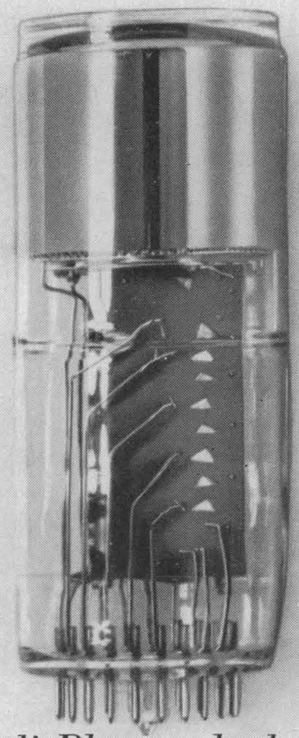
SCIENCE

13 November 1964

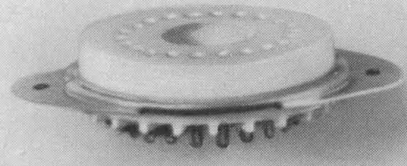
Vol. 146, No. 3646

AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

MIGRATORY SPARROW



RCA-C31000 Bi-Alkali Photocathode... 2 Nsec Rise Time



UNPARALLELED QE... 24% (Typical) @ 3850 Å

10 $\frac{\text{electrons}}{\text{Cm}^2\ \text{Sec}}$ @25°C

RCA now offers a heretofore unobtainable combination of highly desirable photomultiplier characteristics in one tube. Foremost of these attributes are unparalleled high speed and low noise characteristics coupled with high quantum efficiency.

These are just a few of the exciting benefits of RCA's new Photomultiplier—the developmental RCA-C31000. A "universal" type of tube for pulse applications, this 2" photomultiplier has a rise time of less than 2 nanoseconds. In addition, the improvement in the noise characteristic has been demonstrated by the measurement of thermionic emission values as low as 10 electrons cm^{-2} sec^{-1} at 25°C from the photocathode.

This new phototube offers unexcelled QE. For example: RCA-C31000, with its bi-alkali photocathode, has a typical quantum efficiency of 24% at 3850 angstroms. Many S-11 types with CS_3Sb cathodes have a QE of only 16% at 4200 angstroms. And of high importance, its dark current values are improved by as much as three orders of magnitude over S-11 types.

RCA-C31000, already finding application in liquid scintillation counting, time-of-flight measurements, medical equipment, and coincidence counting, has as among its numerous features: Low residual radioactivity envelope • 50 ohm output line to eliminate ringing • Teflon socket supplied, to accommodate base of rigid-pin construction • Uniform collection efficiency • CuBe substrate for stability • 8% (max.) Pulse Height Resolution • Freedom from shock excitation • No after pulse.

For more information on RCA-C31000, or other RCA Photomultipliers, including versions with semi-flexible leads, or potted voltage dividers, see your RCA Representative. For technical data, write: RCA Commercial Engineering, Section K31Q, Harrison, New Jersey.

RCA Electronic Components and Devices

The Most Trusted Name in Electronics

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SCIENCE

SCIENCE is published weekly by the American Association for the Advancement of Science, 1515 Massachusetts Ave., NW, Washington, D.C. 20005. Now combined with T **Scientific Monthly®**. Second-class postage paid at Washington, D.C. Annual subscriptio $8.50; foreign postage, $1.50; Canadian postage, 75¢; single copies, 35¢. School year subscriptions: 9 months, $7; 10 months, $7.50. Provide 4 weeks' notice for chan of address, giving new and old address and zip numbers. Send a recent address label. SCIENCE is indexed in the **Reader's Guide to Periodical Literature**.

AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

COVER

Migratory white-crowned sparrow (*Zonotrichia leucophrys gambelii*) at its wintering ground near San Jose, California. Birds of this species nest in northern Canada or Alaska and return each fall to the same location in California. They also have the ability to go back to the same winter home after artificial displacement across the continent. See page 941. [William K. Kirsher, Menlo Park, California]

Kodak advertises:

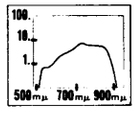
false, ugly, useful colors... help from the Bureau of Mines... the question raised by a new film

Try crazy color

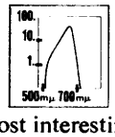
Pictures like these are seen in *Life*, *Look*, and *The Saturday Evening Post* as they should be seen—in color. There we boast of film to renew your conviction that the world is beautifully colored. Here we advise of another color film of ours carefully designed to show chlorophyll as magenta, a film that depicts the works of nature and of man in colors thoroughly false, generally ugly, and possibly useful.

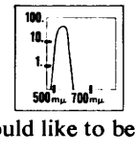
As put up for use in aerial cameras, this KODAK EKTACHROME Infrared Aero Film runs no less than around $110. We have learned that there are still some people around who are shy about laying out that kind of money on precious little assurance of success in their endeavors. We have therefore put it up in 135 form so that they can try out 20 shots in a KODAK RETINA Reflex Camera or such other 35mm still camera as the less fortunate find at hand.

A note to Eastman Kodak Company, Special Sensitized Products Division, Rochester, N. Y. 14650, will start one or more cassettes toward the Kodak dealer you name. We'll also tell you what to do about processing the film for the projector, just like real color film.

An energy distribution like 

will come out red;



, green; and 

, blue. The first is the most interesting. If you would like to be able to pick out from the rest of a scene of cropland or forest or a specimen of tissue or a patient's epidermis or a single cell at work—if you would like to pick out the parts that particularly absorb in this band, or particularly fail to absorb in this band, then this crazy film (aided by a wise choice of filter) fits you with the right kind of eyes, cheaply and simply. The ASA Exposure Index to daylight or electronic flash is 100 with a KODAK WRATTEN Filter No. 12 over the lens.

The rise of silazanation

We use 1,1,1,3,3,3-Hexamethyldisilazane (EASTMAN 9151) ourselves in our research on oil-soluble vitamins and food monoglycerides. It makes them volatile. Almost any hydroxyl-containing organic molecule that is not a high polymer becomes airborne at its kiss.* Almost any such compound one tries seems to turn into an ideal subject for sharp-cutting gas-liquid chromatography when made a trimethylsilyl ether. It is like replacing the proton of each hydroxyl with a bunch of balloons that protect it and lift it away from the grasp of hydrogen bonds. Maybe we would have missed the chance to base a business on high-vacuum distillation of heat-labile substances if silazanation had been discovered 30 years ago.

Silazanation, if the truth were known, drifted into our ken in the late summer of '63. A chemical news story told that a team at a medical school in Pittsburgh was having great good luck purifying carbohydrates and related polyhydroxy compounds by GLC with the trimethylsilyl derivatives. Without further ado we turned to the bench and enjoyed the same good luck with it on our vitamins and monoglycerides. Others had spectacularly good luck in *their* fields. Papers are popping all over on GLC of silazanized fatty acids, steroids, plant sterols, bile acids, alkaloids, barbiturates. There has also been one (*Ann. 659*, 190) on silazanation for peptide synthesis. The best is yet to be, now that we announce the easy availability of 25 grams of EASTMAN 9151 for $14.65.

And to whom are we all indebted? In part, to the U. S. Congress for voting tax money to help the coal industry compete in liquid fuels. In carrying out this mandate of the people, the U. S. Bureau of Mines found trimethylsilyl derivatives useful in analysis, identification, and purification of phenols and pointed out the applicability of GLC to the problem. Even an explanation of why chlorotrimethylsilane catalyzes the reaction comes from the Bureau. True, the Bureau was probably being influenced by organosilicon research sponsored by a glass company and two other big companies that happen to make silicones.

EASTMAN 9151 also inactivates GLC support materials against adsorption of the gaseous solute in competition with the stationary-phase liquid. This was discovered in the nonpolitical, non-commercial, prestige-covered halls of Cambridge University, alma mater to Isaac Newton. The boys were grinding up firebrick and taking their lead from the U. S. Bureau of Mines on the affinity of hexamethyldisilazane for the hydroxyls in the stuff.

