SCIENCE

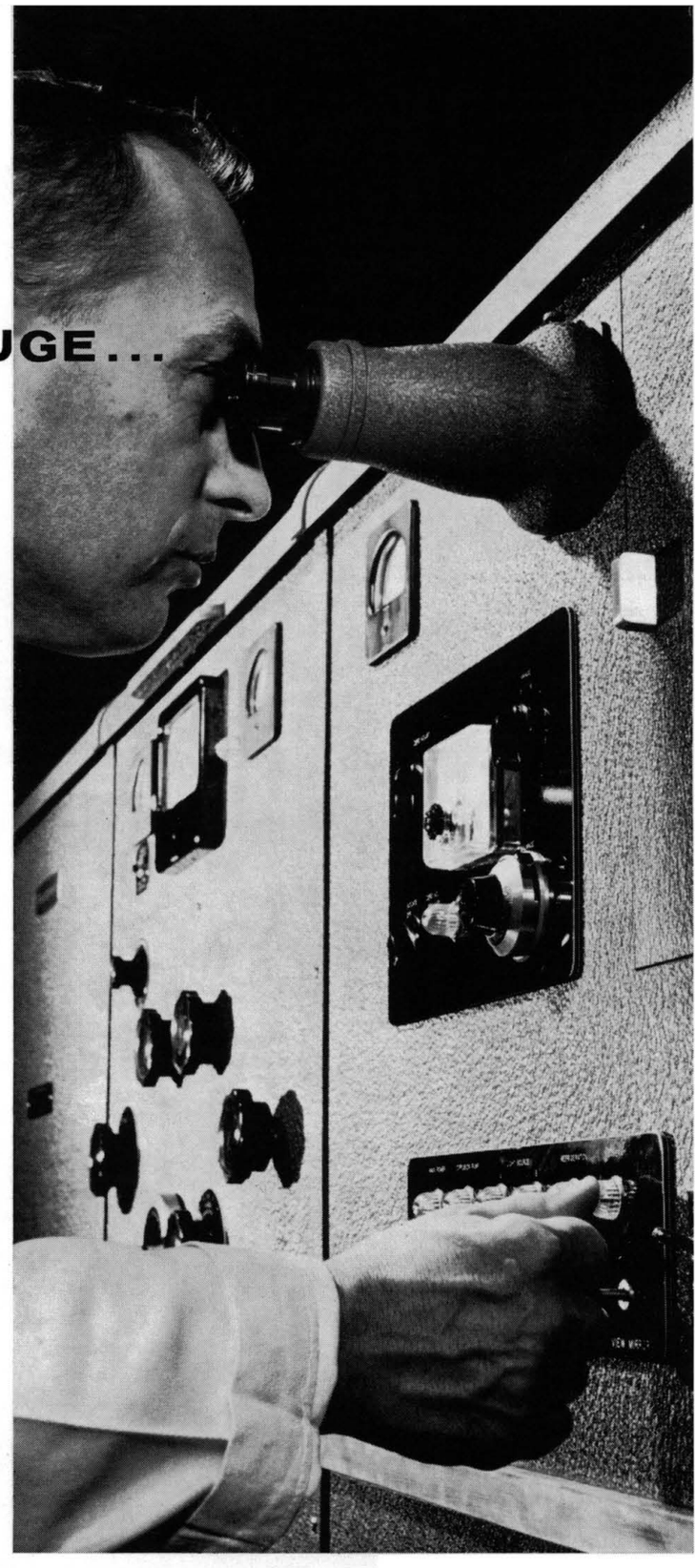
9 February 1962

Vol. 135, No. 3502

AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

New developments in the

ANALYTICAL ULTRACENTRIFUGE...



A Sharper Eye in the UV

Biochemists measuring molecular properties with the ultracentrifuge usually select either schlieren optics or interference optics to record the behavior of molecules in the centrifugal field.

More recently, the instrument's third optical system—ultraviolet absorption—has become increasingly favored because of developments both in instrumentation and technique. The instrumentation consists of a more precise absorption optical system built into the Beckman ultracentrifuge which gives sharper UV patterns, allows more sophisticated UV measurements.

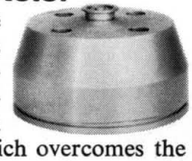
The techniques are principally: density gradient centrifugation, the new and popular method of separating nearly identical materials by taking advantage of minute differences in density; and molecular weight measurements at very low solute concentrations of strongly UV-absorbing materials such as nucleic acids and viruses.

Absorption optics, having come of age, promise to be increasingly useful in molecular research with the ultracentrifuge.

Windows of Sapphire

High-speed studies using interference optics are now practical with the development of sapphire windows for the ultracentrifuge cell. Quartz, the usual cell window material, begins to distort under extreme centrifugal forces, causing optical patterns to blur. The new sapphire windows are much stronger, and give clear fringes throughout the centrifugal force range of interference cells.

