50,000,000 tube hours...
an unusual electron tube
still keeps undersea
voice signals strong

Deep on ocean floors, from North America to Europe, between Key West and Havana, Florida and Puerto Rico, under the Pacific to Hawaii and Alaska—in 20,000 miles of undersea telephone cable—a special kind of electron tube is setting a remarkable record for reliability.

This four-inch-long electron tube was designed, developed and fabricated at Bell Telephone Laboratories to operate with no attention for 20 years or more. It is part of the submarine cable repeater manufactured by Western Electric which faithfully and reliably amplifies voice signals transmitted along undersea coaxial cables.

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Years before it was put to use, Bell Laboratories scientists and engineers began developing this undersea tube, another example of forward-looking technology that has made the Bell Telephone Laboratories the world center of communications research and development.

BELL TELEPHONE LABORATORIES
Inexpensive Flat Field
High-dry Achromat

It is inevitable that conventional achromatic objectives have a certain amount of field curvature, if the best central definition is to be obtained. There is, however, a need for high-power dry objectives with flat fields, especially in the more routine laboratory uses of the microscope, and many makers compute their 40X objectives to give a flatter field while sacrificing something in resolution. In these past few years some elaborate designs have given flat fields without this compromise, but these objectives have not been generally adopted because of the very high cost involved.

An Inexpensive Flat Field
High-dry Achromat

Many applications for the comparatively new techniques of thermogravimetry (measurement of weight change through a heat-time cycle) have been discovered in the fields of chemistry and metallurgy. In order to extend these studies into the critical areas where high temperatures and high vacuums are required, specialized apparatus has been needed.

Extension of Thermogravimetric Techniques

A New Research
Polarizing Microscope

The Cooke M75 series Universal Polarizing Microscope is designed for both quantitative and qualitative mineralogical techniques and, at the same time, provides for those having special requirements for observation in conventional transmitted and incident light microscopy.

A large universal stand is supplied fitted for either built-in "solid source" illumination or an exterior higher-power source. Both stage and limb are mounted on robust dovetail slides and can be moved and clamped to provide up to 105mm of free space between objective and stage surface, allowing use of special set-ups and very large specimens. Different types of stage for a wide variety of special purposes can be instantly interchanged. There is a centerable aplanatic condenser suitable for both conoscopic and orthoscopic observation without the necessity for a trip-out front lens. A quartz compensator in the binocular body eliminates any partial polarization effects of the inclination prisms.

With this microscope all mineralogical techniques as well as regular transmitted and normal incident light studies in bright field, dark field and phase contrast can be carried out. Slotted objectives permitting insertion of compensators just above the objective back lens and a "Wright" slotted ocular can be supplied.

A new basic approach to this design problem has been taken by Cooke resulting in the development of a new 40X achromatic objective. The Microplan 40 gives an extremely flat field of view, retains the maximum definition of the best N.A. 0.65 conventional achromatic objectives, and costs only slightly more. Because of tube length considerations the objective is most suitably used with the Cooke M15 Biological Microscopes.

The new Chevenard TH59 Thermobalance has been developed for routine and research studies in programmed temperature cycles up to 1500°C with specimens (up to 50 grams in weight) in a high vacuum or any desired controlled atmosphere. Recording is accomplished by a photoelectric spot-follower system of novel design. Very small weight changes can be shown as a function of time or of time and temperature.

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By Frank A. Geldard, University of Virginia. Written by one of today’s leading psychologists, this new introductory text provides an up-to-date and internally consistent account of man’s nature as revealed through experimentation. It presents the study of psychology as a disciplined, scientific inquiry which draws upon the biological sciences for an understanding of basic human phenomena and upon the social sciences for insights into the most complex aspects of human behavior. The author’s coverage is complete and systematic—no important topic in modern general psychology is omitted. Important experiments are introduced throughout the book as the basic material from which psychological facts and principles emerge. The entire work has been organized in such a way as to stress the interrelation of motivation, learning, and perception in human behavior. In addition, chapters are devoted to such important topics as personality deviations, group behavior, and the future of psychology. 1962. Approx. 484 pages. Prob. $6.93.