To find out about all *the* EASTMAN *Organic Chemicals and their prices, write Distillation Products Industries, Rochester, N. Y. 14603 (Division of Eastman Kodak Company).*

* We kiss as follows: to 10 mg. of material, add 1.0 ml. of *Pyridine* (EASTMAN 214), 0.2 ml. of EASTMAN 9151 and 0.1 ml. of *Chlorotrimethylsilane* (EASTMAN P8710). Shake for 30 sec. and let stand for 5 min. while NH_4Cl precipitate settles. Take aliquot for GLC. To save for future reference, continue washing with alternate 5 ml. portions of water and *Hexane* (EASTMAN P1135) until pyridine odor is gone.

Prices subject to change without notice.

For background on how many milliroentgens film can distinguish from natural background

A new free pamphlet on personal monitoring films is available from Eastman Kodak Company, Special Sensitized Products Division, Rochester, N. Y. 14650. It contains a bibliography.

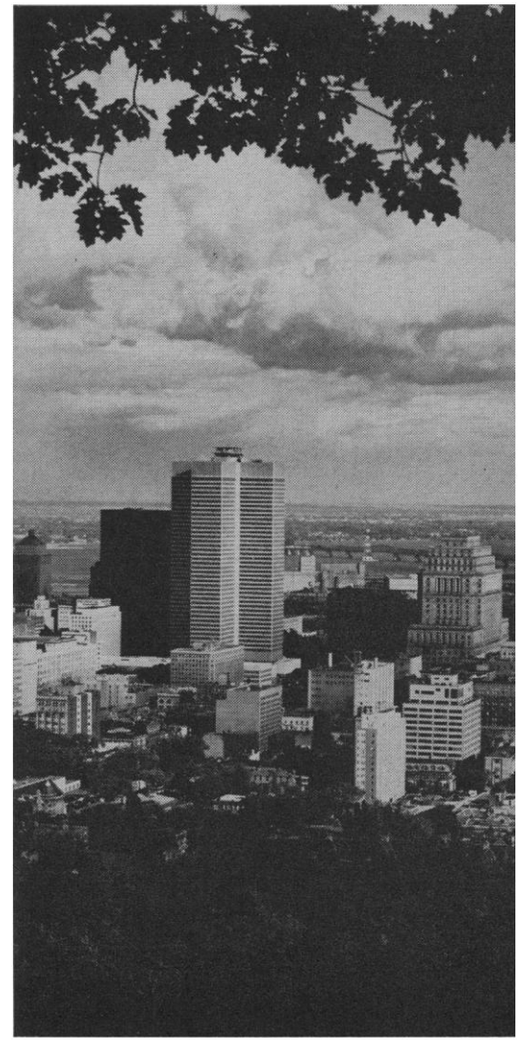
For background to the need for background on monitoring against background

Film-badge services rely on agreed "safe" levels of personal exposure. The arrangement permits the customer to treat the whole thing as routine. Is there any obligation to reopen the subject merely because a newer Kodak film happens to make it just as easy to detect a much smaller increment over natural background than was possible when the conveniently safe levels were chosen?

MONTREAL • 131st AAAS

Order Your General Program

It provides complete, detailed information about all the sessions and symposia scheduled, the Annual Exposition of Science and Industry, and the Science Theatre.



Program Highlights

Moving Frontiers of Science V. C. Wynne-Edwards on self-regulating systems in animal populations; J. M. Harrison on nonrenewable world resources; Philip Morrison, "New Channels in Astronomy"; and Clement L. Markert on role of genes in embryonic development.

Interdisciplinary Symposia Possible meteoric or lunar influences on meteorological phenomena; basic concepts of biochemical differentiation; medical geology and geography; history of the popularization of science.

Special Sessions AAAS Presidential Address by Alan T. Waterman; the Joint Address of Sigma Xi and Phi Beta Kappa by René Dubos; the George Sarton Memorial Address by Lloyd G. Stevenson; the National Geographic Society Illustrated Lecture; and the AAAS Distinguished Lecture by Lord Brain, retiring president, British AAS.

International Conference on Primate Behavior Three AAAS sections and the combined ESA and ASZ Section on Animal Behavior and Sociobiology are sponsors. Six sessions, open to the public, will include 37 speakers from four continents.

AAAS Committees Sessions of the AAAS Committee on Meetings, including two sessions on the sociology of science arranged and chaired by Robert K. Merton; and the Commission on Science Education.

Sections and Societies The 20 AAAS Sections and some 76 participating societies are scheduling specialized symposia; some have sessions for contributed papers.

AAAS Science Theatre The latest foreign and domestic films.

Exposition The Annual Exposition of Science and Industry is adjacent to all session rooms on the convention floor of the Queen Elizabeth Hotel.

Advance Registration By registering in advance, you avoid delay at the Registration Center on arrival, you receive the *General Program* in time to plan your days at the meeting, and your name is posted in the Visible Directory of Registrants when the meeting opens. Use the coupon below.

AAAS
1515 Massachusetts Ave., NW
Washington, D.C. 20005

(Check 1a or 1b)

1a. ☐—Enclosed is $5.00 Advance Registration Fee. This brings me the **General Program** and a **Convention Badge.**

1b. ☐—Enclosed is $3.00 for the **General Program.** (If I attend the meeting, the Badge, which I need to obtain the privileges of the meeting, will cost me $2.00 more.)

2. FULL NAME (Dr., Miss, etc.) .....
(Please print or typewrite) (Last) (First) (Initial)

3. OFFICE ☐ OR HOME ☐ ADDRESS .....
(For receipt of General Program)

CITY ..... STATE/PROVINCE ..... ZIP CODE/ZONE .....

4. ACADEMIC, PROFESSIONAL, OR BUSINESS CONNECTION .....

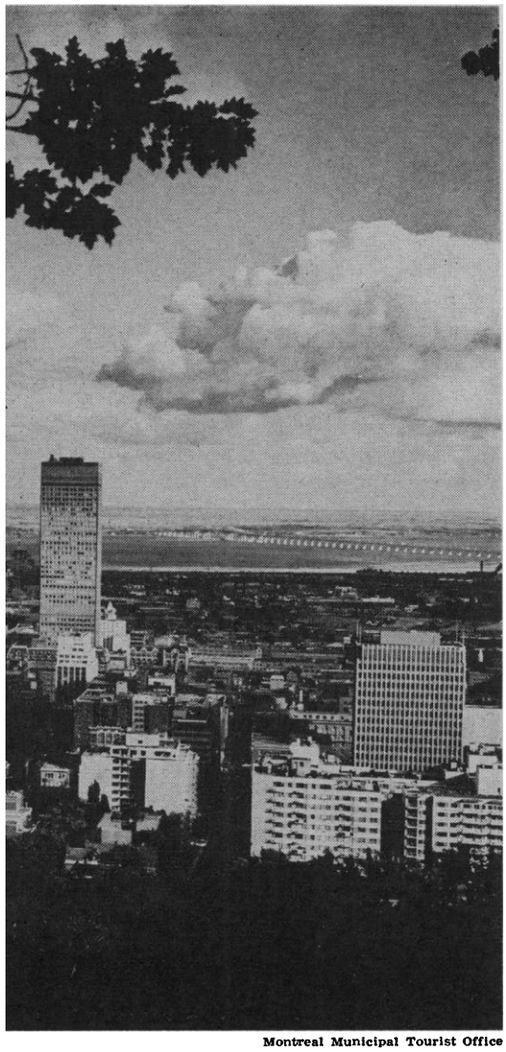
5. FIELD OF INTEREST .....

