volume 155, Number 3759

SCIENCE

Global Weather

Man is changing the earth's atmosphere. Most obvious is the increasing concentration of carbon dioxide. If present trends of release continue until the year 2000, global atmospheric temperatures could be increased, through a greenhouse effect, by as much as 4°C. Potentially more serious are effects we cannot now foresee or evaluate. The atmosphere has intrinsic tendencies toward instability. Thus, in tropical latitudes a gentle breeze can develop into a destructive hurricane in a few days. Other weather patterns persist for months but suddenly give way to new patterns. On a still longer time scale, weather was mild in the period around A.D. 1100 and severe around A.D. 1600.

New developments in science and technology promise a better understanding of the weather and the effects man may have in his efforts to alter it. These developments were the subject of a major presentation by Thomas F. Malone and of a symposium* at the recent annual meeting of the AAAS. Some major developments were cited. (i) Understanding of the physical processes occurring in the atmosphere has progressed to the point where the behavior can be approximated by mathematical models. (ii) Computers now under development will have sufficient speed and memory to permit realistic simulation of world-wide weather and to determine consequences, to the atmosphere, of human intervention. (iii) Capabilities exist for observing and measuring atmospheric conditions on a global scale in unprecedented detail.

Development of earth-orbiting satellites for useful purposes is being effectively pursued. As weather-observing platforms, satellites have many desirable features. They are able to view the atmosphere as a global phenomenon. A satellite in polar orbit can examine every point on the earth periodically, and at intervals of as little as 12 hours.

For the most part, satellites measure phenomena occurring far beneath them. The greatest success to date has been in photography of cloud cover. Temperature observations have also been made of surfaces, cloud tops, tops of moist layers, and the stratosphere. Additional means of measuring important aspects of the weather will become available as various portions of the electromagnetic spectrum are linked to atmospheric processes.

Satellites may be used in another important way: as data collectors. In principle, a satellite in polar orbit can interrogate each of thousands of remote sensors at intervals of 12 hours.These sensors can be of various forms—for example, buoys in the oceans. Information from different altitudes in the atmosphere is particularly desired. Global coverage on a spacing of, for example, 500 kilometers is also wanted. The most practical way of achieving such distribution is by use of free-floating balloons. These have been built and are being tested. They are equipped with an electronics package and a solar-cell power supply that, in total, weighs only 100 grams. Reliable reception from them has been obtained at distances up to 8000 kilometers.

Technology is furnishing powerful tools for measurement, analysis, and forecasting of global weather. From this, it is hoped, will come understanding of what we are doing to our planet and either reassurance or a convincing warning. In view of our uncertainties concerning the atmosphere, we have no alternative but to work urgently toward such an understanding—PHILIP H. ABELSON

*"The World Weather Watch," chairman, Louis J. Battan; arranged by John E. Masterson; participants, Robert M. White, Walter Orr Roberts, Joseph Smagorinsky, and Morris Tepper.

Now... Mettler does for melting point determinations what they've done for weighings

With the introduction in 1947 of the modern single-pan analytical balance, Mettler brought revolutionary speed and convenience to laboratory weighing.

Now, with the introduction of the Mettler FP-1, melting and boiling point determinations are automated–and improved just as dramatically. Now of truly analytical value, they are no longer imprecise, tedious and subjective tests.

The Mettler FP-1, when programmed and started, completes these determinations automatically, eliminating the need for an operator's constant attention and close visual observation. Results, displayed in numerical form for easy, error-free reading, are retained on the readout panel until the instrument is cleared for the following run.

By electronic sensing, the Mettler FP-1 automatically selects the point at which melting or boiling takes place. By removing the subjective element of operator choice, the instrument provides completely objective and greatly improved analytical data.

Three melting point tests can be run simultaneously, making the Mettler FP-1 ideal for convenient and practical identity tests by the mixed melting point method. When used with a standard time-base recorder, the instrument also permits study of the dynamics of the melting process.