Low-speed Equilibrium Rotor



Equilibrium studies of very large molecules require low rotor speeds to prevent the molecules from sedimenting completely. For these low-speed studies, we have developed an extra-heavy rotor (22 pounds) which overcomes the tendency of lighter rotors to precess at low speeds, and gives sharp pictures down to 2,000 rpm.

If you are not familiar with the ultracentrifuge, we will be happy to send you copies of "An Introduction to Ultracentrifuge Techniques" and the latest issue of "Fractions," a periodical sent to owners of Beckman ultracentrifuges, electrophoresis-diffusion instruments and amino acid analyzers. Write:

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SPINCO DIVISION,
Stanford Industrial Park,
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86A

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Cover

Carbon replica of the surface of several cycloliths in a fragment of a coccosphere of *Cyclolithus* sp. from Middle Eocene deposits at Donzacq, Landes, France. Cycloliths are related to the modern coccoliths—skeletal elements produced by marine planktonic flagellates. Electron micrograph, × 30,000. [Kenneth M. Towe and William W. Hay, University of Illinois, Urbana]

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Edited by: Mary Sears.
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1959, 2nd printing 1961. 922 pages. 256 illustrations.
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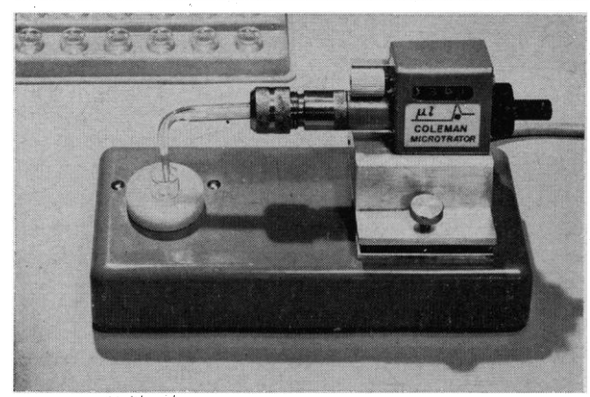

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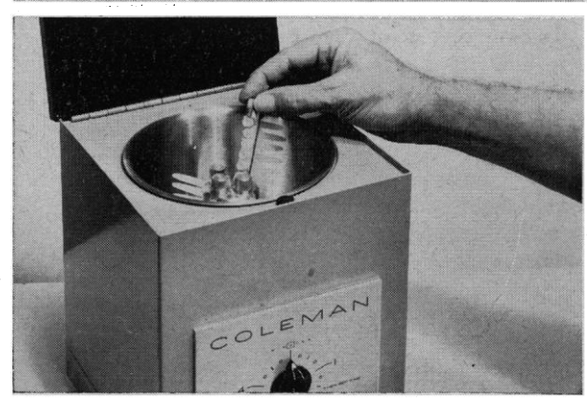

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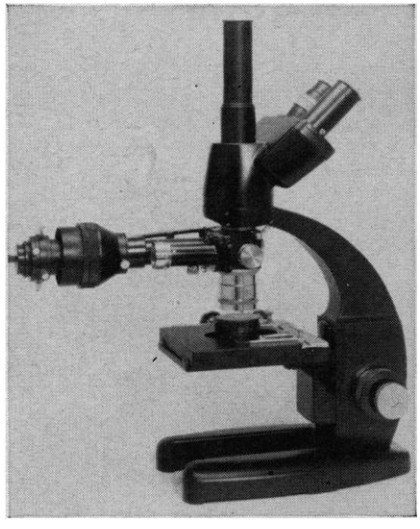
Instruments and Applications

Routine and research versatility of the M12 "universal" microscope

The M12 Metallurgical Microscope is carefully designed for full convertibility to allow use in the wide range of optical techniques usually associated with a "Universal" microscope.

The model shown is fitted for the examination and photography of opaque surfaces in bright field and dark field, the built-on light source being very intense and capable of photographic use at the highest powers.

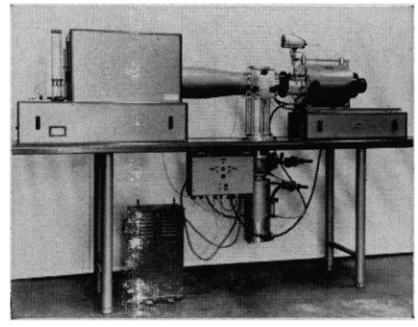


By mounting a substage motion, at little additional cost, the instrument can be used for transmitted light studies in bright field, dark ground, phase contrast and polarized light. Mixed illumination (simultaneous normal incident and transmitted) can be used. In this form, the microscope may be employed on the widest possible variety of specimens.

