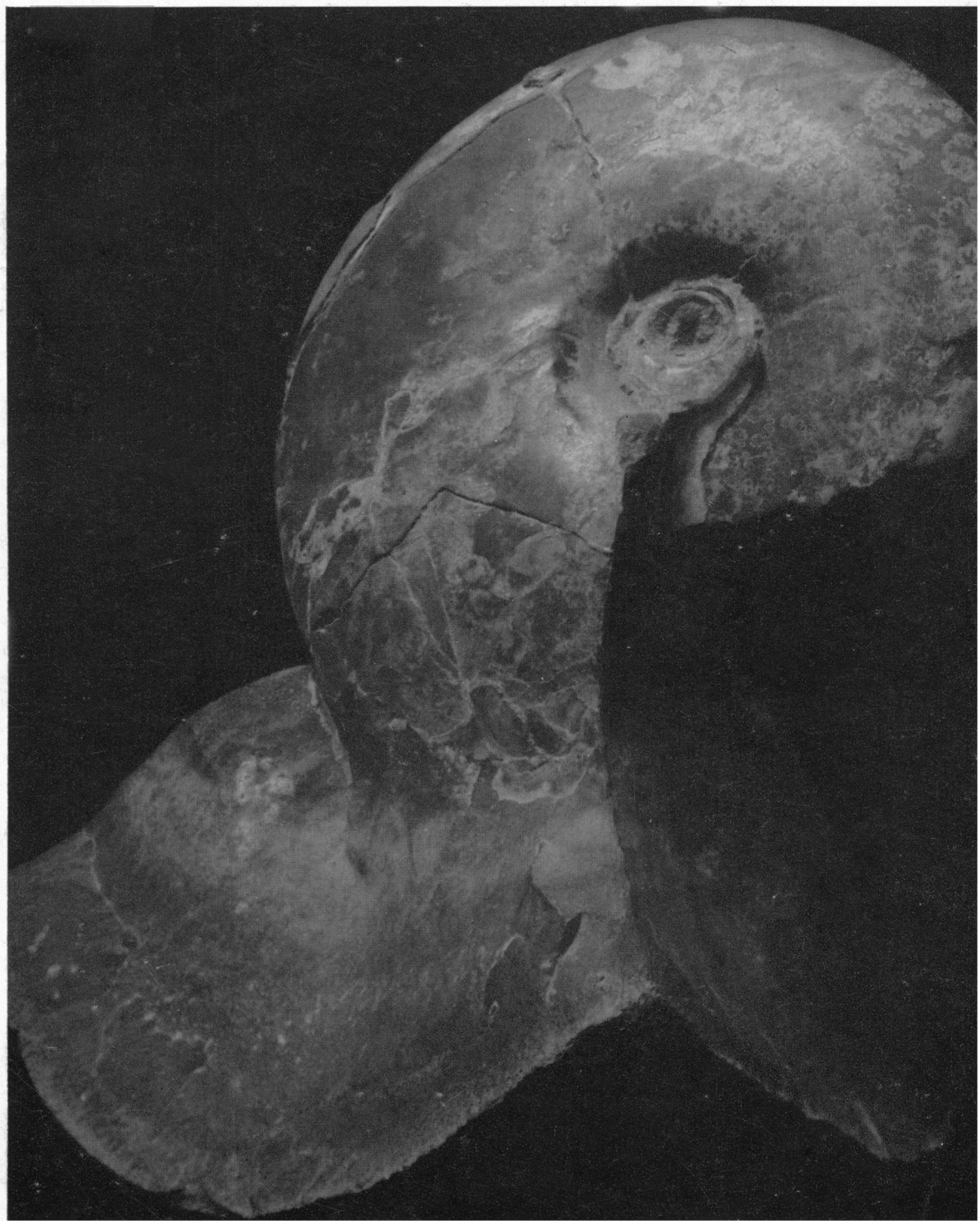
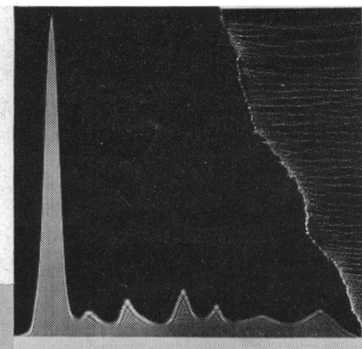
SCIENCE

13 May 1960

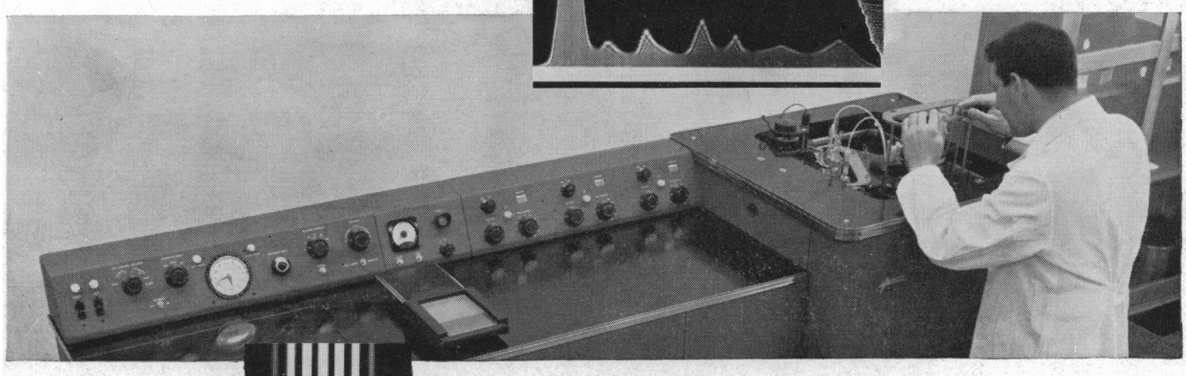
Vol. 131, No. 3411

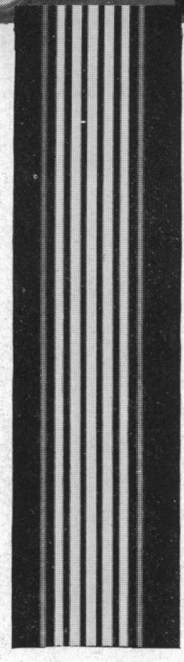
AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE





Electrophoresis of human plasma diluted 1:6; ascending boundaries. Inclined knife-edge schlieren.





Portion of typical reference fringe pattern obtained from standard production model, magnified to show straightness and definition of entire pattern.

ELECTROPHORESIS AND DIFFUSION

in one precision instrument

As protein research progresses, biochemists rely more and more upon instruments of high precision for diffusion and electrophoresis studies. Especially critical are the optical measurements needed to obtain accurate diffusion coefficients, absolute electrophoretic mobilities, and information on purity.

An exceptional optical system is one of the outstanding features which have made the Spinco Model H invaluable for exacting work in both electrophoresis and diffusion. Light passes through each operating cell twice, giving double sensitivity. Patterns are sharply defined and peak positions can be precisely determined. Reproducible measurements may be made to better than 1/25 of a fringe, which corresponds to approximately .00025 percent protein.

The optical system is flexible, too. It permits measurements by five different methods – ordinary and cylindrical lens schlieren, Rayleigh and Gouy fringes, and mechanical scanning.

Further versatility is achieved by a rotary cell turret which supports three operating cells. Any combination of diffusion and electrophoresis studies may be performed simultaneously with the three cells.

We'd like to tell you more about the Model H and how it can fit the requirements of your research program. For complete details, please write Spinco Division, Beckman Instruments, Inc., Stanford Industrial Park, Palo Alto, California, for information File H-5.

Sales and service facilities on the Model H are available on the same basis as for Spinco Ultracentrifuges, assuring prompt, efficient service for users here and abroad.