6. CONVENTION ADDRESS .....
(May be added later, after arrival)

Please mail this coupon and your check or money order for the total amount to the AAAS in Washington, D.C. (address as shown)

MEETING • 26–31 DECEMBER

Reserve Your Hotel Room



Montreal Municipal Tourist Office

Make sure you have the accommodations you prefer. A list of headquarters hotels of participating societies appears on page 299, 17 July, SCIENCE. The AAAS headquarters is the Queen Elizabeth.

The hotels for the AAAS Montreal meeting have established special, low rates and have reserved large blocks of rooms for the meeting.

Use the coupon below to make your hotel reservation in Montreal. **Send your application to the AAAS Housing Bureau in Montreal, not to any hotel.** Give a definite date and estimated hour of arrival, and also probable date of departure. The Housing Bureau will make the assignment and send you a confirmation promptly.

A rollaway bed can be added to any room at $3.00 per night. Mail your application now to secure your first choice of accommodations.

Hotels with asterisks have unlimited free parking for guests. The Windsor has overnight free parking for guests, but not between the hours of 9 A.M. and 4 P.M.

HOTEL RATES

For a list of the headquarters of each participating society and section, see page 299, 17 July, SCIENCE.

Hotel	Single	Double	Twin	Suite
*Queen Elizabeth	$ 8.50, 10.00	$15.00	$15.00	$30.00–$50.00
*Sheraton-Mount Royal	8.50, 10.00	15.00	15.00	25.00– 45.00
Windsor	8.50	15.00	15.00	25.00– 45.00
*Laurentien (Sheraton)	7.50	12.00	12.00	21.00– 30.00
Ritz Carlton	10.00	15.00	15.00	35.00
Berkeley	7.00	10.00	10.00	17.50

AAAS Housing Bureau
2055 Peel St., Suite 525
Montreal 2, Que., Canada

Date of Application .....

Please reserve the following accommodations for the 131st Meeting of the AAAS in Montreal, 26–31 December 1964

First Choice Hotel ..... **Second Choice Hotel** ..... **Third Choice Hotel** .....

Type of room: Single ☐ Double ☐ Double, twin beds ☐ Suite ☐ Rates: Desired ..... Maximum .....

Number in party .....Sharing this room will be: .....

(List name and address of each person, including yourself. Attach list if space is insufficient.)

.....

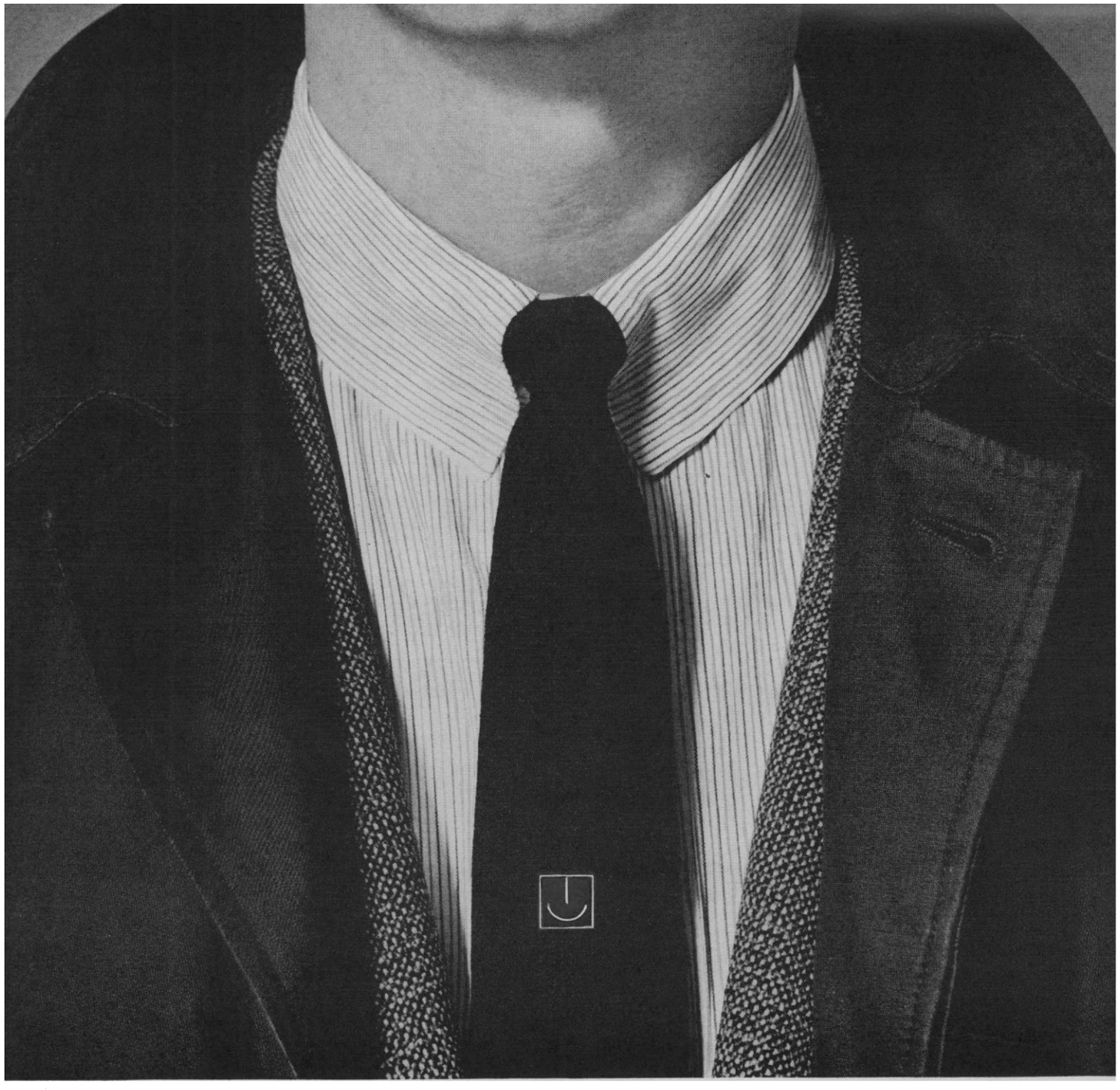
.....

DATES: ARRIVAL ..... A.M. .....P.M. ..... DEPARTURE .....
(These must be indicated—add approximate hour, A.M. or P.M.)

NAME .....
(Individual requesting reservation) (Please print or type)

ADDRESS .....
(Street) (City) (State/Province) (ZIP Code/Zone)

Mail this coupon now to the Housing Bureau. Rooms will be assigned and confirmed in order of receipt of reservation.



Wherever it's worn, it says dependable instrument service. And it's worn everywhere.

We believe that every purchaser of a Nuclear-Chicago instrument deserves reliable service when and where it's needed. That's what this "smile" symbol means: dependable service, everywhere.

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This kind of service depends on the man who answers your call. So our "smile" says people, too. Experienced, qualified people—ready to handle an emergency repair or a routine calibration. People you can talk to about an instrument modification or conversion. People who see to it that you get what you want in parts and accessories.

We've put men of this caliber into a nation-wide network of service centers—17 service offices, 24 franchised service agents, and 22 authorized service representatives. All this to make sure Nuclear-Chicago service is where you are.

Further, we offer two types of service contracts: one covers all service costs; the other provides maintenance and system assurance tests.

Get the full story on dependable instrument service. Call your Nuclear-Chicago sales engineer or your nearest service office. Or write for our service brochure.

NUC:S-4-256

NUCLEAR-CHICAGO CORPORATION

349 Howard, Des Plaines, Illinois 60018 U.S.A.

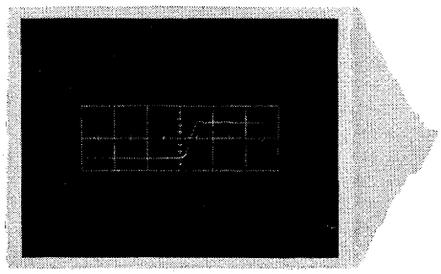
In Europe: Donker Curtiusstraat 7
Amsterdam W, The Netherlands

How do you take a picture of something you can't see?