Ask your Mettler dealer for the new Mettler FP-1 bulletin, or request a trial or demonstration in your own laboratory. Write Mettler Instrument Corporation, 20 Nassau Street, Princeton, N. J., 08540.

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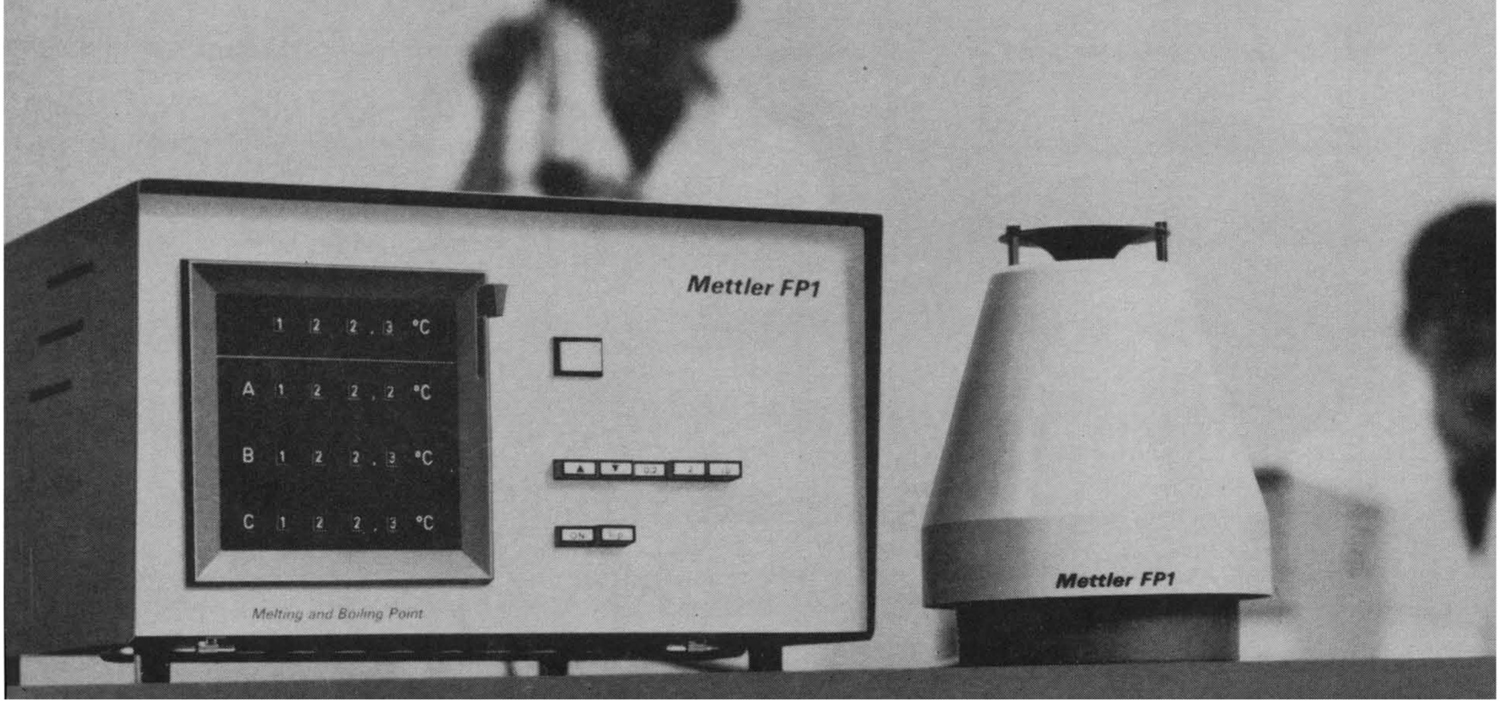

synthesis and nuclear RNA polymerase activity in the uteri of rats stimulated by estrogen. He suggested that the hormone might act through increasing RNA polymerase activity by making available a "protecting protein" in the absence of which the enzyme is inactivated. According to this idea, the mechanism of action of estrogen is to activate RNA polymerase, but not, initially at least, to cause synthesis of new RNA polymerase.