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By Curtis L. Hemenway and Richard W. Henry, both of Union College; and Martin Caulton, RCA Laboratories. A self-contained presentation of the physical principles governing the operation of electronic devices, this book develops the understanding in depth which is needed for further study of electronic circuits as well as for actual work in electronics technology. It begins by presenting the necessary basic physics (i.e., elementary quantum mechanics and statistical mechanics) and then uses this basic material to develop a physical understanding of vacuum, gaseous, liquid, and solid-state devices. 1962. Approx. 376 pages. Prob. $9.50.*

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major way, by nucleation and growth and by surface reactions, in contrast to barrier films for which high-field ion transport is all-important. The absence of an extensive discussion of the nucleation and growth of anodic films is the most serious fault in the book.

DAVID A. VERMILYEA
General Electric Company, Schenectady, New York

Natural Products


This book, which represents the proceedings of a symposium on plant phenolics held in Bristol in April 1960, should be a required addition to any substantial library on natural products. The contributors, English, German, and Swiss organic chemists, are members of a group that meets several times each year with the object of promoting "the advancement of the knowledge of phenolic and related constituents of plants."

The book is composed of 12 chapters, the first six of which deal extensively with the biosynthesis of plant phenolics. Chapters 1 to 3, written by R. W. Richards, W. C. Whalley, and H. Grisebach, respectively, give a most satisfactory picture of our present knowledge of the biosynthesis of phenolic compounds and of the biogenetic relationships between them.

In chapter 4, W. D. Ollis and I. O. Sutherland present an excellent review of the occurrence, structure, and synthesis of those phenolic natural products which contain isoprenoid moieties.

Some recent studies on the intramolecular free-radical coupling of phenols, made by C. H. Hassall and A. I. Scott and their collaborators, are summarized in chapter 5. This chapter is highly recommended to any organic chemist interested in natural products. As the authors point out, the importance of this coupling reaction is bound to grow as we understand more about the biosynthesis not only of plant phenolics but also of alkaloids and fungal metabolites.

The remaining six chapters are of a more specific nature and deal with the isolation and structure determination of such diverse phenolic compounds as the gallotannins, tannins from algarobilla, biflavonols, phenolic C-glycosides, the betacyanins, and antibiotics related to rutulintanine and the pyrromycinones.

The entire book is well written and attractively printed; it contains a wide abundance of structural formulas and references. In particular, it is a relief to see that the editor has used Arabic instead of Roman numerals to number the individual structures. Typographical mistakes have been kept to a minimum.

MAURICE SHAMMA
Department of Chemistry, Pennsylvania State University

For Amateur Coleopterists


A combination of art and science, with art predominant, this book is spectacular. It is primarily a demonstration of the art of photographing in color the largest, most colorful, and most bizarre beetles of the world and of shadowing and printing these photographs, enlarged two or three times, so that the beetles seem to be alive—great armored animals glistening in the sun. One has to look very closely to find the spot on the right elytron from which the mounting pin was withdrawn. There are 60 full-page (9.5 by 13.3 inch) color plates with the names of the beetles and other information about them on the facing left-hand pages. From one to nine species are illustrated in each plate, a total of 224. Where there is marked difference in ornamentation between male and female, specimens of both sexes may be shown. In one instance a large grub is pictured.

It really does not matter very much that there are also 66 pages of two-column, double-spaced text about beetles—the picture is the thing wherein to capture the attention and admiration of layman and entomologist alike. This is a "gee-whiz" or "oh, my" book, not a book for identification of American beetles, nor even of European beetles, which are stressed because the book was originally written in German and published in Germany under the title, Der Käfer. Of the species pictured, only six are found in the United States; most are tropical.

I hope this book will stimulate the development of amateur entomology in the United States, which lags behind European countries and Japan in this delightful collecting hobby. For would-be American coleopterists the most useful part of Beetles gives suggestions for finding, catching, killing, labeling, and preserving beetles in a collection. To sum up, this is a book to be given to those who may be susceptible to its pictures.

FRANK L. CAMPBELL
Division of Biology and Agriculture, National Academy of Sciences—National Research Council

New Books

Biological and Medical Sciences


The sharp minds now focussed on the information-storing function of photography always seem to wind up thinking very small. At the same time electronics is shrinking to microelectronics. This also requires thinking very, very small about photography.

We cannot be blamed for feeling a little wistful while we cheer photography’s progress in Lilliput. A remarkably small number of dollars worth of Kodak High-Resolution plates are used up in producing a remarkably large number of micro-transistors.

Fear not for us. We’ll make out.

Nowhere will you catch us claiming that this “micro” business is as easy photographically as falling off a log. Indeed, an appreciation of the relationship between the logs of exposure and reciprocal transmittance makes scarcely more than a good beginning toward controlling them on a micro scale. Here the frequency response of a photographic emulsion must be cascaded with the frequency response of the other components in the total picture-handling system.