Transient oscilloscope traces in the subnanosecond range move too fast for the human eye. How can you study them?

Use Polaroid 10,000-speed Land film. It's fast enough to make clear, high-contrast pictures of the most fleeting traces. And the results are fast, too.

Your pictures are fully developed in 10 seconds. If you are studying sequential traces, you can click off a full roll (8 exposures) in 20 seconds. Simply let the film stay in the camera back for 2 seconds, then pull the tab,



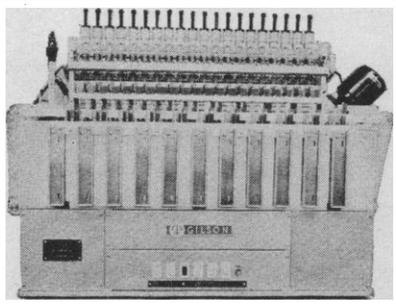
repeating the process for each exposure. Strip away the negative and you've got eight finished pictures.

The catalog name for this film is Polaroid PolaScope Type 410. It's panchromatic, responds best to blue phosphors such as P-11. The film's extreme sensitivity lets you use small camera apertures and low beam intensities too, so your trace pictures are really sharp.

Try Type 410 Land film the next time you need oscilloscope pictures. And see.

POLAROID AND POLASCOPE®

Polaroid 10,000-speed Land film.



THE GILSON RESPIROMETER, an innovation in the field of microrespirometry, provides for differential respirometry with digital readout in numbers of microliters.

A calibrated micrometer returns the manometer fluid to its balanced position by movement of a piston in the enclosed volume. This obviates the need for calibration of glassware and simplifies calculations.

Because there is no change in the level of manometer fluid at balance, this permits the connection of a large number of manometer-flask units to but a single reference flask.

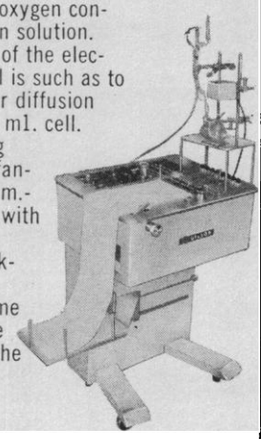
Varying barometric pressure and moderate variations in temperature have no effect. Furthermore, with an attached barometer and system for evacuation and supplying gas, an experiment can be conducted at either a standard pressure or at a pressure which may be chosen in order to simplify calculations.

Refrigerated and photosynthesis models are available.

A severalfold increase in accuracy and reproducibility of results is provided in comparison with a nondifferential method.

THE GME OXYGRAPH was developed in collaboration with Dr. S. Kuby of the Enzyme Institute, University of Wisconsin, Madison. It is a micro platinum cathode for recording rapid changes of oxygen concentration in solution. The design of the electrode vessel is such as to minimize air diffusion into the 2.5 ml. cell.

Recording is done on fan-folded, 20-cm.-wide paper with millimeter square markings. The response time is about one second for the full span of 200 mm.

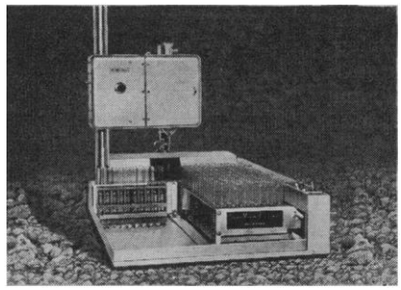


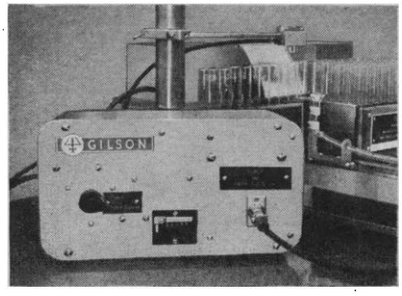
GME POLYGRAPHS are designed to provide convenient and accurate recording of physiological variables encountered in physiology, pharmacology, cardiovascular surgery, cardiac catheterization, and anesthesiology. The exclusion of utility for industrial use has resulted in simplification of operation and structure without loss of function in the field of biology.

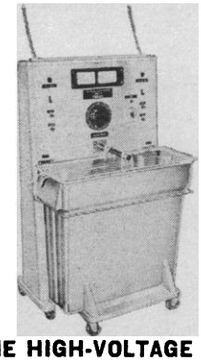
THE ESSENCE OF DIRECT AND SIMPLE DESIGN AND RUGGED CONSTRUCTION TO PROVIDE THE HIGHEST RELIABILITY

GILSON

GME FRACTIONATORS have been in use for many years and are being ordered in ever-increasing numbers. All of the available types of collecting units may be actuated by the new Gilson combination drop counter and timer, or by the Gilson volumetric unit. A miniature cold room is available to refrigerate the column without condensation problems.

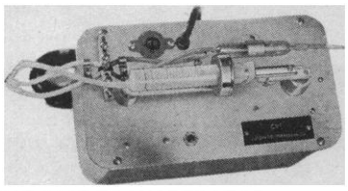






GME HIGH-VOLTAGE ELECTROPHORATORS are designed to provide rapid and convenient separation of polypeptides, amino acids, nucleotides, and many other compounds. The use of large sheets of paper permits chromatography in a second dimension for "finger printing," and high resolution one-dimensional separations. Model D—5,000 volts at 300 ma.; Model DW—10,000 volts at 500 ma.

UV-254
UV-265 1F for nucleotides
UV-280 1F for proteins
GME ULTRAVIOLET ABSORPTION METERS are designed to indicate which test tubes in the Fractionator contain material of interest.



THE GME TRANSFERATOR is an instrument designed to facilitate the use of the spectrophotometer. Successive samples may be transferred from test tubes into the spectrophotometer cuvette, read, and transferred back into the original test tubes.

GILSON MEDICAL ELECTRONICS Middleton, Wis. 53562 • On Madison's West Beltline Highway • Phone 608/836-1551

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ADVERTISING CORRESPONDENCE: Rm. 1740, 11 W. 42 St., New York, N.Y. 10036. Phone: 212-PE 6-1858.

Basic Research Journals

Two recent reports from the National Science Foundation, *Characteristics of Scientific Journals, 1949–1959*, and *Characteristics of Professional Scientific Journals, 1962*, contain a good bit of information about the 500 U.S. journals that serve an important scientific function by devoting more than half of their space to reports of basic research (not including technology, agriculture, and medicine). Typically these journals are small, with an average size of 1050 pages a year, 4400 subscribers (3300 domestic and 1100 foreign), and annual expenses of $31,500.

Analysis of the more detailed figures shows clearly that some of these journals are in trouble. Some are probably doing as well as can be expected. But others face a continuing struggle. Evidence comes from the efforts that editors have made to keep up with their problems. The average length of article has been decreased substantially since 1949. Format changes have allowed printing of a greater number of words per page. Half of the editors receive no compensation for the average of 800 hours a year they devote to their editorial duties. Advertising revenue for journals owned by scientific societies increased from 8 percent of all income in 1949 to 13 percent in 1959. Subscription charges, on a cost-per-word basis, were increased 37 percent from 1959 to 1962. Despite these efforts, many journals run at a loss; in 1962, 40 percent of the university-owned journals and nearly 20 percent of the society-owned ones were partially supported by subsidies or special grants.

Comparisons among the different groups of journals suggest some ways in which the weaker ones might achieve improvements, economies, or additional income.

Journals in engineering, physics, and chemistry have the most economical formats; those in biology and the social sciences, the most expensive. Among the society-owned journals, the cost to subscribers was lowest in physics ($0.67 a year per 100,000 words of research reports) and highest in the social sciences ($2.98 per 100,000 words). Costs were still higher for commercial journals, which typically have small circulations ($3.94 per 100,000 words).