Alternatively a less expensive stage, normal incident illuminator and body may be chosen, if the user requires a comparatively limited but inexpensive instrument for routine or educational purposes.

A high temperature vacuum dilatometer

To meet the needs of those interested in dilatation studies of modern special metal alloys, Chevenard has produced the HT-60 Dilatometer.



With this instrument dilatation characteristics at temperatures up to 1500°C and in a very high vacuum can be determined.

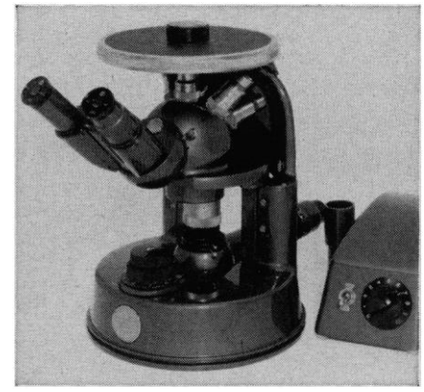
A photo-electric spot-follower principle of recording is employed and either "expansion vs. temperature" or "expansion vs. time" (the specimen being held at a constant temperature) curves can be obtained.

Design features of the Metalette microscope

This new metallurgical microscope has several innovations in stand design which improve optical performance and convenience in use.

The gliding stage is mounted to a fixed limb of ample proportions. Stage and specimen do not move during focusing, thus eliminating a common source of wear and fine vibrations as well as permitting the examination of very heavy specimens.

Coarse and fine adjustments are centrally located at top front of base. No control knobs project outside limb or base and controls are accessible with equal ease to each hand. In this instrument the fine adjustment control is the outside larger knob, the use of which facilitates the very small and precise motions required of it. All controls for adjustment of illumination are in easy reach just behind the focusing controls.

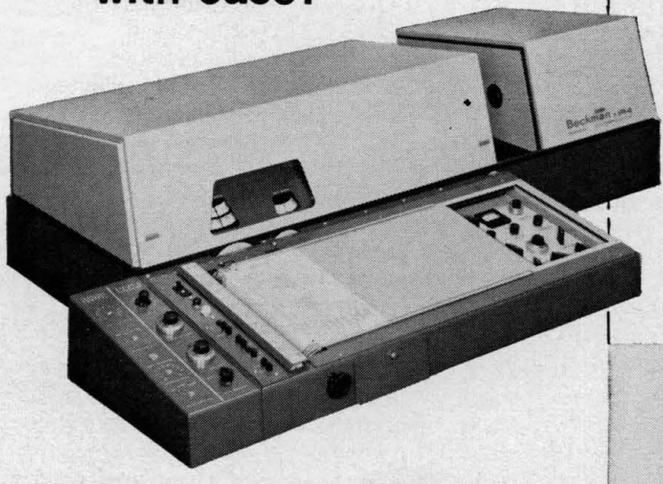


Ball bearing focusing slides, carrying objectives, illuminator and body are of unusual width. These slides subtend the wide angle of 114° at the optical axis — in comparison to a usual value of about 34° in conventional microscopes. This gives the microscope a rigidity which other designs cannot provide.

A long working distance objective suitable for use with heating stages

For work under such condition, the M7817 20X Long Working Distance Objective may be useful. Numerical aperture is low for an objective of this power, being 0.28, however, this objective is most versatile. A working distance of 14mm is provided; the lens can be used in either transmitted or normal incident light; it can be employed on specimens with or without cover glass (of whatever thickness), immersed or dry.

go from simple to complex Infrared applications with ease!



Special applications present no problem to the double-beam, double-monochromator Beckman® IR-4—most versatile of all infrared spectrophotometers. IR-4 design accommodates a wide variety of accessories to meet today's increasing need for unique IR analyses. Instrument down-time for accessory attachment is negligible. And equipping the IR-4 for the *unusual* in no way affects its capability to perform the *usual* qualitative and quantitative studies.

For the solution to your special IR problem, call your nearest Beckman Sales Office or write direct for Data File 38-6-02.