Beckman®

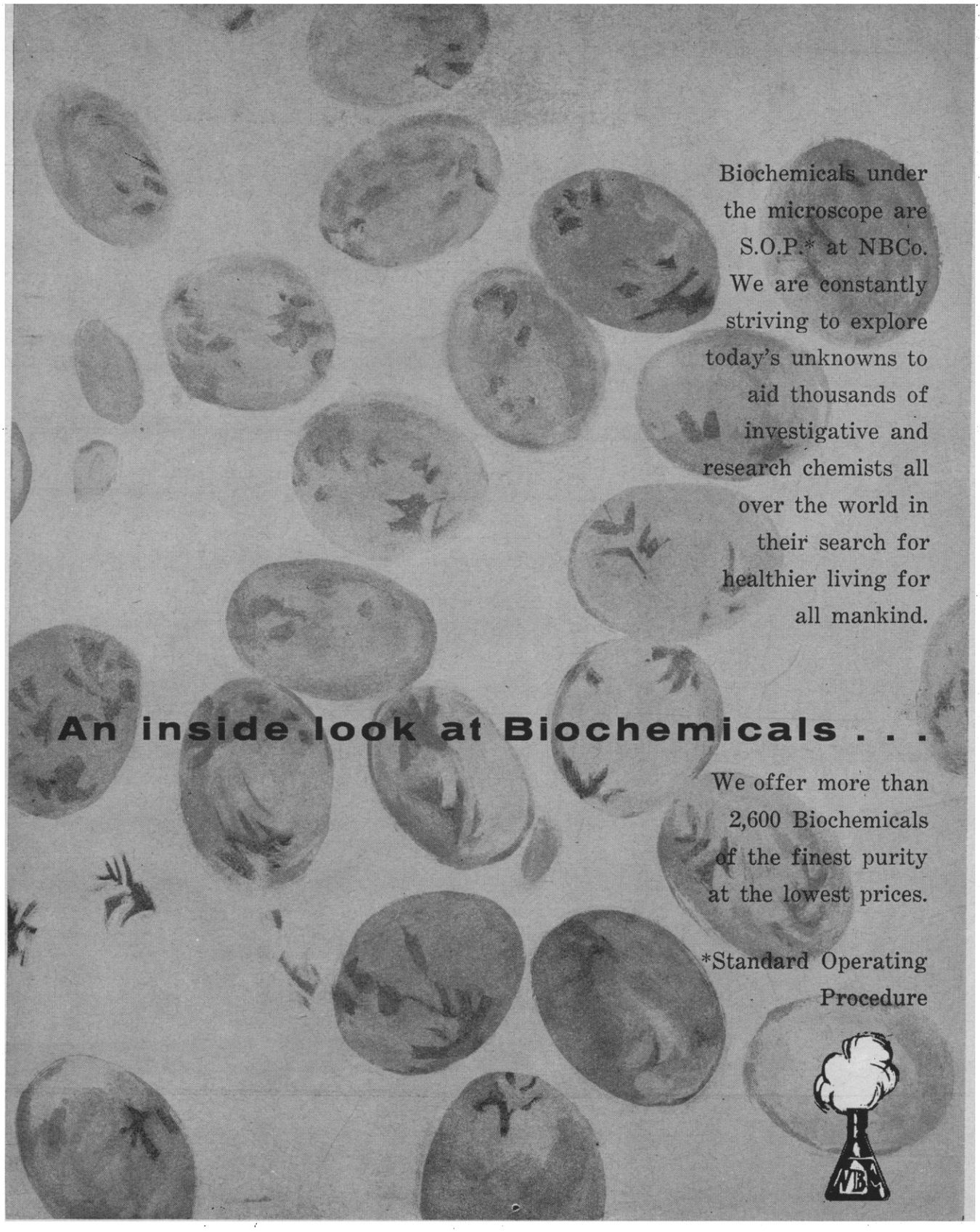
INSTRUMENTAL IN YOUR FUTURE 25 YEARS 1935-1960

Spinco Division

Beckman Instruments, Inc.

S-53

SCIENCE is published weekly by the AAAS, 1515 Massachusetts Ave., NW, Washington 5, D.C. Second-class postage paid at Washington, D.C., and additional mailing office. Annual subscriptions: $8.50; foreign postage, $1.50; Canadian postage, 75¢.



Biochemicals under the microscope are S.O.P.* at NBCo. We are constantly striving to explore today's unknowns to aid thousands of investigative and research chemists all over the world in their search for healthier living for all mankind.

An inside look at Biochemicals . . .

We offer more than 2,600 Biochemicals of the finest purity at the lowest prices.

*Standard Operating Procedure

SEND FOR OUR FREE MARCH, 1960 CATALOG

FILL OUT COUPON AND MAIL TODAY FOR YOUR COPY.

SC

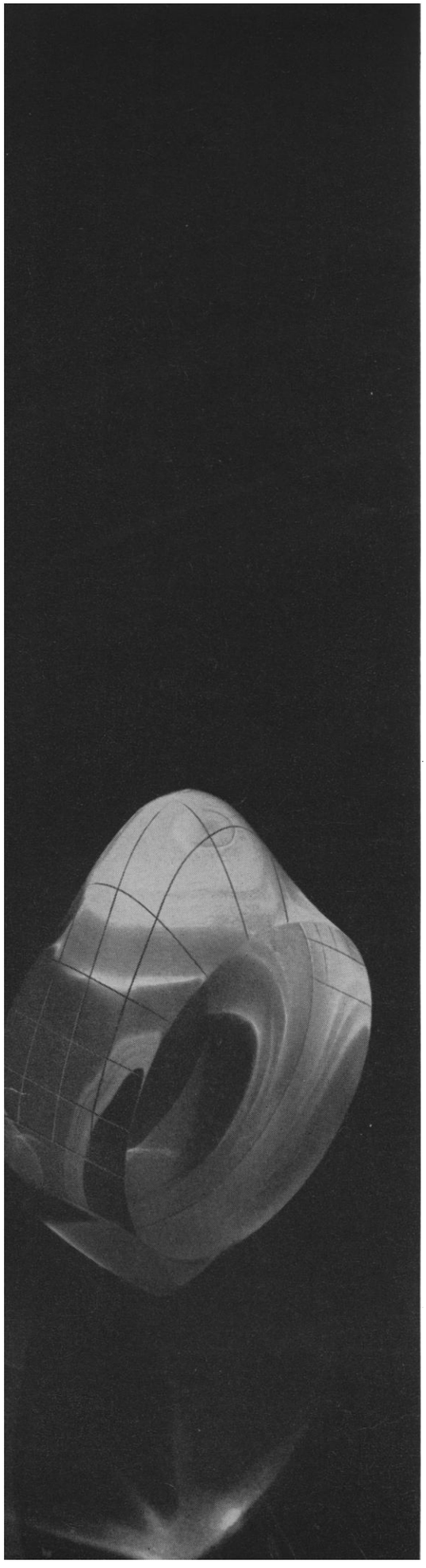
Name_____

Organization_____

Address_____

City_____ Zone____ State_____

NUTRITIONAL BIOCHEMICALS CORPORATION
21010 Miles Avenue
Cleveland 28, Ohio



One of a series

Catching Up with a Slippery Equation

What goes on when two moving surfaces are separated by a film of oil?

Simple question? Maybe, but engineers and mathematicians have been trying to answer this classic question of lubrication ever since Osborne Reynolds neatly stated the problem in equation form back in 1886.

Unfortunately, analytical methods for solving Professor Reynolds' partial differential equation worked only for unrealistic oil bearings, bearings with widths approaching zero or infinity. And approximate methods were crude, requiring a complete recalculation for each slight change in the bearing.