Alexander Leaf (Harvard) showed how DNA-dependent RNA synthesis, followed by protein synthesis in the action of aldosterone, increases sodium transport across the toad's urinary bladder. Observations supporting this mechanism are a 60-minute delay in the effect, inhibition of the response by either $10^{-6}M$ actinomycin or $10^{-5}M$ puromycin, and a dependence on oxidative metabolism. This contrasts the aldosterone mechanism rather sharply with the similar effect of antidiuretic hormones on the same tissue, where macromolecular synthesis seems to have been ruled out.

Talwar then discussed the binding of estradiol to cell fraction from various tissues. In general, binding was greater to fractions from tissues that normally respond to estradiol (for example, uterus, hypothalamus) than to fractions of normally non-responsive tissues (for example, lung). H. G. Williams-Ashman (Johns Hopkins) recalled that estrogen does not accumulate significantly in mammary glands, where it is presumed to have an important function. Gorbman suggested an interpretation somewhat different from Talwar's, namely that estrogen might accumulate preferentially in tissue in which it is not metabolized.

A somewhat more detailed study of steroid incorporation into cell fractions was presented by J. D. Wilson (Texas). These results indicated incorporation of radioactive testosterone into the euchromatin portions of nuclei from the preen gland of the duck, and of 17-β-estradiol into chromosomal loops from ova of the newt.

Joseph Larner (Minnesota) discussed some studies of the action of insulin on glycogen synthesis in isolated diaphragms of the rat. Insulin increases base levels of transferase activities in the absence of added glucose-1-phosphate. It was suggested that insulin might act in the induction of glycogen breakdown in muscle by acting on the kinase system through a route which does not involve adenylate cyclase or protein synthesis. This implies basic differences between insulin action on muscle and that on liver, where macromolecular synthesis has been implicated.

The conference was held under the auspices of the Interdisciplinary Communications Program of the New York Academy of Sciences, and was supported by the Office of Naval Research and the National Aeronautics and Space Administration. Murray D. Rosenberg (Minnesota) was chairman of the conference. The Academy was represented by Frank Fremont-Smith, director of the Conference Program.

LEE D. PEACHEY
Departments of Biochemistry and Biophysics, University of Pennsylvania, Philadelphia

Forthcoming Events

January

25–27. American **Crystallographic** Assoc., mtg., Georgia Inst. of Technology, Atlanta. (W. L. Kehl, Gulf Research and Development Co., P.O. Drawer 2038, Pittsburgh, Pa. 15230)

25–27. American **Mathematical** Soc., 73rd annual mtg., Houston, Tex. (The Society, P.O. Box 6248, Providence, R.I.)

25–28. American **Group Psychotherapy** Assoc., New York, N.Y. (Mrs. M. Schiff, 1790 Broadway, New York 10019)

26–28. **Mathematical** Assoc. of America, 50th annual mtg., Houston, Tex. (H. L. Alder, Univ. of California, Davis)

28–30. **Radiology**, southern conf., Point Clear, Ala. (M. Eskridge, P.O. Box 4097, Mobile, Ala.)