The game is widely believed to be worth the candle. To shed light on what is really going on, one needs to be able to measure density reliably over an area as little as 1/4 micron wide, scanned in synchronism with a recorder so that hard-to-judge light sensations are logarithmically converted into easier-to-judge traces on a chart.

Shown above is such an instrument we built for our own work. Here also, perhaps, is some of the answer to the little economic problem we have hinted at. We can be paid for our work through sale not only of the cartoned products of our research but also through sale to others of the best available tools for such research. If we can line up orders for, say, half a dozen of these Kodak Microdensitometers, Model 3, we would be able to deliver them for about $38,000 apiece, more or less.

A note to Eastman Kodak Company, Special Products Sales, Apparatus and Optical Division, Rochester 4, N.Y., will bring enough details to approach the boss for authorization to come to Rochester for a look and a talk.

Mcnair’s Stationary Phase

\[
\begin{align*}
H_2C-OCH_2CH_2C&=N \\
H_6C-OCH_2CH_2C&=N \\
H_6C-OCH_2CH_2C&=N
\end{align*}
\]

1,2,3-Tris(2-cyanoethoxy)propane (25 g. for $3.25) is a liquid which makes a good stationary phase for gas chromatographic columns. It has better selectivity for olefins, aromatics, naphthenes, alcohols, esters, ethers, and alkyl halides than can be expected of solvents like dinonyl phthalate. Its affinity for paraffins is small, but even these are separable at 55°C. One can see reasons why one might have expected that this triple-ply ether with nitrile prongs would exhibit a useful combination of phlegmatic character and polar attraction to various molecular species passing by.

Frankly, it had not occurred to us. It occurred instead to Mr. H. M. McNair. Mr. McNair was engaged at the time in earning the right to be addressed as Doctor McNair. This required that something new and decidedly significant be freely contributed to human knowledge. McNair undertook to fulfill the obligation by studying 17 solvents and 40 solutes for correlation between retention volumes and solvent-solute interaction forces. One of the fruits of the investigation was the knowledge (duly contributed to mankind in Anal. Chem. 33, 806) of the wide usefulness in gas chromatography of 1,2,3-Tris(2-cyanoethoxy)propane. While Doctor McNair has moved along to the research laboratories of a large corporation (not the one paying for this space, as it happens), we suggest the substance be remembered as McNair’s Stationary Phase.

Alternatively, you can remember it as Eastman 8443, one of some 3900 Eastman Organic Chemicals sold by Distillation Products Industries, Rochester 3, N. Y. (Division of Eastman Kodak Company).

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What would you say to a photographic paper that comes out red or blue, depending on the color of the exposing light and black where they overlap?

If you would like to buy some for experimentation with photographic playback systems (or other purposes), we might be able to oblige. Write Eastman Kodak Company, Photorecording Methods Division, Rochester 4, N. Y.

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The photomicrographs at upper right are of an adrenal cortical carcinoma at 100x and 400x magnification. They were taken with the setup pictured above—a standard laboratory microscope, a Honeywell Pentax 35mm single lens reflex camera with microscope adapter and right-angle finder, and a Honeywell Strobonar (electronic flash) light source. A second Honeywell Pentax body, loaded with color film, stands by.

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New Products

The head and tape-transport assembly of a compact 26-ounce magnetic tape recorder (model MTR-362LT) are capable of operation at temperature extremes of -80° to +82°C. This device incorporates two new major features, a precision gear drive (see cut) and a silicon rubber capstan as mover for the tape. It is available with 7- or 14-channel heads and with ½- or 1-inch tape, which moves at speeds of 3 3/4, 7½, 15, or 30 in./sec with conventional, FM, carrier erase, or digital modes of recording. This model holds 75 feet of 1-mil Mylar tape. Its working parts are protected by a rugged case of investment cast aluminum. A sister device of the recorder has been used to record physiological reactions to environmental extremes, for example, in the free falls of Joseph Kittinger.—R.L.B. (Leach Corp., Dept. S31, 717 N. Coney, Azusa, Calif.)