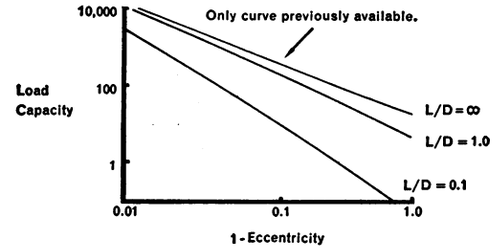
Recently, mathematicians at the General Motors Research Laboratories came up with the most versatile and efficient method of solution yet made. Their analytical method for solving the two-dimensional Reynolds' equation applies to all finite journal bearings — as well as other hydrodynamic bearings — with *no* assumptions or approximations about boundary locations. The new method uses a long-neglected energy theorem recorded by Sir Horace Lamb instead of the force relationship tried by Reynolds and others.

Besides being a valuable contribution to the theory of lubrication, this work has its practical side: namely, accurate, serviceable design curves for engineers. At GM Research, we believe delving into both the theoretical and applied sides of a problem is important to progress. It is a way of research that helps General Motors fulfill its pledge of "more and better things for more people."

General Motors Research Laboratories

Warren, Michigan

Hydrodynamic analyses have led to specific answers about bearing operation. Shown here are the oil pressure distribution (main illustration) and load-carrying capacity for a non-rotating journal with a reciprocating load.



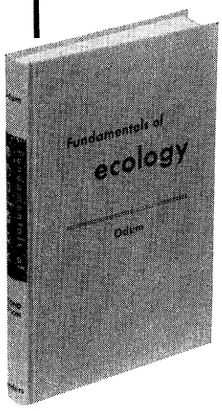
13 May 1960, Volume 131, Number 3411

SCIENCE

Cover

A late Cretaceous ammonite, *Placenticeras pseudoplacenta* Hyatt, originally described from Utah. Height, about 11 inches. The photograph was taken with a Polaroid-Land camera (type 53, 4 × 5 professional pan Land film). [Gerry Sharpe]

Check these valuable Saunders textbooks for next Fall's college classes



ODUM–FUNDAMENTALS OF ECOLOGY

Second Edition—A popular college text, this book gives the student a clear picture of the interrelationships operating among plants, animals, microorganisms and his fellow man. It explains what nature "does" as well as how she "looks." Presenting a well balanced synthesis of the entire field of ecology, the textbook combines the *functional* and the *descriptive*, the *aquatic* and *terrestrial*, as well as the *basic* and *applied aspects* of the subject. Outstanding chapter coverage includes: the scope of ecology—energy in ecological systems—organization at the species population, interspecies population and community levels—freshwater ecology—marine ecology—terrestrial ecology—application of ecology to natural resources, to public health and welfare and to human society—radiation ecology.

By EUGENE P. ODUM, Alumni Foundation Professor of Zoology, University of Georgia, Athens; in Collaboration with HOWARD T. ODUM, Director, Institute of Marine Science, University of Texas, Port Aransas. 546 pages, with 160 illustrations. $7.50. *Second Edition.*

VILLEE, WALKER AND SMITH–GENERAL ZOOLOGY

Here is a superbly illustrated presentation of modern zoology. This text gives the college student a skillful blending of broad biological principles with a thorough examination of carefully chosen representative animals. You will find a progressive study of protoplasm, cells and tissues and the physiologic mechanisms all animals have in common—respiration, locomotion, digestion, etc. Each major invertebrate phylum is considered in a separate chapter featuring discussions of one or more typical species. The vertebrates are introduced with a detailed consideration of the frog as representative. Both the vertebrate and invertebrate sections point out not merely the anatomy of the animals described, but also the habitat, mode of life and role in the biological community.

By CLAUDE VILLEE, Harvard University; WARREN F. WALKER, Jr., Oberlin College; and FREDERICK E. SMITH, University of Michigan. 877 pages, with 444 illustrations. $7.50.

FISHER & KITZMILLER–LAB EXERCISES IN GENERAL ZOOLOGY

This helpful manual gives students a firm basis for laboratory work in zoology. Designed to closely follow Villee, Walker and Smith's "General Zoology" (above), it can be used effectively with any zoology text. Emphasis is placed on principles and functions, not just the dissection of animals. The comparative approach is stressed throughout. The first section of the manual surveys the animal kingdom and includes all the "classical" animals necessary to a beginning course in zoology. The second part is devoted to the comparative anatomy of organ systems both vertebrate and invertebrate. Interesting exercises consider: organic evolution; natural history; symbiosis; survey of the animal phyla; muscular systems; gametogenesis; embryonic development; genetics; parasitology; reproduction; etc.

By HARVEY I. FISHER, Ph.D., Chairman, Department of Zoology, Southern Illinois University, Carbondale; and JAMES B. KITZMILLER, Ph.D., Chairman, Department of Zoology, University of Illinois. 227 pages, illustrated. $4.00.

NOLLER–CHEMISTRY OF ORGANIC COMPOUNDS

Second Edition—Designed for an intensive basic organic course, this text is ideal for students majoring in chemistry or allied sciences. Current concepts of mechanisms are explained and emphasized. Compounds are discussed in the light of the theory of gross structures. Dr. Noller's correlation of physical and chemical properties is extremely clear. By carefully blending theoretical and practical organic chemistry, he stimulates student interest in the mechanisms of reactions and maintains this interest throughout the entire text. Excellent coverage includes: *absorption of electromagnetic radiation—anhydro sugars—behavior of small ring compounds—natural gases, petroleum and derived products—esters—waxes, fats and oils—derivations of carbonic acid and thiocarbonic acid—carbohydrates—aromatic amines—etc.*

By CARL R. NOLLER, Ph.D., Professor of Chemistry, Stanford University. 978 pages with 106 illustrations. $9.00. *Second Edition.*

NOLLER–TEXTBOOK OF ORGANIC CHEMISTRY

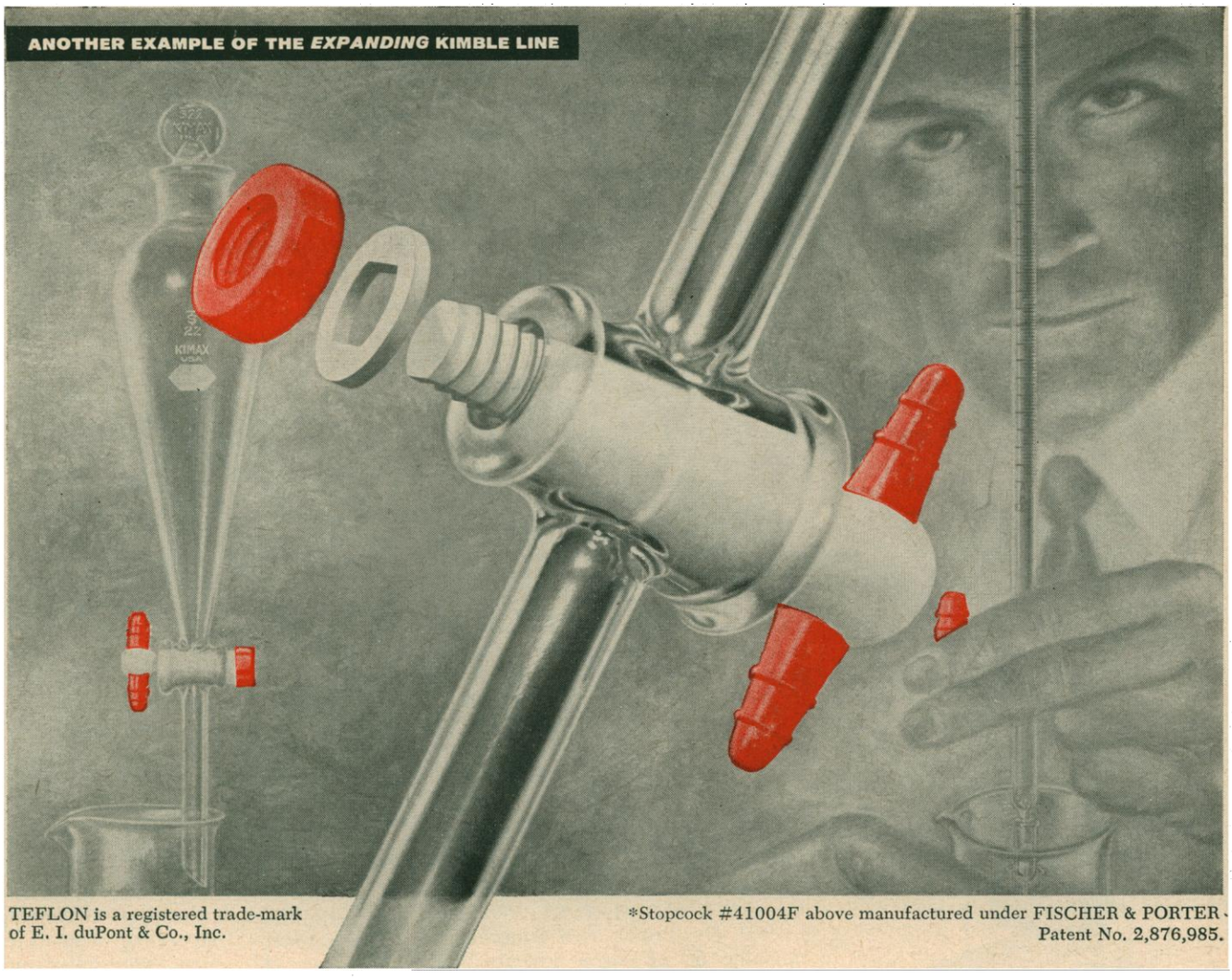
Second Edition—A careful abridgement of Dr. Noller's longer volume (above), this text maintains the same excellent balance between theoretical and practical organic chemistry. It is ideally suited to organic chemistry courses of 90-100 hours for both chemistry majors and non-chemistry majors. Dr. Noller emphasizes current explanations of physical properties, in order to give the student a clear picture of the nature of the forces holding atoms and molecules together. Valuable discussions cover: conformation, inclusion compounds, oxidation mechanisms, insulin, tranquilizer drugs, ferrocene, oxytocin, silicon compounds, tropolones, aldosterone, lanosterol, polyisoprene and urethan rubbers, boron and aluminum compounds, epoxy and polyester resins, etc.