28–1. American Acad. of **Allergy**, Phoenix, Ariz. (J. O. Kelley, 756 North Milwaukee St., Milwaukee, Wis. 53202)

29. **Mössbauer Effect Methodology**, 3rd annual symp., New York, N.Y. (P. A. McNulty, New England Nuclear Corp., 575 Albany St., Boston, Mass. 02118)

29–3. **Power**, mtg., Power Group, Inst. of Electrical and Electronics Engineers, New York, N.Y. (E. C. Day, IEEE, 345 E. 47 St., New York 10017)

30. American Soc. of **Heating, Refrigerating, and Air Conditioning Engineers**, semi-annual mtg., Detroit, Mich. (Miss J. I. Szabo, 345 E. 47 St., New York)

30–1. **Personnel Radiation Dosimetry**, symp., Chicago, Ill. (J. H. Pingel, Argonne Natl. Laboratory, Bldg. 301, 9700 S. Cass Ave., Argonne, Ill. 60439)

30–2. American **Physical** Soc., annual mtg., New York, N.Y. (The Society, Executive Secretary, Columbia Univ., New York 10027)

30–2. American Assoc. of **Physics Teachers**, New York, N.Y. (A. B. Arons, Physics Dept., Amherst College, Amherst, Mass.)

30–3. **Zodiacal Light and the Interplanetary Medium**, intern. symp., Honolulu, Hawaii. (F. E. Roach, Aeronomy Lab., Inst. for Telecommunication Sci-

ences and Aeronomy, Environmental Science Services Administration, Boulder, Colo. 80302)

31–2. Ciba Foundation symp. on **Cell Differentiation**, London, England. (Ciba, 41 Portland Pl., London W.1)

31–3. **Reinforced Plastics**, 22nd conf., Soc. of the Plastics Industry, Washington, D.C. (The Society, 250 Park Ave., New York 10017)

31–4. American College of **Radiology**, mtg., Los Angeles, Calif. (American College of Radiology, 20 N. Wacker Dr., Chicago, Ill.)

February

1–3. Southwestern Federation of **Geological** Soc., Hobbs, N.M. (American Assoc. of Petroleum Geologists, P.O. Box 979, Tulsa, Okla. 74101)

1–3. **Neural Regulation of Food and Water Intake**, conf., New York, N.Y. (P. J. Morgane, Communication Research Inst., 3430 Main Highway, Miami, Fla. 33133)

4–11. Pan American **Medical Women's Alliance**, 10th congr., Lima, Peru. (R. Quiroz B., Los Castanos 395, San Isidro, Lima)

5–6. American Soc. for **Testing and Materials**, natl. symp., Toronto, Ont., Canada. (ASTM, 1916 Race St., Philadelphia, Pa.)

5–10. American Soc. for **Testing and Materials**, winter mtg., Detroit, Mich. (ASTM, 1916 Race St., Philadelphia, Pa.)

6–7. **American Chemical Soc.**, 2nd Mid-Atlantic mtg., New York, N.Y. (S. M. Gerber, Ciba Co., Fairlawn, N.J. 07410)

6–8. **Flight Test, Simulation, and Support**, conf., Cocoa Beach, Fla. (Meetings Manager, American Inst. of Aeronautics and Astronautics, 1290 Sixth Ave., New York 10019)

6–8. Society of **Rheology**, winter mtg., Santa Barbara, Calif. (M. C. Shen, North American Aviation Science Center, 1049 Camino Dos Rios, Thousand Oaks, Calif. 91360)

7–8. **Sanitary Engineering**, 9th conf., Urbana, Ill. (J. H. Austin, 203 Engineering Hall, University of Illinois, Urbana 61801)

7–9. Institute of **Electrical and Electronic Engineers**, winter conv., Los Angeles, Calif. (Office of Technical Activities Board, 345 E. 47 St., New York 10017)

8–10. Canadian Inst. of **Surveying**, annual mtg., Ottawa, Ont. (Secretary, 157 McLeod St., Ottawa)

13–17. Australia–New Zealand Conf. **Soil Mechanics and Engineering**, 5th mtg., Auckland, New Zealand. (P. W. Taylor, Conf. Secretary, P.O. Box 6422, Auckland)

14–19. **Triplet State**, symp., American Univ. of Beirut, Beirut, Lebanon. (A. B. Zahlan, American Univ. of Beirut)

15–16. **Electron Probe Microanalysis**, conf., London, England. (Institute of Physic and the Physical Soc., 47 Belgrave Sq., London, S.W.1)