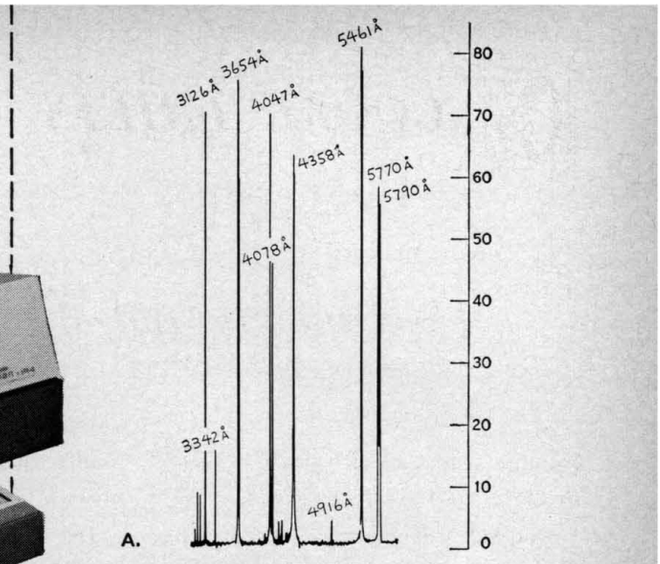
A. EXTENDED RANGE BENEFITS • It takes only minutes to convert the IR-4 to visible and near-UV ranges for high-resolution external source and detector studies. No second instrument is needed. There's no disassembly and assembly. Curve shows emission of mercury vapor in ranges indicated, using a .20 mm slit.

B. EXTERNAL SOURCE STUDIES • Use the IR-4 to analyze radiation from sources outside the instrument. Example: measuring infrared radiation from jet aircraft exhausts in order to minimize the tracking ability of enemy missiles.

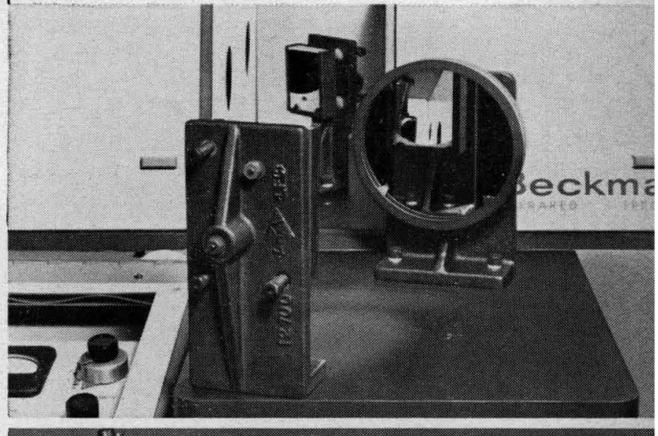
C. REFLECTANCE STUDIES • With HEMISPHERE REFLECTANCE ATTACHMENT, the IR-4 measures reflectance with or without specular components at various angles of incidence. Use HOHLRAUM CAVITY UNITS for total reflectance or emissivity studies. Example: heat absorption studies of commercial protective coatings.

D. EXTERNAL DETECTOR MONITORING • External detector optical systems permit the study of detector response as a function of wavelength. Example: checking the performance level of infrared tracking detectors in the nose cones of our missiles.

NOTE: *Attachments for above studies are also available with Beckman IR-5 and IR-7 spectrophotometers.*



A.



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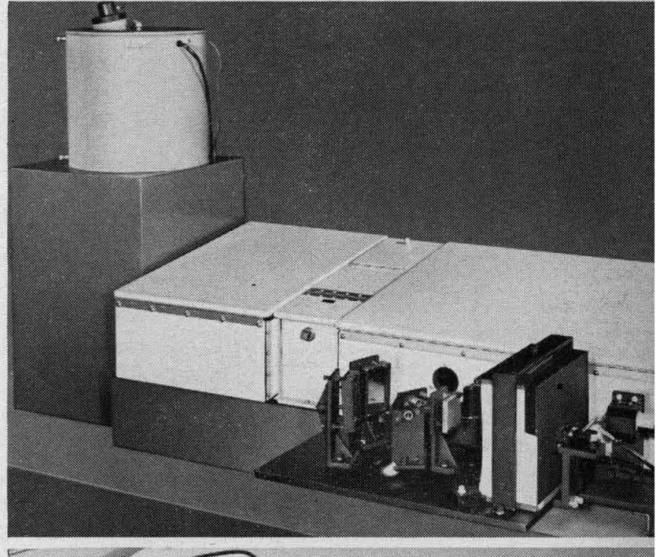

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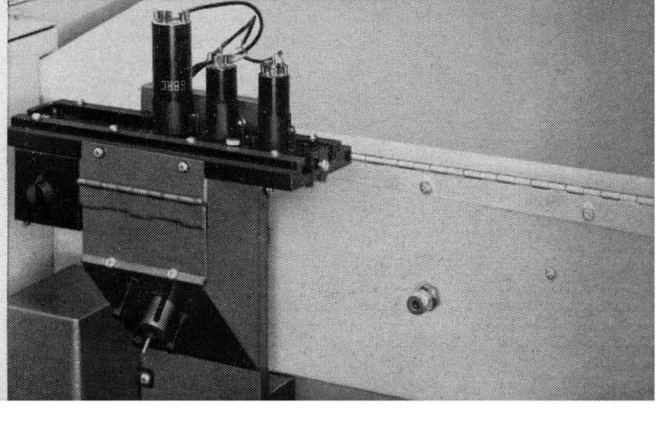

D.