Resolver bridge (series 130 IR) features 2-second accuracy and 0.1-deg resolution of angular setting, according to the manufacturer. Settings are made digitally by means of front-panel knobs. The instrument is direct reading over the range from 0 to 360 deg without interpretation, interpolation, or quad-

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rare switching. Design of the four-arm resolver bridge is based upon the toroidal ratio-transformer divider. Instruments with operating frequency ranges from 20 to 3000 cy/sec are available, and resolutions as fine as 0.001 deg can be obtained on special order.—J.s. (Astrosystems, Inc., Dept. S36, 220 East 23 St., New York 10, N.Y.)

Multipurpose display console (model S-C 1090)—designed for monitoring digital computers—displays characters, symbols, and vectors on the 19-inch-diameter screen of the manufacturer's shaped-beam tube. Since the tube requires only a few microseconds to display a single character, more than 1000 characters can be displayed on the tube face in nonflickering presentation. Optional equipment such as an internal test routine, input register, level converters, internal storage of complete display frame, vector generator, expansion and off-centering, and category selection are available to adapt the instrument to specific data-system requirements. In addition to constant monitoring of computer outputs, the unit can display a significant block of stored information, as well as the contents of data registers in the computing section of the system. This quick-search capability makes possible rapid debugging of new programs without mechanical printing of information.—J.s. (General Dynamics/Electronics, Dept. S41, 1895 Hancock St., San Diego 12, Calif.)

Gamma irradiation unit, capable of dose rates greater than 10⁴ r/hr when cobalt-60 is used, is self-contained and requires no additional shielding. Dose rates at the surface of the shield are said to be substantially less than minimum AEC requirements. Solid, liquid, or gaseous samples may be irradiated in the main chamber with complete monitoring during irradiation. Continuously flowing gases or liquids may be irradiated in a coil surrounding the source. Alternatively, the coil may be used to provide temperature control of the irradiation chamber. Controls permit automatically timed exposures.—J.s. (Ohio-Nuclear, Inc., Dept. S45, 27105 Knickerbocker Rd., Cleveland 40, Ohio)

Portable standing-wave amplifier (model B813T) is said to provide accuracy of ±0.05 db for the full-scale meter movement and for each 5-db step on the range switch. Calibrated range is 75 db. Normal, expanded, and com-

* With capillary electrodes for samples as small as a single drop, the new Metrohm-Brinkmann equipment for Blood pH measurements represents an improved version of the components first introduced in 1959. Used in hundreds of hospitals and laboratories throughout the U.S., this equipment fulfills all the requirements for satisfactory Blood pH determinations. For further information contact exclusive U.S. distributors, address below.
pressed meter scales are provided and can be used interchangeably without readjusting the gain control. Other features include controls and circuitry for bolometer protection and for selective meter damping, bandwidth and frequency selection, and peaking. The instrument is battery powered for field application, but it can be operated from the line—J.S. (FXR Division of Amphenol-Borg Electronics Corp., Dept. S42, 25-26 50 St., Woodside 77, N.Y.)

An electric furnace intended for high temperature demonstrations in the classroom has unusual features that suggest its utility in other fields. Temperatures up to the melting point of tungsten (3370°C) are produced in a few seconds. This furnace heats a 1¼-inch square area in a piece of woven graphite cloth, which is strong and durable enough to support small samples. Solids can be melted directly on the cloth, and they remain in a ball after firing so that crucible losses and contamination are avoided. Glasses may be prepared by radiation heating by placing the powdered mix close under the heater element. A graphite planchet supports the mix and provides a noncontaminating sample holder. Small samples of special glasses for preparation of the alkali-metal electrodes could probably be prepared with this device. The graphite cloth heater is a remarkably strong woven fabric that is heated by an adjustable low-voltage power supply. It heats rapidly and will last several minutes. Cloth is discarded after each run at a cost of less than 20 cents per element. The furnace area is a platform on top of a cabinet about 20 inches square and 10 inches high; a bell jar is provided for controlling the atmosphere. Power consumption is 2000 watts, and a water connection is required for cooling the electrodes.—R.L.B. (Baird-Atomic, Inc., Dept. S33, 33 University Rd., Cambridge 38, Mass.)

Comparator and coordinate cathetometer makes linear measurements in a horizontal or vertical plane. Measurements are made by sighting through a 50× telescope-microscope onto calibrated scales reading directly to 0.0004 inch. By tilting the telescope to a vertical position and inserting an objective lens, the instrument is converted into a micrometer slide comparator. Horizontal range is 9.0 inches and vertical range is 7.0 inches.—J.S. (National Instrument Co., Inc., Dept. S35, 4119–4127 Fordleigh Rd., Baltimore 15, Md.)
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