15–17. **Solid-State Circuits**, intern. conf., Philadelphia, Pa. (V. I. Johannes, Room 3E-323, Bell Telephone Labs., Holmdel, N.J. 07733)

15–24. **Scientific and Technical Films**, 4th intern. festival, Brussels, Belgium. (Centre Universitaire du Film Scientifique, 50 Ave. F. D. Roosevelt, Brussels 5)

16–18. **American Educational Research** Assoc., New York, N.Y. (L. Walters, 1201 16 St., NW, Washington, D.C. 20036)

17–18. **Thyroid**, 3rd Midwest conf., Columbia, Mo. (Executive Director, Continuing Medical Education, M-176 Medical Center, Univ. of Missouri, Columbia 65201)

18–22. American Acad. of **Allergy**, 23rd annual mtg., Palm Springs, Calif. (Executive Secretary, 756 N. Milwaukee St., Milwaukee, Wis. 53202)

19–23. American Inst. of **Mining, Metallurgical and Petroleum Engineers**, annual mtg., Los Angeles, Calif. (Executive Secretary, 345 E. 47 St., New York 10017)

19–25. **Biochemistry**, Chemical Inst. of Canada, conf., Ste. Marguerite, P.Q. (General Manager, 48 Rideau St., Ottawa 2, Ont.)

20–25. American Acad. of **Forensic Sciences**, mtg., Honolulu, Hawaii. (S. R. Gerber, 2153 Adelbert Rd., Cleveland, Ohio 44106)

21–24. **Offshore Exploration**, conf., Long Beach, Calif. (M. Richardson, Box 88, 2516 Via Tejon, Palos Verdes Estates, Calif. 90274)

22–24. **Biophysical** Soc., 11th annual mtg., Houston, Tex. (A. Cole, M. D. Anderson Hospital, Univ. of Texas, Houston 77025)

23–25. American **Physical** Soc., mtg., Austin, Tex. (K. K. Darrow, American Physical Soc., Columbia Univ., New York 10027)

26. **Psychoanalysis**, 5th annual conf., New York, N.Y. (D. M. Kaplan, 175 W. 12 St., New York 10011)

26–2. International **Anesthesia Research** Soc., 41st congr., Bal Harbour, Fla. (Executive Secretary, 227 Wade Park Manor, Cleveland, Ohio 44106)

27. **Thermoanalysis**, Chemical Inst. of Canada, symp., Toronto, Ont. (H. G. McAdie, Ontario Research Foundation, Toronto, Ont.)

27–1. American **Astronautical** Soc., mtg., Huntsville, Ala. (S. S. Hu, Northrop Space Labs., P.O. Box 1484, Huntsville)

27–1. Fundamental **Cancer Research**, 21st annual symp., Houston, Tex. (D. E. Frei, M.D., Anderson Hospital, Univ. of Texas, Houston 77025)

27–1. **Sounding Rocket Vehicle Technology**, conf., American Inst. of Aeronautics and Astronautics, Williamsburg, Va. (C. A. Sandahl, Mail Shop, 214A, NASA, Langley Station, Hampton, Va. 23365)

27–3. Australian **Dental** Congr., 18th, Melbourne. (J. M. Newton, 53 Martin Pl., Sydney, Australia)

27–3. **High Energy Physics and Nuclear Structure**, intern. conf., Rehovoth, Israel. (M. Sela, Weizmann Inst. of Science, Rehovoth)

27–3. **Membrane Structure and Function**, symp., Chemical Inst. of Canada, Ste. Marguerite, P. Q. (K. K. Carroll, Collip Medical Research Lab., Univ. of Western Ontario, London, Ont.)

28–1. **Systems Effectiveness**, 2nd conf., Los Angeles, Calif. (A. M. Wilson, Engineering Dept., Electronic Industries Assoc., 2001 Eye St., NW, Washington, D.C. 20006)