By CARL R. NOLLER, Ph.D. 654 pages, illustrated. $7.00 *Second Edition.*

Saunders books

Gladly sent to college teachers for consideration as texts

W. B. SAUNDERS COMPANY—West Washington Square, Philadelphia 5



TEFLON is a registered trade-mark of E. I. duPont & Co., Inc.

*Stopcock #41004F above manufactured under FISCHER & PORTER Patent No. 2,876,985.

Simplicity of design makes Kimble Stopcocks with TEFLON® Plugs easy to use, maintain and clean

New Kimble Stopcocks with TEFLON plugs are superior because:

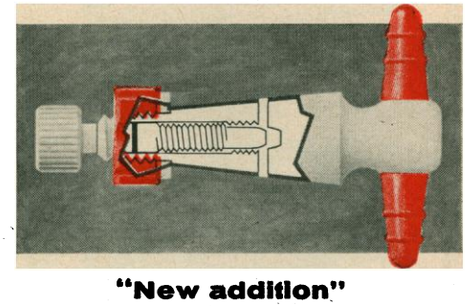
1. Plugs consist of only three parts
2. All three parts are made of self-lubricating, chemically inert TEFLON

therefore Kimble apparatus and TEFLON plugs . . .

- can be autoclaved
- can be cleaned in acids, alkalis or organics, hot or cold
- will not corrode—there are no metal parts
- can be positively controlled and adjusted—you don't rely on the whim of a spring
- won't bind or leak—accomplished by exaggerated 1:5 taper of plugs in polished glass barrels
- won't freeze because TEFLON is chemically inert

And, threads are exceptionally heavy and coarse to eliminate stripping.

Your dealer has stocks of new Kimble apparatus with TEFLON plugs. They are also listed in the new Kimble Catalog Supplement SP-57. For your free copy, write to Kimble Glass Company, subsidiary of Owens-Illinois, Toledo 1, Ohio.



"New addition"

Now! Kimble adds plugs with metering valve to its TEFLON line. They provide ultra-precise control. Construction is simple for ease of cleaning and use. Available as plug replacement (Catalog #41575F) or in straight bore stopcock #41002F or capillary stopcock #41007F.

KIMBLE LABORATORY GLASSWARE
AN (O) PRODUCT

OWENS-ILLINOIS
GENERAL OFFICES • TOLEDO 1, OHIO

Letters

Color Phenomena

Recently I reported [*Sci. American* **202**, 168 (1960)] that many of the colors described by Land could be obtained binocularly in a procedure that was essentially the same as that of N. Geschwind and J. R. Segal [*Science* **131**, 608 (1960)]. Additional unreported results indicate that a "natural image situation" is not necessary for the appearance of colors in a binocular setup. In the attempt to isolate a critical variable and, moreover, to obviate the need for transparencies, I drew two circles in India ink on a white card. The centers were so spaced that when stereoscopic fusion occurred the subject saw two concentric circles. When a red filter (Wratten 25 A) is placed before one eye, the circle stimulating the other eye (no filter) is dark red, and the other circle is green. Changes in the intensity of light can change the green to blue. This result appears to be a case of simultaneous contrast and, of course, is related to colored shadows. The fact that G. L. Walls [*Psychol. Bull.* **57**, 29 (1960)] has reinterpreted Land's major results in terms of simultaneous contrast suggests a principle for explaining the colors obtained by me and by Geschwind and Segal.

For an additional point of possible interest I repeated J. L. Brown's procedure [*Science* **131**, 155 (1960)] stereoscopically. Brown used a mechanical chopping device for alternately interrupting the two light beams projecting registered images on a screen. Without any filters, Brown reported the usual variety of colors and hues. When I tried this procedure I did not obtain any colors at all.

NICHOLAS PASTORE
Department of Psychology,
Queens College, Flushing, New York

The Term "Cosmoparticle"

A meteorite has been defined as "a solid body of subplanetary mass that either is in space or has come therefrom, is falling or has fallen as a discrete unit onto the Earth or onto some other astronomical body, and still retains its essential cosmic character." Since there seems to be some need now for a term to include all particles of *submeteoritic* mass, it is proposed that the word *cosmoparticle* be used for this purpose. A cosmoparticle may be defined as "a discrete material entity of submeteoritic mass, either in space or having come therefrom."

Cosmoparticles may be "free" or individual molecules or atoms or molecular or atomic constituents of any kind—ions, atomic nuclei, protons, neutrons, electrons, positrons, and so on. Cosmoparticles and meteorites, as here defined, evidently together comprise all material entities below the category of planet.

FREDERICK C. LEONARD
Department of Astronomy,
University of California, Los Angeles

Stochastic Models

The article on stochastic models of population dynamics by Jerzy Neyman and Elizabeth L. Scott [*Science* **130**, 303 (1959)] contains the statement, "with a little luck in attracting the attention of more workers in the field, the process of clustering, with its further theoretical developments, may easily become the basis of a new theory which we like to call indeterministic cosmology." An offer from these particular statisticians to devote their energies to cosmology should not go without comment at a time when more and more observational data will be coming out of this nation's space science program for use in analysis and testing of various models.

The claim by Neyman and Scott that an indeterministic model will solve some problems in cosmology that the deterministic model is incapable of solving goes counter to the feeling of many in the physical sciences who reject any research not aimed at complete understanding, which, to them, means a deterministic model. Any model that is not deterministic is not considered realistic. An explanation in stochastic terms is no explanation at all. Knowledge must be gained with a deterministic model at every step of the way. An unfortunate result of this attitude is that difficulties in a limited area of a given field of research can slow down progress in the entire field until the difficulties are completely resolved in a deterministic manner. This is like not allowing the use of x to represent an unknown quantity, denying the use of algebra, and insisting that all problems must be solved through the more realistic arithmetic methods. Also unfortunate is the fact that frequently there is no meeting of minds in arguments on this point because these implicit assumptions or subconscious convictions do not come to the surface and the controversy centers around secondary concepts that follow from them.