The leadership of the American Institute of Physics in levying page charges against the authors' institutions is now being followed by some other journals, but most have not yet turned to this source of income.

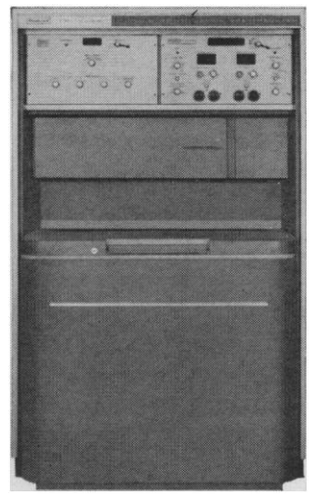
As circulation increases, and as the total amount of material published per year goes up, unit costs come down. There are difficulties in consolidating existing journals, but a change to fewer and larger journals would effect some economies. Studies of circulation overlap and patterns of subscriptions should turn up a number of candidates for journal mergers that could be published more economically than are the separate journals. Most scientists find it necessary to subscribe to several journals. But 500 journals provide fantastically more different combinations than there are scientists. If we assume that no individual subscribes to more than five journals (by no means an unusual number), then 500 journals provide approximately 2.5×10^{11} different combinations to satisfy the individualistic needs of some 2.5×10^{5} scientists. Surely fewer journals would suffice, and the merged ones would be stronger and healthier.—DAEL WOLFE

Quench Determination IN NEW TRI-CARB® SPECTROMETERS

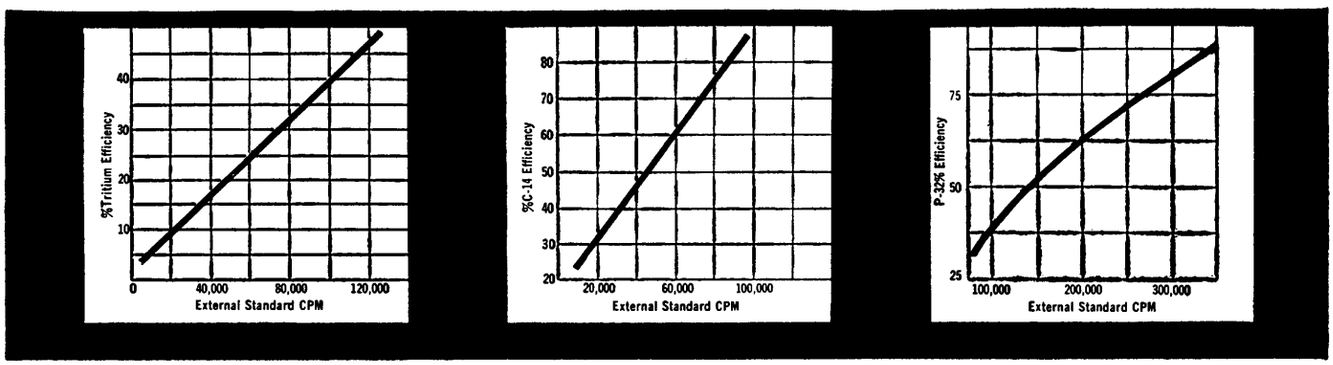
AUTOMATIC EXTERNAL STANDARDIZATION—In liquid scintillation counting, the most accurate quench determinations require that each sample be counted twice . . . with and without a known standard. Originally, this involved the addition of carefully measured amounts of an *internal* standard. Now, a new Packard development automatically introduces an *external* gamma standard into the counting chamber immediately after each sample count is recorded. The tedious and time-consuming addition of internal standards is no longer necessary, and the samples remain unaltered for further counting if desired.

The small sealed gamma standard used in Tri-Carb Spectrometers is transported rapidly and reliably by means of a pneumatic tube between a well-shielded, remote storage location and a precisely reproducible position in the counting chamber. It provides gamma radiation with energies well above those of the beta emitters commonly counted in liquid scintillation samples. When positioned adjacent to the counting vial, it generates a Compton electron spectrum in the sample and produces a light output that is affected by quenching substances in essentially the same way as the light produced by beta particles from the sample isotopes.

By adjusting the Tri-Carb Spectrometer to record the energetic portion of the Compton spectrum in one channel, sample counting efficiencies may be determined directly from curves such as those shown in Figures 1, 2 and 3. This method is entirely independent of the radioactivity of the samples, and good precision is obtained with only one-minute counts of the relatively high activity gamma standard regardless of the activity level of the sample.



3000 SERIES



Automatic External Standardization is standard on all 4000 Series Tri-Carb Spectrometers, and optional on most 3000 Series instruments. Furthermore, in line with Packard's policy of providing new features for existing instruments wherever possible, Automatic External Standardization is also available as a field modification for most 3000 Series Spectrometers.

CHANNELS RATIO—When sample activity is reasonably high and when quenching is not too severe, the Channels Ratio method may be used to determine counting efficiencies. This technique utilizes the radioactivity of the sample itself for determination of the degree of quenching. The change in spectral shape that results when colored or chemical quenching substances are present in a sample is measured by the change in ratio of the net counts in two channels of pulse height analysis selected to span certain portions of the spectrum. These ratios may be directly correlated with counting efficiencies of samples as shown by the curves in Figures 4 and 5.

Various models of 3000 and 4000 Series Tri-Carb Spectrometers provide calculators or true electronic digital computers programmed to present, in *addition* to total net counts *and* net count rate for each channel, all of the possible channel ratios.

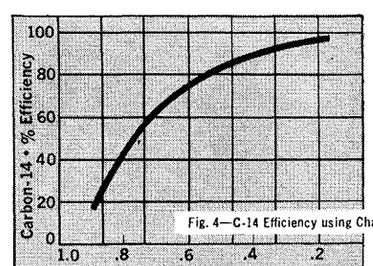


Fig. 4—C-14 Efficiency using Channels Ratio

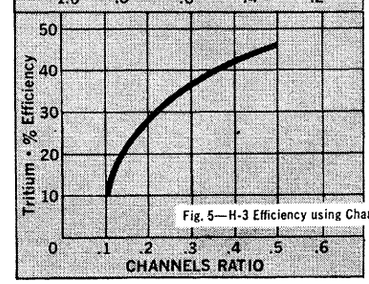


Fig. 5—H-3 Efficiency using Channels Ratio

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involve the formation of an intermediate between DPNH and triphosphopyridine nucleotide (TPN).

A second session, chaired by E. C. Slater, continued the discussion of mitochondrial compartmentation. Van Dam's determination of the relationship between the amplitude of the "ATP (adenosine triphosphate) jump" in rat liver mitochondria and the simultaneous appearance of diphosphopyridine nucleotide (DPN) leads to the tentative conclusion that the jump in ATP does not provide, as heretofore believed, evidence for high-energy intermediates of the respiratory chain. However, the need for verifying in terms of oxygen utilization the oxidation of DPNH and the consequent synthesis of ATP was emphasized by Estabrook. The difficulties of carrying out this experiment at low temperatures where the reactions of ADP are slow were pointed out.

As a second topic, the site of inhibition by atractylate was discussed. M. Klingenberg and his co-workers and A. Kemp and E. C. Slater presented evidence that, unlike oligomycin, atractylate does not inhibit the phosphorylation of mitochondrial ADP by inorganic phosphate, but that it prevents the interaction of external nucleotides with the internal mitochondrial pool of the mitochondria. This conclusion, which disagrees with those presented at the Sixth International Congress by Azzone and Bruni and by P. Vignais, is in agreement with Bruni's finding that stractylate prevents the binding of adenine nucleotides to the mitochondrial membrane, and J. B. Chappell's observation that all mitochondrial reactions supported by ATP (with the exception of adenylate kinase) are inhibited by atractylate. W. C. Hülsmann presented experiments suggesting that carnitine can stimulate mitochondrial respiration by relieving a block in the Krebs cycle at the α-ketoglutarate step, caused by a high ratio of acyl-CoA to free CoA.