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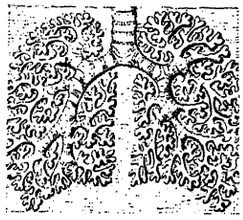
IT HAPPENED THIS MONTH...

a glance at yesterday in relation to today

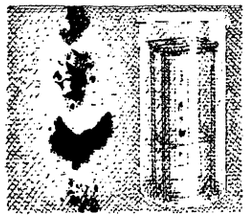


IN FEBRUARY—(1810)—in answer to critics of his work, Mr. J. Acton defends the thesis that seeds, plants, and animals, during their respective functions of germination, vegetation, and respiration, absorb oxygen gas and emit carbonic acid gas. There are some who believe that living organisms emit solid carbon which then unites with oxygen externally. Acton attempts to prove oxygen absorption by demonstrating changes in the color of the viscera of animals killed in an atmosphere of oxygen gas. He feels that oxygen uptake by the blood accounts for the formation of the carbonic acid gas, which must surely be more easily emitted in an aeriform rather than a solid state.[1]

Acton's critics were soon silenced and attention shifted to the details of the metabolic processes associated with the gas exchange. If Acton — like modern workers — had had C^{14} and O^{18} to work with, his ideas might have won acceptance more readily. Use of these isotopes has contributed enormously to our knowledge of respiratory and vegetative functions. For example, C^{14} compounds have played a key role in studies on photosynthesis. Schwarz BioResearch makes a wide variety of C^{14}-labeled biochemicals; our most recent addition is a group of C^{14}-labeled 5′-nucleotides.

IN FEBRUARY—(1938)—D. Breese Jones and his associates[2] report on some studies concerned with *Phaseolus vulgaris*, the "black turtle soup" bean of the Mayas. Anthropologists have reported that the Mayas subsist almost entirely upon this bean and maize, and yet are a strong, healthy race. Jones' findings indicate a supplemental relationship between the bean and maize protein: the relatively large content of lysine, tryptophane, histidine, and cystine in the bean protein contrasts sharply with low concentrations in maize.

If you are studying the physical, chemical or biological properties of proteins, Schwarz BioResearch does not offer you beans, but we do offer an array of optically standardized amino acids and derivatives labeled with C^{14}, H^3, N^{15}, or O^{18} . . . and many CBZY amino acids, amino acid esters and polyamino acids that we distribute for Yeda of Israel.



IN FEBRUARY—(1961)—a short communication from the Mirsky group discusses nuclear "amino acid-transfer" RNA. Their previous work had shown that isolated thymus nuclei contain amino acid activating enzymes and are capable of sustained amino acid incorporation into nuclear protein. Now they have incubated C^{14}-labeled leucine with a nuclear fraction containing RNA and activating enzymes. After incubation the mixture was hydrolyzed with ribonuclease and a radioactive leucine-adenosine complex isolated by paper electrophoresis and chromatography. This indicates that the receptor group of nuclear (like cytoplasmic) "transfer" RNA is adenosine.[3]

Whether you work with nucleus or cytoplasm, RNA or DNA, radioactive or non-radioactive compounds, check the Schwarz catalog. If you do not have a copy, write for it.

1. Acton, J.: Further remarks on respiration, in answer to J. F. J. Nat. Phil., Chem., and the Arts 25:88 (Feb.) 1810. 2. Jones, D. B.; Gersdorff, C. E. F., and Phillips, S.: Proteins of the black bean of the Mayas, Phaseolus vulgaris. J. Biol. Chem. *122*:745 (Feb.) 1938. 3. Hopkins, J. W., Allfrey, V. G., and Mirsky, A. E.: Adenosine as the receptor end group in nuclear amino acid transfer RNA. Biochim. et Biophys. Acta *47*:194 (Feb. 12) 1961.

9 February 1962, Volume 135, Number 3502

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Alas, a Lack, or Why English Slept

Almost anyone can think up ways to improve high school teaching of English. We can do without memorizing *The Rime of the Ancient Mariner*. It stoppeth one, if not two, of three students. And instead of retracing the trials of Silas Marner at the pace at which they were lived, one could read more rapidly a few contemporary novels. Use of paperback books, in their variety and availability, should permit students and teachers to satisfy individual tastes. And for students going to college, more demanding instruction in composition should eliminate the need for that perennial hodgepodge, Freshman English.

What is really needed to improve English instruction, however, is not random thoughts but a systematic study of the curriculum, from elementary school through the first year or two of college. Such an effort is now under way in the U.S. Office of Education's Project English. Plans call for setting up curriculum study centers at three universities this spring. The curricula, borrowed or invented, will be designed to teach students to read with comprehension and to write with clarity. Literature will be included as it bears on these goals. The most promising feature of the project is the effort to draw upon the talents of university people outside, as well as inside, the schools of education.