Now let us look at the other side of the problem. Does a stochastic model

IEC

INTERNATIONAL MODEL PR-2 REFRIGERATED CENTRIFUGE

. . . first choice for blood fractionations and similar low temperature separations.

HERE'S WHY MOST LABORATORY DIRECTORS SPECIFY THE INTERNATIONAL PR-2 FOR LOW-TEMPERATURE SEPARATION

. . . It offers positive temperature control with wide-range versatility for separations between —20° and +10C.
The temperature you set on the control panel is automatically held within ±1°C. In fact, material temperature can be maintained at 0°C indefinitely even at speeds up to 19,000 rpm . . . without subcooling rotor or chamber!

28 INTERCHANGEABLE HEADS . . . horizontal, angle, high-speed, high-capacity and shaker . . . provide accessory combinations to meet virtually all laboratory needs.

WIDE CAPACITY RANGE . . . from 4 liters down to 7 ml. . . . is unmatched in the refrigerated centrifuge class.

Write for Bulletin T.

INTERNATIONAL IEC EQUIPMENT CO.

1219 SOLDIERS FIELD ROAD, BOSTON 35, MASSACHUSETTS

really solve some problems or is it merely a utilitarian way around them? Neyman and Scott seem to take either view at various times. In some of their writings they admit that their stochastic approach may be at least partly utilitarian. In other places they state that the people who espouse determinism are trying to explain an indeterministic world with a deterministic model and so are doomed to failure. This can alienate some potential friends from the physical sciences. In yet another place Neyman calls such speculation idle. It may be idle technically but it can affect cooperation among scientists from different disciplines. A more accurate way of saying the same thing might be that the utilitarian aspects in the work of Neyman and Scott stand up no matter how we view the basic nature of the universe. The random portion of a stochastic model can be used to describe: (i) a truly random process; (ii) a process that appears random to us; (iii) a process that is too complex to be described completely.

If the world is basically indeterministic, the stochastic model can, of course, be realistic. If the world is basically deterministic, the stochastic model can still be thought of as a utilitarian generalization of a deterministic model. For example, when research reaches an impasse such as the contradiction between the cosmological principle and local irregularities, one can bypass it by the use of a stochastic model. The former impasse becomes an "island of indeterminism" within an otherwise deterministic model. Such a model can never explain in deterministic terms that part of the mechanism which has been assumed to be random. This statement is trivial but it does point up an important divergence in "parlance" between some theoretical statisticians and some physical scientists. To a statistician, any reduction of unexplained variation can be called an explanation. He can happily refer to an explanation of the behavior of aggregates in an "island of indeterminism" while the physical scientist bemoans the fact that the behavior of individuals is unexplainable with such a model.

Perhaps such divergence in views can be reconciled. To a statistician, any particular model is highly expendable. As knowledge increases, one can construct newer models with a decreasing area of indeterminism so that one approaches a deterministic model. The ultimate degree of approach will depend upon the nature of ultimate reality. A scientist can believe whatever he wishes about the ultimate state of affairs and still accept the stochastic model for its utilitarian aspects. This should be comforting to those in the physical sciences who like to feel that they are now working with reality even though the model they are using has replaced many former models and will itself inevitably be replaced some day.

NICHOLAS E. MANOS
National Aeronautics and Space Administration, Washington, D.C.

Detecting Antibodies to Penicillin

The report by Marguerite Epp [*Science* **130**, 1472 (1959)] that sera from penicillin-allergic subjects agglutinate erythrocytes coupled to penicillin by means of a bis-diazotized-benzidine linkage confirms results of my co-workers and me with the same method plus the use of human antiglobulin (Coomb's) reagent as a final step to "develop" the reaction. As a matter of fact we believe that our procedure, as reported to the first Latin American Congress of Microbiology (Mexico, 12–19 October 1958) and to the National Congress of Allergists (Toluca City, Mexico, May 1958), avoids the necessity of making the "checkerboard" titration that Epp uses.

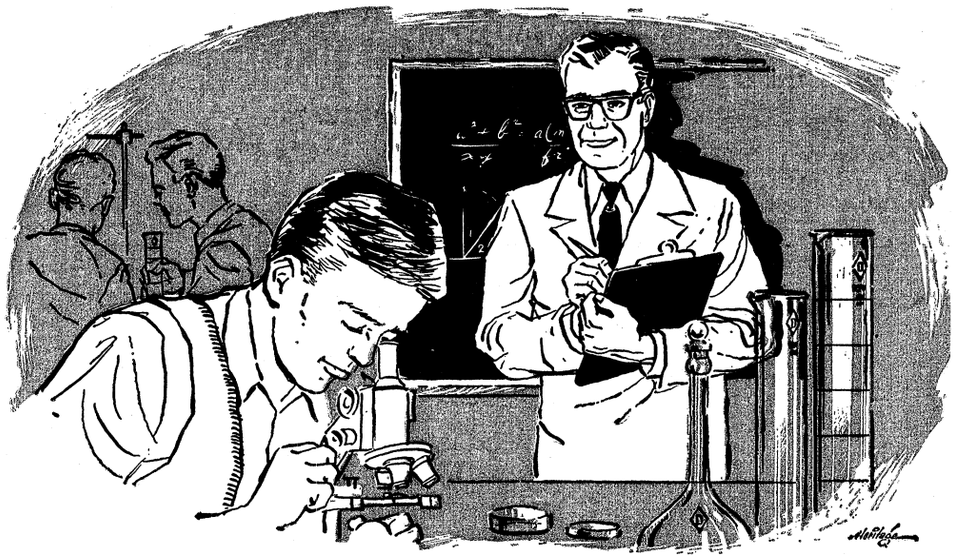
References to our work appear only in Spanish [reports and abstracts of works presented to the first Latin American Congress of Microbiology (1958); F. Martínez and L. Martín *Prensa méd. Mex.* **24**, 245 (1959); M. Salazar Mallén and L. Ortiz, *Alergia Rev. iberoam. alergol.* **7**, 348 (1959); and the thesis of L. Ortiz, University of Mexico (1959)].

We believe that the description that Epp gives of the method she uses and the information given here will encourage other investigators to take advantage of this first specific in vitro procedure, so useful in our hands, for diagnosing or confirming diagnoses of penicillin allergy.

M. SALAZAR MALLÉN
Medellín 94, Mexico City, Mexico

There are several points of importance in M. Salazar Mallen's letter which, I think, should be made clear. I rather question his statement that the "checkerboard" titration to establish the optimal ratio of penicillin to bis-diazotized-benzidine is unnecessary. In practice, there are variations in biological and chemical products. For example, the optimal ratio may vary as follows: from 2.5 to 4.5 mgm of penicillin to from 0.25 to 0.5 ml of the diluted chemical compound. Moreover, the method of Salazar Mallen and his collaborators and that described by me differ in principle. The former detects incomplete antibodies, whereas the procedure described in my report measures complete antibodies.

MARGUERITE EPP
Department of Bacteriology, University of Saskatchewan, Saskatoon



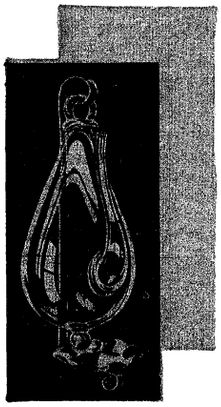
Don't Shortchange The Student!

The school and college laboratory is the training ground for budding scientists. It is in school that they learn the fundamentals which they carry throughout their entire lives. It is in school that they formulate the thought processes which they put to good use in the years following graduation.