A session devoted to cation uptake by mitochondria was chaired by H. Rasmussen, who emphasized the similarities and differences of calcium and magnesium uptake. B. C. Pressman discussed the structures of a number of antibiotics, among them valinomycin and gramicidin, in relation to the stimulation of active transport of sodium and potassium in mitochondria. Carafoli and Lehninger described the concomitant uptake of ATP with calcium in mitochondria with an observed stoichiometry of about 1 ATP for every 10 Ca^{++}. This uptake of adenine nucleotide served to balance in part the electrostatic charges associated with calcium accumulation. Klingenberg presented similar data on the concomitant uptake of adenosine diphosphate (ADP) during calcium accumulation; apparently a difference in results exists. The possibility that other cations such as sodium or potassium were transported during oxidative phosphorylation was considered, as was the nature of the high-energy compound which contributes the energy source for ion uptake. Chappell described experiments similar to those of Pressman in which gramicidin was used to stimulate potassium uptake and hydrogen ejection, and proposed a mechanism whereby hydrogen-ion transport out of the mitochondria might be accompanied by the uptake of divalent cations such as calcium and strontium or of monovalent cations such as potassium or ammonium ion, with or without the concomitant uptake of phosphate. In the case of

ammonium ion uptake, charges are balanced and proton ejection was not to be expected, while proton ejection could be observed in the case of divalent cations. Chappell and Chance emphasized the lack of respiratory stimulation in the reaction of potassium with the mitochondrial constituents. The sites of ion accumulation were actively discussed by Chappell, L. Peachey, J. Brierley, and Klingenberg, and it was concluded that the deposits of calcium can be observed in mitochondria associated with the membrane subunits (IMS) on the membraneous part as well as in the matrix. The general hypothesis that the matrix compartment is the area where cation accumulation occurs was presented, and Peachey emphasized that the normal granules of the matrix space provide a suitable point for calcium accumulation. The possible relation between ion uptake in mitochondria and in the whole cells was discussed by A. Kleinzeller, who emphasized the possible usefulness of the concepts developed from studies with whole cells to the mitochondrial problems.

In the session on the swelling of mitochondria, chaired by A. Lehninger, a number of factors affecting large-amplitude swelling were discussed by Hunter, Azzone, and Lehninger, with particular reference to the properties of peptides such as oxytocin and gramicidin (the latter participates in cation transport). The present status of contractile protein was evaluated by Azzone and Lehninger and compared with properties of the cold labile adenosine triphosphatase and actomyosin.

The effect of a soluble relaxing-factor preparation upon mitochondrial contraction caused by the addition of ATP and magnesium was discussed by H. Baltscheffsky, and experiments illustrating the temporary inhibition of contractility were presented. Lastly, the physical changes that occur in mitochondria in large-amplitude swelling were described by Lehninger, with particular emphasis on the fact that the basic lipid bi-layers of which the cristal membrane may well be composed cannot stretch to the degree required to explain large-amplitude swelling. The general question of the shape of the cristae in nature was evaluated critically, and it was pointed out that fewer cristae are observed in 0.44*M* than in 0.32*M* sucrose. A number of properties of mitochondria prepared in a high concentration of sucrose differ from those prepared in low sucrose concentration, particularly their high content of endogenous substrate and the relatively small response to added ADP. Chance presented the hypothesis that cristae may well be in the "collapsed" state as observed by Stoeckenius. The cristal structure would be held in this condition by cross-links between adjacent crista, which may well involve portions of the projecting subunits, that is, either a zipper-like interlocking of the heads or (in view of the evidence suggesting that the subunits project into the matrix space) an extension of these cross-links, allowing for a reasonable amount of swelling and shrinkage; in large amplitude swelling the cross-links may be entirely broken.

All in all the "compostium" a (polyglot term created by Bücher) appeared to be highly successful. The presence of experts on morphology as well as on enzymology helped to focus on the major areas currently under active investigation. A greater appreciation of the two approaches was achieved. In brief, the

meeting, although loosely organized, served as a forum for the extensive discussion in depth of current hypotheses dictating the direction of research in mitochondrial structure, biological oxidations, and associated energy-transfer reactions.

The organizers of the Malvern meeting are deeply indebted to Mrs. L. S. L. Chance and to the panel chairmen, Drs. Linnane, Palade, Ernster, Slater, Rasmussen, and Lehninger. The ability of these discussion leaders to set the rapid tempo of the meeting was the direct factor responsible for the success of this postcongress discussion session.

B. CHANCE
R. W. ESTABROOK
Johnson Foundation, University of Pennsylvania, Philadelphia 4

Forthcoming Events

November

21–22. American **Geological** Inst., Miami Beach, Fla. (L. Hoover, 1444 N St., NW, Washington, D.C. 20005)

21–24. American **Speech and Hearing** Assoc., San Francisco, Calif. (K. O. Johnson, 1001 Connecticut Ave., NW, Washington, D.C.)

23–24. **Water** for Texas, 9th annual, Texas A&M Univ., College Station. (E. T. Smerdon, Water Resources Inst., Texas A&M Univ., College Station)

23–25. American Physical Soc., **Fluid Dynamics** Div., Pasadena, Calif. (R. J. Emrich, Dept. of Physics, Lehigh Univ., Bethlehem, Pa.)

23–27. **Dosimetry of Irradiations from External Sources**, intern. symp., Health Physics Soc., French section, Paris, France. (M. Gras, 5, rue Armand, Gauthier, Paris 18e)

23–27. Use of **Radioisotopes** in Animal Nutrition and Physiology, symp., Intern. Atomic Energy Agency, Food and Agriculture Organization of the UN, Prague, Czechoslovakia. (Symp. Secretariat, Kärntnerring 11, Vienna 1, Austria)

23–28. **Internal Medicine**, 8th intern. congr., Buenos Aires, Argentina. (Secretariat, Melo 2081, Buenos Aires)

24. **Manufacturing Chemists'** Assoc., 14th conf., New York, N.Y. (Manufacturing Chemists' Assoc., 1825 Connecticut Ave., NW, Washington, D.C.)

26–28. Central Assoc. of **Science and Mathematics Teachers**, 64th annual, Detroit, Mich. (Sister Mary Ambrosia, Gesu Convent, 17180 Oak Drive, Detroit 48221)

27–28. National Council for **Geographic Education**, Minneapolis, Minn. (L. Kennamer, Univ. of Texas, Austin)

29–1. Applications of **Fundamental Thermodynamics** to **Metallurgical Processes**, conf., Pittsburgh, Pa. (G. R. Fitterer, Engineering Research Div., Schools of Engineering and Mines, 405 Engineering Hall, Univ. of Pittsburgh, Pittsburgh)

29–1. Association for Research in **Oph-**

thalmology, Minneapolis, Minn. (H. Kaufman, J. Hillis Miller Health Center, Univ. of Florida, Gainesville)

29–4. American Soc. **Mechanical Engineers**, annual, New York, N.Y. (D. J. Sengstaken, ASME Nuclear Engineering Div., Long Island Lighting Co., 175 Old Country Rd., Hicksville, L.I., N.Y.)

29–4. **Radiological** Soc. of North America, Chicago, Ill. (M. D. Frazer, 1744 S. 58 St., Lincoln, Neb.)

30. **Food and Drug Administration and Law** Inst., 8th annual conf., Washington, D.C. (S. T. Grey, Bureau of Education and Voluntary Compliance, FDA, Washington 25, D.C.)