Use of persons who are not professors of education does not, of course, make this English program unique. The program bears some similarity to the now familiar efforts at reform in teaching science and foreign languages, which are supported by the National Science Foundation and, under the National Defense Education Act, by the Office of Education. The main idea is also to put a little more emphasis on rigor and a little less emphasis on "life-adjustment." Actually, most students are not fortunate enough to have suffered even the abuses of rigor illustrated in the examples in the first paragraph above.

Project English is starting on a makeshift basis, and it includes other efforts about which it is harder to be enthusiastic. It includes, for example, educational research of the kind that, if it succeeds at all, can only demonstrate the obvious — such as the bearing of vocabulary size on reading comprehension. The key idea of the project, however, is the establishment of the curriculum centers. As the project grows, the hope is to establish more centers. And as blocs of sensible yet imaginative curricula start coming from the centers, the hope is to set up institutes for retraining teachers. These institutes would be similar to those already established for science teachers and foreign language teachers. To move to this final stage, however, will require not only a great deal more money from Congress but also special legislation.

The director of the project is J. N. Hook, who recently came to Washington on leave from the department of English of the University of Illinois. Being in the Office of Education, Hook will work more closely, of course, with the personnel of that office than did his counterparts in some of the earlier work on science teaching. But with reform in education gaining respectability, this could operate to the advantage of the program. The Office of Education had been growing famous for taking the education out of education. Perhaps it will now grow famous for putting it back.—J.T.

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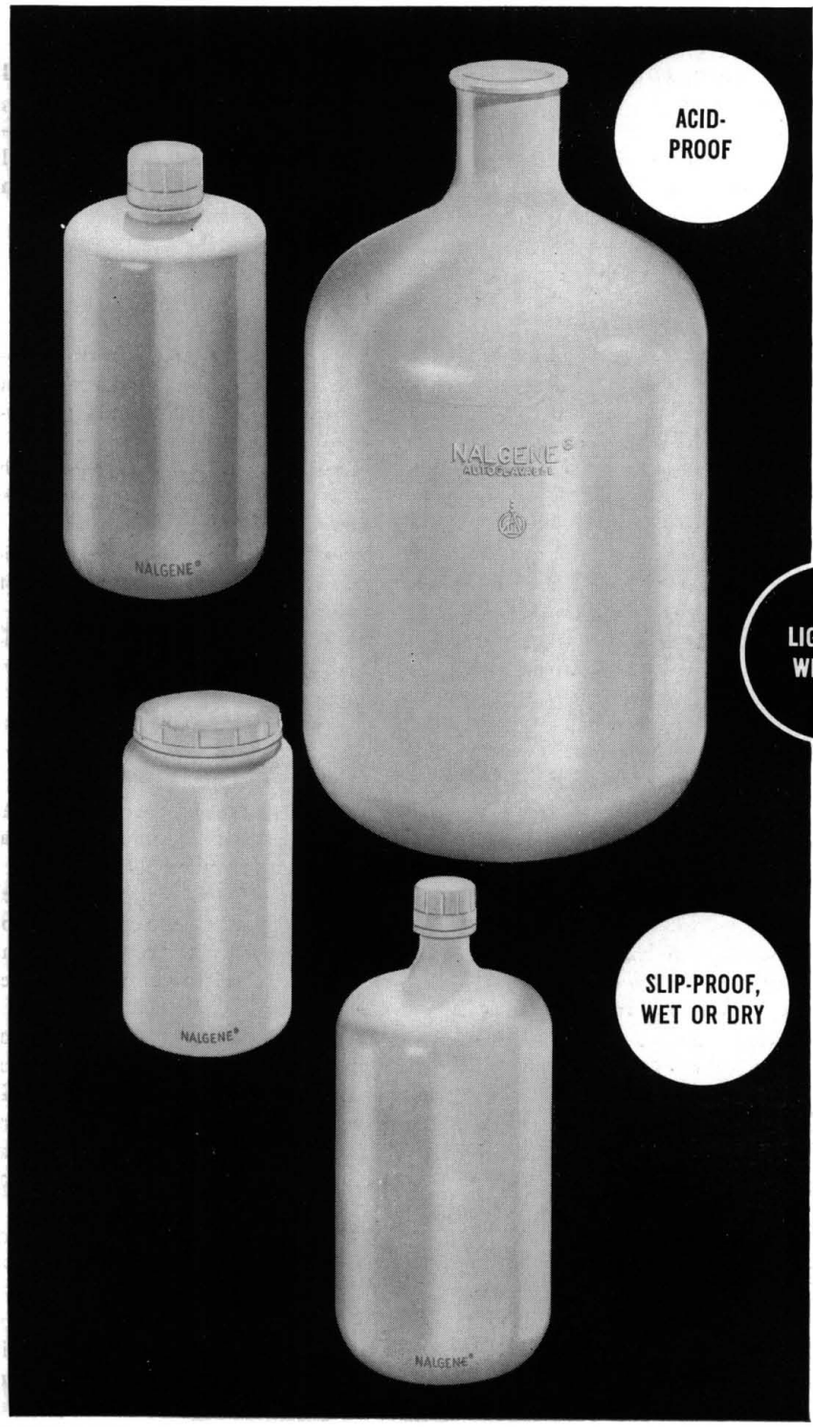