Because of the importance of this training, no school or college will offer students an inferior textbook or an incompetent instructor. The best is none too good for the scientist of tomorrow!

Similarly . . . the best in laboratory equipment is none too good for today's scientific student. Unfortunately, there is available in this field, laboratory glassware which is known as the "second", or "school" grade of well-known manufacturers.

Don't cheat your students of the opportunity to work with the best available laboratory glassware . . . especially when you can buy it cheaper than some of the "inferior" grades. Specify Diamond D and be sure of the best. For the complete story of Diamond D manufacture write today for our booklet "Behind The Diamond D" Doerr Glass Company, Vineland, N.J.



OL' NANTUCKET WEATHER GLASS

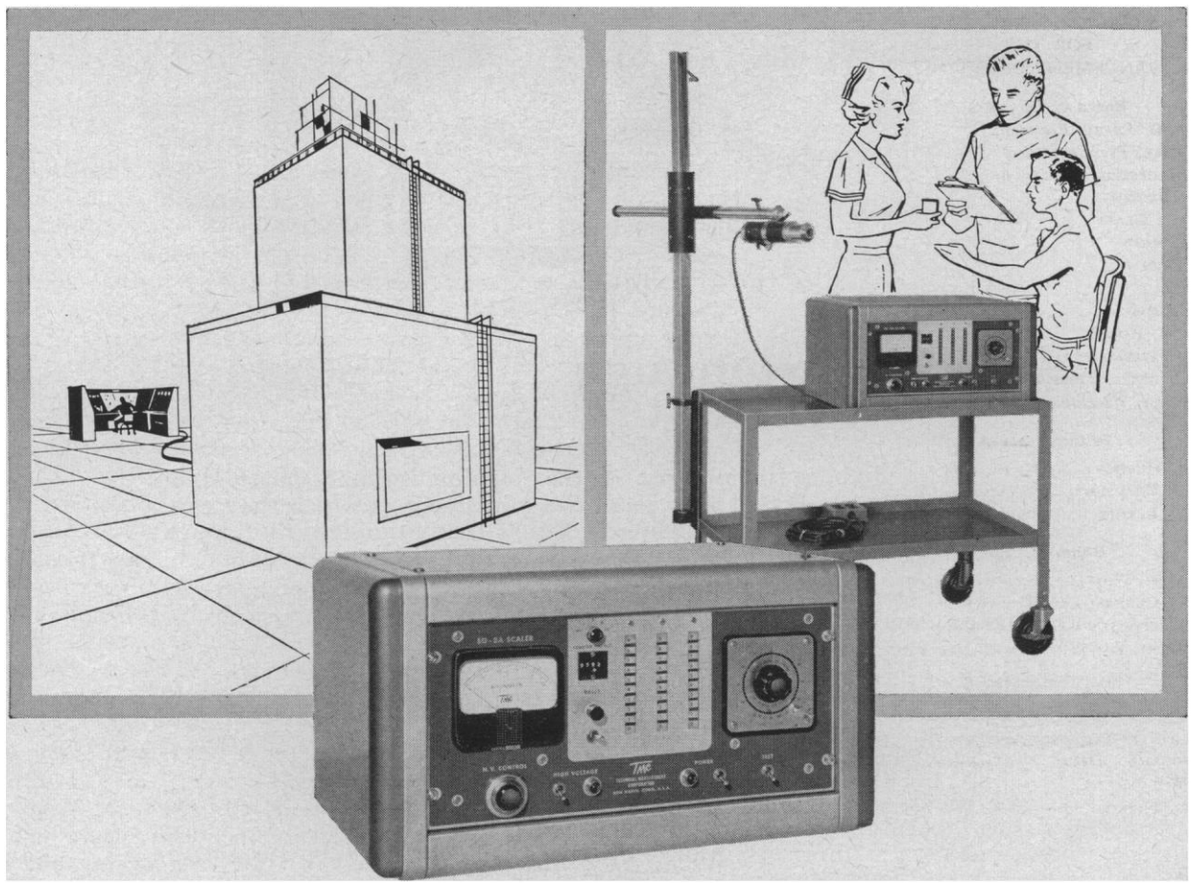
Here is a hand-blown replica of the weather glasses used on the square-rigged sailing ships that rounded Nantucket Light more than a century ago. It is a crystal-clear pear-shaped pendant which hangs on a 10¼" long wrought iron bracket. Fill the glass with water according to directions; chart shows how to translate movement of water in spout in terms of weather forecasts. Ideal for home, office, den, recreation room, college dorm or classroom. $3.95 postpaid. Doerr Glass Specialties, Inc., Vineland, N.J. Offer good only in continental U.S. and Canada.

Diamond D Laboratory Glassware

Quality Begins With Price And Ends With Performance

FOR RELIABLE SCALING—

in *making* radioisotopes . . . or *monitoring* them



PERFORMANCE DATA

The SG-2A Scaler is a completely self-contained unit consisting of:

AMPLIFIER — Chase Higinbotham non-blocking type with selectable sensitivity — 1, 10 or 100 millivolts neg.

Rise time — 0.20 μs.

Dynamic range (at 1 mv. sens.) 10,000 to 1.

POWER SUPPLY

Dual Ranges 300 to 1000 volts, 300 to 2500 volts.

Stability — 2 volts low range, 4 volts high range (under normal operating conditions.)

(Available on special order with 5000 volt power supply for counters using high voltage gases. Dual ranges 1000 to 2500, 1000 to 5000 volts.)

SCALER — three etched wire decade strips followed by a precision four digit counter.

Counts — to 240,000 CPM with less than 1% coincidence loss.

Resolving time — 2.5 μs.

Auto-time — pre-set or elapsed time from 1 sec. to 60 min.

Accuracy ±0.2 sec.

(Model SG-2A4 also available with all electronic pre-set count from 100 — 10,000 counts.)

TMC MODEL SG-2A SCALER PROVIDES ACCURACY YOU CAN DEPEND ON—AT THE REACTOR, LABORATORY OR HOSPITAL

When the SG-2A is used as part of *reactor instrumentation*, the one millivolt sensitivity and wide dynamic range of its Chase Higinbotham non-blocking amplifier permit accurate measurement of neutron levels at start-up long before the less sensitive operating instruments detect their presence. For *medical diagnostic procedures* using radioisotopes, many hospitals find that the SG-2A with the mobile cart and detector arm (above), provides the reliability and good reproduceability that are particularly necessary for thyroid function studies and blood and plasma volume measurements using Iodine (I^{131}) tracers, or in determining red cell mass with radiochromium (Cr^{51}). Countless other applications of the SG-2A range from radioactivity protective monitoring systems in industry to experimental work in college laboratories — wherever there is need for accurate radiation measurement.

If you use radioisotope tracers, write for complete information on the SG-2A Scaler, or related TMC detectors, pulse height analyzers, ratemeters and other instruments. By describing your work and the radioisotopes being used, you will enable TMC to recommend the most suitable instruments for your needs.

TMC **TECHNICAL MEASUREMENT CORPORATION**

441 WASHINGTON AVE., NORTH HAVEN, CONN.

13 May 1960, Volume 131, Number 3411 **SCIENCE**

SCIENCE, which is now combined with THE SCIENTIFIC MONTHLY, is published each Friday by the American Association for the Advancement of Science at National Publishing Company, Washington, D.C. The joint journal is published in the SCIENCE format. SCIENCE is indexed in the *Reader's Guide to Periodical Literature.*

Editorial and personnel-placement correspondence should be addressed to SCIENCE, 1515 Massachusetts Ave., NW, Washington 5, D.C. Manuscripts should be typed with double spacing and submitted in duplicate. The AAAS assumes no responsibility for the safety of manuscripts or for the opinions expressed by contributors. For detailed suggestions on the preparation of manuscripts and illustrations, see *Science* **125,** 16 (4 Jan. 1957).

Display-advertising correspondence should be addressed to SCIENCE, Room 740, 11 West 42 St., New York 36, N.Y.