30–1. **Mechanisms of Dental Caries**, New York Acad. of Sciences, New York, N.Y. (J. F. Fredrick, New York Research Laboratories, 3425 Boston Post Rd., Bronx, N.Y. 10469)

30–2. New Horizons in **Solid State Electronics**, seminar, Rochester, N.Y. (A. DeWinter, Rochester Inst. of Technology, Extended Services Division, Rochester 8)

30–2. **Pacific Air Force Medical** conf., Fuchu Air Station, Tokyo, Japan. (Lt. Col. R. J. Carter, 14th PACAF Medical Conf., USAF Hospital Tachikawa, APO 323, San Francisco, Calif.)

30–2. **Thalamic Regulation of Sensorimotor Activities**, symp., New York, N.Y. (M. D. Yahr, New York Neurological Inst., 710 W. 168 St., New York 10032)

30–3. **Atomic Industrial Forum**, annual, San Francisco, Calif. (Atomic Industrial Forum, 850 Third Ave., New York, N.Y.)

30–3. **Entomological** Soc. of America, annual, Philadelphia, Pa. (ES, 4603 Calvert Rd., College Park, Md.)

30–3. American **Nuclear** Soc., winter meeting, San Francisco, Calif. (W. H. Nutting, Pacific Gas and Electric Co., 245 Market St., San Francisco)

December

1. **Food Standards**, symp., Washington, D.C. (Food Law Inst., Inc., 205 E. 42 St., New York 10017)

1. **New Polyolefin Copolymer Plastics**, regional technical conf., Philadelphia, Pa. (E. A. Jeffreys, Registration Chairman, c/o Allied Chemical Corp., 901 Catalapa Rd., Warminster, Pa.)

2–4. **Communication Wires and Cables**, 13th annual symp., Atlantic City, N.J. (J. Spergel, WCS, U.S. Army Electronics R&D Laboratories, Fort Monmouth, N.J. 07703, Attn: SELRA/PEE)

2–5. **Crystalline Lens**, symp., Minneapolis, Minn. (J. E. Harris, Dept. of Ophthalmology, Univ. of Minnesota Medical School, Minneapolis 55455)

3–5. **American Chemical Soc.**, 20th annual southwestern regional meeting, Shreveport, La. (ACS, 1155 16th St, NW, Washington, D.C. 20036)

3–5. **Sociological Questions Pertaining to the Medical Field**, East German Hygiene Soc., symp., Berlin, East Germany. (German Acad. of Sciences, Mohrenstrasse 39, Berlin W.8.)

3–5. **Texas Acad. of Science**, annual, Dallas. (S. O. Brown, Texas A&M Univ., Box 33, College Station)

4. Central States Society of **Industrial Medicine and Surgery**, Iowa City, Iowa.

(Dean, State Univ. of Iowa College of Medicine, Iowa City 52241)

4–5. **American Rheumatism Assoc.**, annual, Washington, D.C. (J. A. Coss, Jr., 20 E. 76 St., New York 10021)

4–5. **American Rheumatism Assoc.**, 11th interim scientific session, National Institutes of Health, Bethesda, Md. (G. W. Speyer, ARA, 10 Columbus Circle, New York 10019)

4–5. Association for Research in **Nervous and Mental Diseases**, New York, N.Y. (R. J. Masselink, ARNMD, 700 W. 168 St., New York 10022)

4–5. **Oxygen in Biosystems**, basic science symp., New York, N.Y. (Miss J. Newkirk, New York Heart Assoc., 10 Columbus Circle, New York 10019)

4–5. **Oxygen**, symp., New York, N.Y. (A. P. Fishman, New York Heart Assoc., 10 Columbus Circle, New York 10019)

4–5. Southern Soc. for **Pediatric Research**, Houston, Tex. (F. K. Edwards, Emory Univ. School of Medicine, Thomas K. Glenn Memorial Bldg., 69 Butler St., Atlanta, Ga. 30303)

4–6. American **Psychoanalytic** Assoc., fall meeting, New York, N.Y. (APA, 1 E. 57 St., New York 10022)

4–9. American Acad. of **Dermatology**, Chicago, Ill. (S. E. Huff, AAD, 636 Church St., Evanston, Ill.)

5–6. Academy of **Psychoanalysis**, midwinter meeting, New York, N.Y. (A. H. Rifkin, AP, 125 E. 65 St., New York)

6. American Acad. of **Dental Medicine**, mid-annual meeting, New York, N.Y. (S. C. Conrad, 133-28 228th Street, Laurelton, L.I.)

6–10. American Inst. of **Chemical Engineers**, annual, Boston, Mass. (J. Henry, AIChE, 345 E. 47 St., New York 10017)

6–12. Latin American Congr. on **Microbiology**, 3rd, Bogota, Columbia. (O. Juliao, Instituto Nacional de Salud, Aptdo, Aereo 3495, Bogota)

7. American Institute of **Mining, Metallurgical and Petroleum Engineers**, annual, Tucson, Ariz. (H. N. Appleton, AIME, 345 E. 47 St., New York 10017)

7–9. Performance of **High Temperature Systems**, Pasadena, Calif. (G. S. Bahn, 16902 Bollinger Dr., Pacific Palisades, Calif. 90272)

7–9. Southern **Surgical** Assoc., meeting, Hot Springs, Va. (G. H. Yeager, University Hospital, Baltimore 1, Md.)

7–11. Chemical Effects Associated with **Nuclear Reactions and Radioactive Transformations**, symp., Vienna, Austria. (P. Ghelardoni, Div. of Scientific and Technical Information, International Atomic Energy Agency, Karntnerring 11, Vienna 1)

8–9. Ciba Foundation Guest Symposium on **Measurement of Oxygen Tension**, London, England. (Ciba Foundation, 41 Portland Pl., London, W.1)

8–11. American Soc. of **Agricultural Engineers**, New Orleans, La. (J. L. Butt, ASAE, 420 Main St., St. Joseph, Mich.)

9–11. **Antiviral Substances**, conf., New York Acad. of Sciences, New York, N.Y. (B. K. Forscher, Publications Section, Mayo Clinic, Rochester, Minn.)

12–15. American Acad. of **Optometry**, annual, Columbus, Ohio. (C. C. Koch, AAO, 1506-08 Foshay Tower, Minneapolis 2, Minn.)

14–16. **Hahnemann Medical College**, 13th symp., Philadelphia, Pa. (J. H. Moyer, Dept. of Medicine, Hahnemann Medical College, Philadelphia)

14–16. **Reticuloendothelial** Soc., meeting, New York, N.Y. (N. R. Di Luzio, Univ. of Tennessee Medical Units, Memphis)

14–17. **Adipose Tissue Metabolism and Obesity**, conf., New York, N.Y. (B. N. Brodoff, New York Acad. of Sciences, 2 E. 63 St., New York)

14–18. Conference on **Nuclear Electronics**, Bombay, India. (International Atomic Energy Agency, Karntnerring 11, Vienna 1, Austria)

14–22. **International Geological Congr.**, 22nd, New Delhi, India. (Secretary-General of the Congress, c/o Geological Survey of India, 27, Chowringhee, Calcutta 13)

14–22. International **Mineralogical** Assoc., 4th general, New Delhi, India. (J. V. Smith, c/o Dept. of Geophysical Sciences, University of Chicago, Chicago, Ill.)