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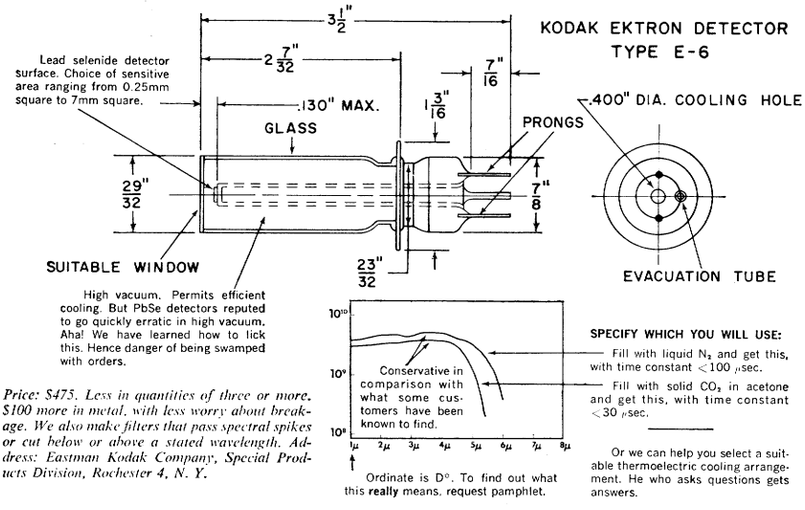
ST. LOUIS • NEW YORK • MONTREAL

Kodak reports on:

PbSe detectors, stable in high vacuum . . . gentle gravity . . . a note for your little black book . . . Miss Kellogg's project

For sale practically off the shelf:

(unless response to this advertisement swamps us)



Price: $475. Less in quantities of three or more. $100 more in metal, with less worry about breakage. We also make filters that pass spectral spikes or cut below or above a stated wavelength. Address: Eastman Kodak Company, Special Products Division, Rochester 4, N. Y.

A slide projector like a merry-go-round

This is the Kodak Carousel projector. It projects slides. Carousels symbolize carefree abandon. Care lest slides jam can be abandoned. Gravity feeds them. Gentle gravity. Slides are automatically lifted back to 80-slide storage tray. Pushbuttons at end of long cord advance slides,* reverse, even refocus. (Latter is largely for kicks. Actually, slides get prewarmed not to pop out of focus.) See Kodak dealer for exact price. You will find it is less than $150. Lucky you happen to be in the market at this particular time.

*Alternatively, projector can be set to advance every 5, 10, or 20 seconds. This scheme is more urbane than an alarm clock for the chairman.

Second-best acetonitrile

Demand has waxed for *Spectro Grade Acetonitrile* (Eastman S488) despite a price of $7.10 for 250 ml, which suggests widespread concurrence with our belief that nobody else offers acetonitrile as pure as our acetonitrile. Pain at having to charge such a price is eased a little by reflecting that the achievement of this purity calls forth more dogged determination than any other item in the house.

Despite all the noble effort, altogether too many lots of acetonitrile fail to make the grade as Eastman S488 because of trifling hydrocarbon impurities. Recently we succeeded in palming off some of this rejected acetonitrile on our own chemical researchers. They wanted it not as a spectro solvent but for some syntheses involving acid chlorides, where water or alcohols are bugaboos—or, as one educated young man put it, no electron donors allowed.

That sophisticated remark, the eagerness with which a genuine customer from the outside later lapped up similar batches of our acetonitrile for non-spectro purposes, and a price of only $5.05 for 500 grams of this *Anhydrous Acetonitrile* (Eastman plain 488) conspire to remind us of the Lewis acid-base definition, the earlier Brönsted acid-base concept, and the non-aqueous titrimetry technique which has arisen from the Brönsted concept and which now permits so many unlikely compounds to be regarded and measured as acids or bases in suitable non-aqueous solvents.

Eastman plain 488 makes such an eminently suitable and inert solvent for this purpose! For instance, a great variety of amines can be dissolved in it and titrated with perchloric-acid-in-glacial-acetic acid, viz.,

$$HClO_4 + HOAc \longrightarrow H_2^+OAc + ClO_4^-$$

$$H_2^+OAc + R'R''R'''N: \rightleftharpoons R'R''R'''NH^+ + HOAc$$

Write down in your little black book: "Non-aqueous titrimetry."