Change of address notification should be sent to 1515 Massachusetts Ave., NW, Washington 5, D.C., 4 weeks in advance. If possible, furnish an address label from a recent issue. Give both old and new addresses, including zone numbers, if any.

Annual subscriptions: $8.50; foreign postage, $1.50; Canadian postage, 75¢. Single copies, 35¢. Cable address: Advancesci, Washington.

Teaching "Science Learnings"

A chapter on elementary-school "science learnings," as the author likes to call it, in a recent volume of essays by professors of education contains much with which we agree. The volume is *Modern Methods in Elementary Education* (Henry Holt and Company), edited by Merle M. Ohlsen of the University of Illinois, and the chapter is by J. Myron Atkin, of the same university. It is entirely sensible, as the chapter suggests, to teach the simpler aspects of a subject before broaching the more complex aspects. And we concur that a good science program must have materials for experimentation. But we cannot give the chapter our full endorsement. Atkin, in his enthusiasm to establish that pupils should be taught things that have meaning for them, uses a few expressions whose connotation may lead beginning teachers into unrecommended patterns of pedagogy.

One place where the reader may be led astray is in the discussion of breadth versus depth in "science experiences." The need is cited for youngsters to "have experiences with electricity in the first grade, again in [the] second, more in [the] third." The notion of a continuing program of study is good, but we must caution the reader that by "experiences with electricity" Atkin means only what in more prosaic language we would call "studying electricity"—using well-insulated magnets, buzzers, and the like. He is not suggesting that teachers should administer shocks to their pupils. Admittedly, however, such procedure would make sense in a historical approach to teaching science, for it was just by giving himself shocks and comparing their strength that Cavendish in the 18th century was able to anticipate some of the discoveries of Ohm and Faraday.

The account offered of a hypothetical classroom also requires interpretation. An enlightened teacher is described as listening to his pupils' reports on their recent efforts at testing hypotheses. The children "told of hypotheses they had formulated and tested. Some hypotheses they had tested by simple experimentation. Some they had tested by going to books or adults." Here the beginning teacher should not be awed by the achievements of his pupils as they "test hypotheses." Simple experimentation is simple experimentation, and in going to books and adults the children most likely are doing what we more ordinarily would call "looking things up" and "asking questions." We do grant, however, that by these activities the boys and girls really *could* be testing hypotheses: the hypotheses, for example, that they can read and that grown-ups do not know everything.

A final word of caution concerns the general argument of the chapter; this, as stated by the editor in an introductory note, is that even young children should be taught "to apply the scientific method in solving their everyday academic and personal problems." A timely example of scientific method applied to personal problems, although on a national level, is a theory recently worked out by Senator Muskie of Maine. According to the theory, in the coming presidential election, either Humphrey or Kennedy could beat Nixon, but Rockefeller could beat both Humphrey and Kennedy. The Senator notes that the candidate with the longest name has the best chance of winning: Hoover beat Smith; Roosevelt beat Hoover, Landon, Willkie, and Dewey; Truman beat Dewey; and Eisenhower beat Stevenson. Our final word to beginning teachers, and to the youngsters too, is, do not bet on the election.—J.T.

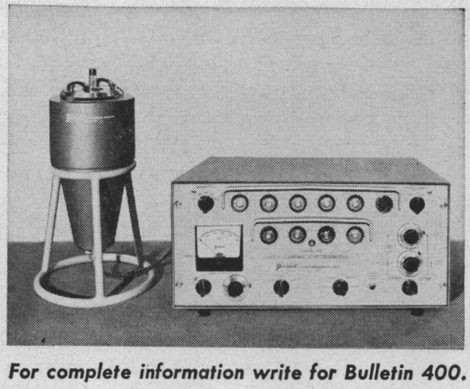
Fully Automatic, Transistorized AUTO-GAMMA® Spectrometer System

for counting samples of:

IODINE^{131} · IRON^{59} · GOLD^{198} · POTASSIUM^{42} · RADIUM DAUGHTERS · COBALT^{60} · CHROMIUM^{51}

. . . and other gamma emitters—

- up to 100 samples counted automatically
- repeats individual samples or entire loading
- symmetrical geometry provides constant background
- sample number, time and count printed out on paper tape
- integral, differential and wide-window counting modes
- manual model can be automated at any time



For complete information write for Bulletin 400.

The Auto-Gamma Spectrometer System counts and records data from as many as 100 test tube samples. Operation can be maintained on an around-the-clock basis.

The energy spectrum of an isotope can be plotted with the Auto-Gamma Spectrometer by means of the precise Narrow Window setting. Ordinarily, the photopeak is then counted within the Wide Window of the pulse height analyzer to minimize background. This use of the spectrometer optimizes the count-to-background ratio and permits shorter counting periods or lower tracer levels.

Obviously, automatic sample counting is desirable when large numbers of samples are to be counted. It is just as useful, however, for counting small numbers of low activity samples. Blanks and standards can be arranged among the samples for background checks and calibration. The complete series of tubes can then be counted automatically as many times as required to give desired statistical accuracy.

The detector and spectrometer components of the system are available separately for manual operation.

Packard *Instrument Company, Inc.*

P. O. BOX 428-A, LA GRANGE, ILLINOIS

ATLANTA • BOSTON • LOS ANGELES • NEW YORK • PHILADELPHIA
PITTSBURGH • SAN FRANCISCO • WASHINGTON, D. C. • ZURICH, SWITZ.

Meetings

Science in Nigeria

The second annual conference of the Science Association of Nigeria was held in Zaria, Northern Nigeria, 15 to 18 December 1959. This association, affiliated with the wider organization of the West African Science Association, has been in existence only 1 year. Its membership is recruited from all branches of the teaching profession, from government scientists, and from industrial organizations.

The immense developments in Nigeria since World War II have given rise to a large increase in the numbers of scientific workers, both African and European. Yet the over-all numbers are still grossly inadequate for the country's need in an age of technological expansion. The association was brought into being for the dual purpose of providing a forum for scientists working in the country and of informing the general public of the role which scientific work is playing in their lives. Already the association has achieved considerable success. The quality of the papers and the discussions at the 1959 meeting was extremely high and gave a picture of a general standard of work and achievement which would have been unthinkable not many years ago.

The most obvious immediate technological needs of this country are in agriculture and allied fields. It is not surprising, therefore, that a great deal of emphasis was placed on agricultural developments and on the relation of these developments to nutrition. But other subjects were not neglected. The disturbing question of the biological effects of radiation—a real issue in this country since the first mention of atom-bomb tests in the Sahara—was dealt with in a scholarly and authoritative manner. There were brief incursions into the realms of physiology and even of philosophy.

The importance of the meeting, though, really lay in the fact that it brought together workers from many parts of Nigeria and from many fields of work. Physical and intellectual isolation are an ever-present danger in a vast, underdeveloped territory such as this, and an interchange of ideas and viewpoints is a real necessity.