15–16. **Periodic Functions in Live Matter**, Czechoslovak Meteorological Soc., conf., Prague. (J. Novak, First "Prof. Konopik" Dermatology Clinic, Prague 2, Apolinarska 4)

15–18. **High Energy Astronomy**, symp., Univ. of Texas, Austin. (Office of Aerospace Research, 4th and Independence Avenue, SW, Washington, D.C. 20233)

15-18. **Relativistic Astrophysics**, symp., Univ. of Texas and Southwestern Center for Advanced Studies, Austin. (Mrs. J. Wardlaw, Dept. of Physics, Physics Bldg. 438, Univ. of Texas, Austin 78712)

16–21. Inter-American Congr. of **Psychology**, 9th annual, Miami, Fla. (V. D. Sanua, Yeshiva Univ., 110 W. 57 St., New York 10019)

20–24. **Theoretical and Applied Mechanics**, congr., Kanpur, India. (M. K. Jain, Indian Inst. of Technology, Kharagpur, India)

21–23. American **Physical** Soc., Berkeley, Calif. (W. Whaling, California Inst. of Technology, 1201 East California St., Pasadena)

21–23. **Biology of Marine Microorganisms**, conf., Univ. of California, Berkeley. (R. Newton, Letters and Science Extension, Univ. of California, Berkeley 94720)

26–29. Society of **Systematic Zoology**/American Soc. Zoologists/Herpetologists' League, annual, Univ. of Tennessee,, Knoxville. (J. G. Rozen, Jr., Dept. of Entomology, SSZ, American Museum Natural History, Central Park West and 79th St., New York, N.Y.; A. G. Richards, ASZ, Dept. of Entomology, Univ. of Minnesota, St. Paul 55101; J. M. Legler, HL, Dept. of Zoology, Univ. of Utah, Salt Lake City)

26–31. **American Assoc. for the Advancement of Science**, annual, Montreal, Canada. (R. L. Taylor, AAAS, 1515 Massachusetts Ave., NW, Washington, D.C. 20005)

The following 45 organizations will meet in conjunction with the AAAS annual meeting in Montreal, Canada, 26–31 December:

Academy Conference (J. T. Self, Dept. of Zoology, Univ. of Montreal, Montreal)

Academy of Psychoanalysis (M. Ullman,

Maimonides Hospital, 4802 Tenth Ave., Brooklyn 19, N.Y.)

Alpha Epsilon Delta (M. L. Moore, 7 Brookside Circle, Bronxville, N.Y. 10708)

AAAS Commission on Science Education (J. R. Mayor, AAAS, 1515 Massachusetts Ave., NW, Washington, D.C. 20005)

American Astronautical Soc. (E. van Dreist, Director, Space Science Laboratory, North American Aviation, Downy, Calif.)

American Astronomical Soc. (G. C. McVittie, Univ. of Illinois Observatory, Urbana)

American Economic Association (H. E. English, Private Planning Assoc., 712 Sun Life Bldg., Montreal 2)

American Meteorological Soc. (K. C. Spengler, AMS, 45 Beacon St., Boston, Mass.)

American Nature Study Soc. (V. Rockcastle, Cornell Univ., Ithaca, N.Y.)

American Soc. of Naturalists (S. Granick, Rockefeller Inst., 66th St. and York Ave., New York 10021)

American Political Science Assoc. (E. B. Skolnikoff, Massachusetts Inst. of Technology, Cambridge)

American Soc. of Criminology (W. C. Reckless, Dept. of Sociology, Ohio State Univ., Columbus)

American Soc. for Microbiology (S. J. Ajl, Director of Research, Albert Einstein Medical Center, York and Tabor Rds., Philadelphia 41, Pa.)

American Soc. of Zoologists, Animal Behavior and Sociobiology Div. (G. W. Barlow, Vivarium Bldg., Wright and Healey Sts., Univ. of Illinois, Champaign)

American Sociological Assoc. (W. E. Moore, Russell Sage Foundation, 230 Park Ave., New York, N.Y.)

Animal Behavior Soc. (J. P. Scott, Jackson Laboratory, Hamilton Station, Bar Harbor, Maine)

Association canadienne-française pour l'Avancement des Sciences (M. J. Beauregard, ACFAS, C.P. 6128, Univ. of Montreal, Montreal)

Association for Computing Machinery (M. Woodbury, New York Univ. Medical Center, New York, N.Y.)

Biometric Soc. (D. S. Robson, Cornell Univ., Ithaca, N.Y.)

Canadian Aeronautics & Space Inst. (H. C. Luttman, CASI, 77 Metcalf St., Ottawa 4)

Canadian Assoc. of Geographers (J. T. Parry, Morrice Hall, McGill Univ., Montreal)

Canadian Assoc. of Physicists (A. C. H. Hallett, Dept. of Physics, Univ. of Toronto, Toronto 5)

Canadian Science Fairs Council (H. I. Bolker, Pulp & Paper Research Inst. of Canada, 3420 University St., Montreal 2)

Ecological Soc. of America (G. M. Woodwell, Brookhaven Natl. Laboratory, Upton, L.I., N.Y.)

Engineering Institute of Canada (G. T. Page, EIC, 2050 Mansfield St., Montreal 2)

Entomological Soc. of Canada (I. S. Lindsay, Defence Research Board, 125 Elgin St., Ottawa)

General Systems Knowledge (O. Wing, Columbia Univ., Dept. of Electrical Engineering, New York 10027)

History of Science Soc. (J. E. Murdoch, Harvard Univ., Cambridge, Mass.)

Institute of Management Sciences (B. V. Dean, Dept. of Management, Case Inst. of Technology, Cleveland, Ohio)

Medical Geology and Geography (H. V. Warren, Dept. of Geology, Univ. of British Columbia, Vancouver 8, B.C.)

Metric Assoc. (R. P. Fischelis, Ohio Northern Univ., Ada)

National Assoc. of Biology Teachers (R. Beidleman, Colorado College, Colorado Springs)

National Assoc. of Science Writers (L. S. Zahn, Hill & Knowlton, Inc., 150 E. 42 St., New York, N.Y.)

National Council of Teachers of Mathematics (J. Gates, NCTM, 1201 16th St, NW, Washington, D.C.)

National Geographic Soc. (R. W. Gray, NGS, 16th and M Sts., NW, Washington, D.C.)

National Inst. of Social and Behavioral Science (D. P. Ray, NISBS, 863 Benjamin Franklin Station, Washington, D.C.)

National Science Teachers Assoc. (A. F. Eiss, NSTA, 1201 16th St., NW, Washington, D.C. 20006)

Pharmacological Soc. of Canada (C. W. Nash, Dept. of Pharmacology, Univ. of Alberta, Edmonton)

Sigma Delta Epsilon (S. C. Stevens, VA Hospital, Lincoln, Neb.)

Society for Computer Programs in Biology and Medicine (R. S. Ledley, Natl. Biomedical Research Foundation, 8600 16th St, NW, Silver Spring, Md.)

Society for Economic Botany (Q. Jones, New Crops Research Branch, Plant Industry Station, Beltsville, Md.)

Society for General Systems Research (J. H. Milsum, Dept. of Electrical Engineering, McGill Univ., Montreal)

Society for the History of Technology (J. J. Beer, Dept. of History, Univ. of Delaware, Newark)

Society of the Sigma Xi (T. T. Holme, Sigma Xi, 51 Prospect St., New Haven, Conn. 06511)

Society of Technical Writers and Publishers (G. Marx, Director of Communications, Illinois Inst. of Technology, Research Inst., Chicago)

27–29. American **Philosophical** Assoc., Boston, Mass. (L. E. Hahn, Dept. of Philosophy, Southern Illinois Univ., Carbondale 62903)

27–30. American **Statistical** Assoc., Chicago, Ill. (D. C. Riley, ASA, 810 18th St., NW, Washington, D.C. 20006)

28–30. American **Economic** Assoc., annual, Chicago, Ill. (H. F. Williamson, AEA, 629 Noyes St., Evanston, Ill.)

28–30. American **Geophysical** Union, Seattle, Wash. (W. W. Kellogg, Rand Corporation, 1700 Main St., Santa Monica, Calif.)

28–30. **Linguistic** Soc. of America, New York, N.Y. (A. A. Hill, Post Office Box 8120, University Station, Austin, Tex. 79712)

28–30. Western Soc. of **Naturalists**, Univ. of Washington, Seattle. (I. A. Abbott, Hopkins Marine Station of Stanford Univ., Pacific Grove, Calif.)

30. **Scientific Research** Soc. of America, Cleveland, Ohio. (D. B. Prentice, 51 Prospect St., New Haven 11, Conn.)