And while you have your pen out, you might jot down that some 3900 Eastman Organic Chemicals can be ordered from Distillation Products Industries, Rochester 3, N. Y. (Division of Eastman Kodak Company).

Roentgen movies

Miss Lina-Lou Kellogg, working anonymously as "X-ray Sales Division, Eastman Kodak Company, Rochester 4, N. Y.," has issued another edition of her bibliography of x-ray cinematography. Eighteen months since the previous edition have added some 175 references, bringing us to some 750. It's a live subject, all right. "Kelly" has the impression that interest is shifting from technique to medical interpretation. She also has the feeling that she is barely scratching the surface. She knows and regrets that her Russian coverage is weak. Still, about 25 people a week ask and receive. So don't be bashful.

Prices subject to change without notice.

Kodak
TRADE MARK

This is another advertisement where Eastman Kodak Company probes at random for mutual interests and occasionally a little revenue from those whose work has something to do with science

as the ATP turnover time and the phosphate potential (ATP/ADP·P_i) were determined and related to electron transfer in various metabolic states of ascites tumor cells. The relationship between energy-linked cytochrome oxidation and light-induced electron transfer was also examined.

The full proceedings of the symposium on respiration and fermentation will be published by the Ronald Press. The abstracts of the symposium papers and the shorter contributed papers are scheduled to appear in the January issue of the *Journal of General Physiology*, currently the official publication organ of the Society of General Physiologists.

Newly elected officers are Albert Tyler, president; Teru Hayashi, vice-president; David Bishop, secretary; and Barry Commoner and Andrew Szent-Györgyi, councilors. Thirty-eight new members were voted into the society.

BARBARA WRIGHT
Huntington Laboratories, Massachusetts General Hospital, Boston

DAVID W. BISHOP
Department of Embryology, Carnegie Institution of Washington, Baltimore, Maryland

Forthcoming Events

February

26–2. Current Trends in Nuclear Power, symp., Tucson, Ariz. (L. Weaver, Nuclear Engineering Dept., Univ. of Arizona, Tucson)

27–1. Application of Switching Theory in Space Technology, symp., Palo Alto, Calif. (J. P. Nach, Lockheed Aircraft Corp., Sunnyvale, Calif.)

March

1–3. Florida Acad. of Sciences, Gainesville. (J. B. Lackey, Dept. of Civil Engineering, Phelps Laboratory, Univ. of Florida, Gainesville)

1–3. Fundamental Cancer Research, Conceptual Advances in Immunology and Oncology, symp., annual, Houston, Tex. (Univ. of Texas, Anderson Hospital and Tumor Inst., Houston 25)

1–3. Scintillation and Semiconductor Counters, 8th symp., Washington, D.C. (G. A. Morton, RCA Laboratories, Princeton, N.J.)

2–4. National Wildlife Federation, Denver, Colo. (T. L. Kimball, 1412 16 St., NW, Washington 6)

4–7. Association for Higher Learning, Chicago, Ill. (Chief of Information, Dept. of the Army, Washington 25)

4–8. Association for Supervision and Curriculum Development, Las Vegas, Nev. (Chief of Information, Dept. of the Army, Washington 25)

4–8. Conference on Gas Turbine Power-Process Industries, American Soc. of Mechanical Engineers, Houston, Tex. (A. B. Conlin, Jr., ASME, 29 W. 39 St., New York 18)

5–9. Analytical Chemistry and Applied Spectroscopy, conf. and exposition of modern laboratory equipment, Pittsburgh, Pa. (C. F. Glick, Applied Research Laboratory, U.S. Steel Corp., Monroeville, Pa.)

5–16. United Nations Economic and Social Council, Committee for Industrial Development, New York, N.Y. (U.N., New York)

8. Problems Relating to Food and Feed Additives, Assoc. of Vitamin Chemists, Chicago, Ill. (H. S. Perdue, Abbott Laboratories, N. Chicago)

9–14. National Science Teachers Assoc., annual, San Francisco, Calif. (M. T. Ballou, Ball State Teachers College, Muncie, Ind.)

10–13. Microminiaturization Congr., New York, N.Y. (C. G. Sedan, American Watchmakers Inst., 18465 James Couzens Hwy., Detroit 35, Mich.)

11–17. American Congr. on Surveying and Mapping—Amer. Soc. of Photogrammetry, annual, Washington, D.C. (G. K. Emminizer, Jr., 106 Valley Rd., Ellicott City, Md.)

12. Wildlife Soc., Denver, Colo. (C. Gordon Fredine, 5921 Anniston Rd., Bethesda 14, Md.)

12–14. North American Wildlife and