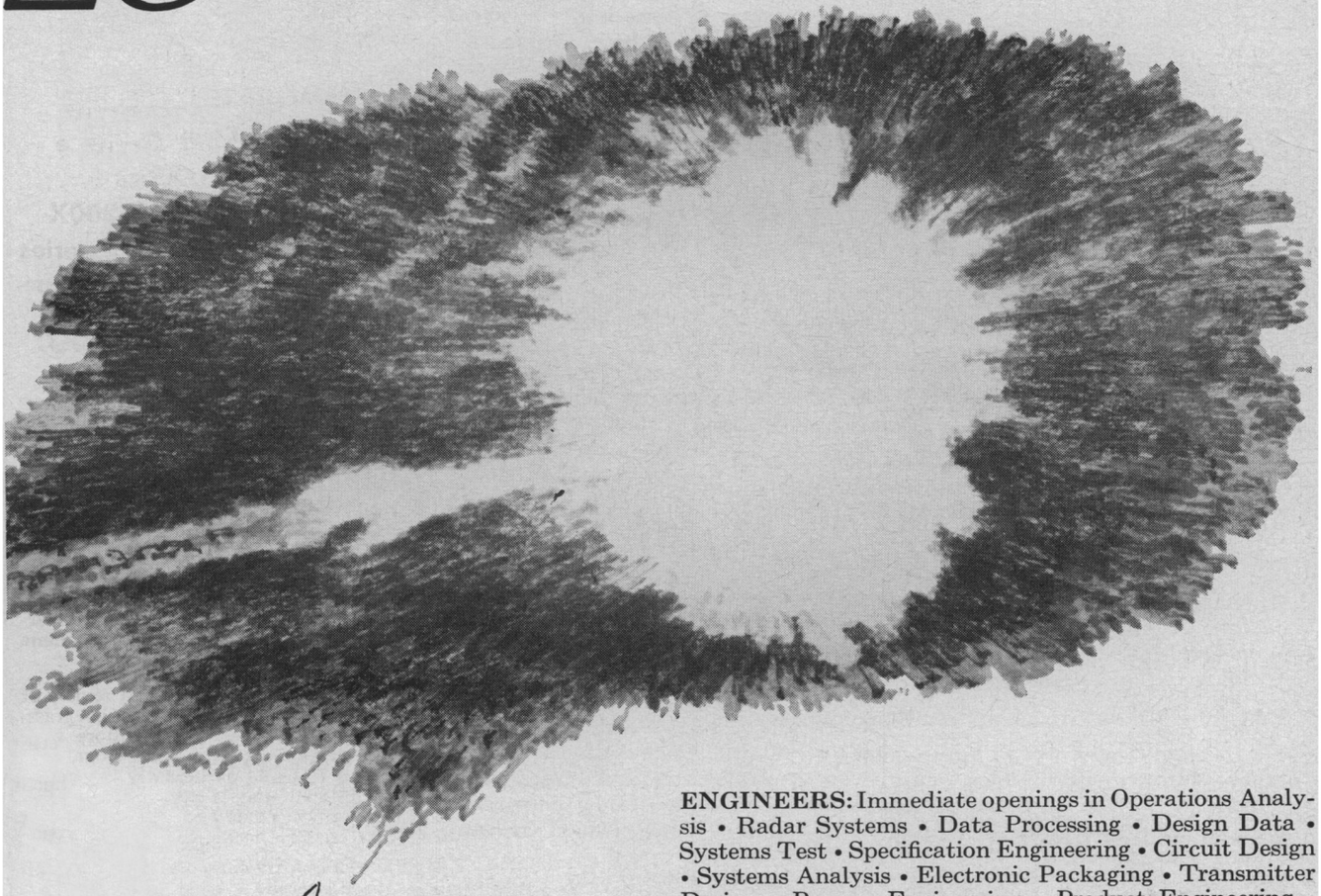
This meeting underlined a phenomenon of great significance, certainly, in Africa, probably also in other territories—namely, a reorientation in the pattern of research. Before the war the tropics, at best, were field stations visited by scientists from Europe who collected their material for examination in properly equipped laboratories in Europe. Today, Nigeria has not merely

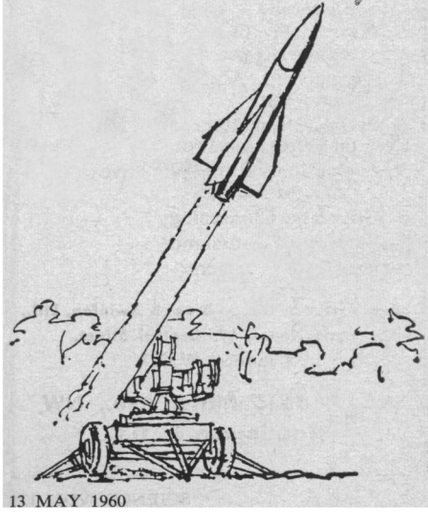
MISSILE-KILLER 20th CENTURY

Over White Sands, New Mexico, a killer searched the skies for its target — and found it. With deadly accuracy Raytheon's HAWK missile delivered a lethal blow to another supersonic missile in flight.

Development of Army's HAWK "killing power" by Raytheon's Missile Systems Division, made possible this *first successful interception* of one missile by another. And today, as a vital part of one of the world's largest electronics companies, Raytheon continues to make significant contributions to the art of missilery. The exciting new Pin Cushion Project for the selective missile identification and the continually being improved Navy's air-to-air SPARROW III are examples of their outstanding creative work.

We are now seeking talented, qualified people to maintain Raytheon's leadership in this challenging field. Raytheon's Missile Systems Division creates a climate for talent — perhaps *your* talent.





ENGINEERS: Immediate openings in Operations Analysis • Radar Systems • Data Processing • Design Data • Systems Test • Specification Engineering • Circuit Design • Systems Analysis • Electronic Packaging • Transmitter Design • Process Engineering • Product Engineering • Publications • Quality Control • Microwave.

Your resumé will receive prompt attention. Please address it to: Mr. Richard S. Malcolm, Coordinator of Employment/Placement, Missile Systems Division, Raytheon Company, 520 Winter Street, Waltham, Massachusetts.

18WS

RAYTHEON MISSILE SYSTEMS DIVISION

... creates a climate for talent.

the laboratories (insufficient in number, perhaps, but still there) but also the scientific personnel to carry out the work. The opportunities here are immense, and the challenge is something which Europe cannot match. There is, after all, a fundamental absurdity (though this was justifiably overlooked at the time they were created) in situating institutions of tropical research in England or indeed anywhere outside the tropics. This change alone is a big development. Most of the original work carried out in this country is, perforce, in applications such as agriculture and medicine. Nevertheless, the third step toward scientific maturity has already been taken, for there is now a great deal of "pure" research going on, particularly at the University College, Ibadan.

Science and technology in Nigeria are still young, but one feels that the plant is viable, that scientific activity will continue to grow, and that the nation as a whole will increasingly come to accept the new technologies as her best guarantee of future prosperity.

These are the impressions gleaned at the conference, at least by one observer. I feel that the Science Association of Nigeria is to be congratulated on the success of its first year of life and, in particular, of its second conference.

BRIAN HOPKINS
University College, Ibadan, Nigeria

Forthcoming Events

June

8–10. Canadian Federation of Biological Societies (Canadian Physiological Soc., Pharmacological Soc. of Canada, Canadian Assoc. of Anatomists, Canadian Biochemical Soc.), 3rd annual, Winnipeg, Manitoba. (E. H. Bensley, Montreal General Hospital, 1650 Cedar Ave., Montreal 25, P.Q.)

8–11. National Soc. of Professional Engineers, annual, Boston, Mass. (P. H. Robbins, NSPE, 2029 K St., NW, Washington 6)

8–12. American College of Chest Physicians, Miami Beach, Fla. (M. Kornfeld, 112 E. Chestnut St., Chicago 11, Ill.)

9–10. American Geriatrics Soc., Miami Beach, Fla. (R. J. Kraemer, 2907 Post Rd., Warwick, R.I.)

9–10. Canadian Inst. of Food Technology, 3rd annual conf., Winnipeg, Manitoba. (W. J. Eva, Box 846, Winnipeg, Manitoba)

9–10. Society of Women Engineers, 10th annual conv., Seattle, Wash. (Mrs. J. A. Troxell, 3613 E. 43 St., Seattle 5)

9–11. Acoustical Soc. of America, Providence, R.I. (W. Waterfall, ASA, 335 E. 45 St., New York 17)

9–11. Endocrine Soc., Miami Beach, Fla. (H. H. Turner, 1200 N. Walker, Oklahoma City 3, Okla.)

9–11. National Speleological Soc., annual, Carlsbad, N.M. (G. W. Moore, U.S. Geological Survey, Menlo Park, Calif.)