SCIENCE

NEW SERIES Vol. 95, No. 2469

Friday, April 24, 1942

Subscription, \$6.00 SINGLE COPIES, .15



Permas Weights have physical properties which enable them to serve better than gold-plated, platinum-plated, or lacquered brass weights in the analytical lab-oratory. They retain their carefully-adjusted mass much longer than weights made of other metals.

Permas is an alloy containing more than 50% nonferrous metals such as chromium, nickel, etc. Permas weights are made with tungsten-carbide tools; they are polished to a high lustre and adjusted to National Bureau of Standards specifications with the aid of a special balance with optical lever.

Permas Analytical Weights, adjusted to N. B. of S. Class S specifications are recommended wherever precise analytical weighing is done.

Permas Weights, Class S, with fractionals.................50-gram set, \$25.00; 100-gram set, \$29.00 If furnished without fractionals 50-gram set, \$22.50; 100-gram set, \$26.50 Permas Student Weights, Class S2, with fractionals..........50-gram set, \$15.00; 100-gram set, \$17.50

— Manufactured and Distributed by —

FISHER SCIENTIFIC CO.



A EIMER AND AMEND

711-723 Forbes Street, Pittsburgh, Penna.

633-635 Greenwich St., New York, N. Y.

Headquarters for Laboratory Supplies

Science: published weekly by The Science Press, Lancaster, Pa.

TWO NEW \dots

UNIVERSITY OF CALIFORNIA PUBLICATIONS IN ENTOMOLOGY

SYSTEMATICS OF THE MELOID GENERA HORNIA AND ALLENDESALAZARIA (COLEOPTERA)

E. GORTON LINSLEY

Volume 7, No. 8, pp. 169-188, plates 4-5. 1 map, 1 figure in text, paper.

25 cents.

NEW SPECIES OF LYGUS FROM CALIFORNIA

(HEMIPTERA, MIRIADE)

BY

N. WARD STANGER

Volume 7, No. 7, pp. 161-168, 1 figure in text. Paper, 25 cents.

UNIVERSITY OF CALIFORNIA **PRESS**

Berkeley

and

Los Angeles

Address all communications to the Berkeley Office.

CLINICAL HEMATOLOGY

By MAXWELL M. WINTROBE, M.D., Ph.D., Associate in Medicine, Johns Hopkins University; Associate Physician, Johns Hopkins Hospital, etc.

Octavo, 792 pages, illustrated with 167 engravings and 7 colored plates. Cloth, \$10.00, net.

This work brings together the accumulated information in the field in a system-It describes the atic and orderly form. newer methods which are of practical value and it outlines details of differential diagnosis. It makes clear the underlying physiological disturbances and describes the indications for and methods of treatment. It is complete, comprehensive, authoritative and practical.

LEA & FEBIGER

Washington Square PHILADELPHIA, PA.

THE ELECTRON MICROSCOPE.

By E. F. BURTON and W. H. KOHL

Head, Dept. of Physics, Research Director, Rogers University of Toronto Radio Tubes, Ltd., Toronto

The first Electron Microscope in America was developed The first Electron Microscope in America was developed and built in 1938 by the authors of this book, assisted by James Hillier, then a student of Dr. Burton's. Since then, news of the miraculous accomplishments of this instrument has spread rapidly through the scientific world. Actual magnifications of 67,000 diameters, permitting enlargement to over 200,000 diameters, have been attained. This enables investigators to examine organisms and colloidal particles of the order of magnitude of large molecules—an achievement whose importance in the fields of applied chemistry, bacteriology and immunology can scarcely be exaggerated. scarcely be exaggerated.

In an informal and clear style, the book outlines the fundamental principles of optical and electron microscopes; tundamental principles of optical and electron microscopes; the discussion is accompanied by many original line drawings illustrating the more important points. The dual nature of light is described in detail, and its bearing on the functioning of the electron microscope clearly shown, with emphasis on the contributions of Newton, Maxwell, de-Broglie and Planck. Many striking photographs of bacteria and of industrial materials such as asbestos, earbon black. and of industrial materials such as asbestos, carbon black, clays and oxides will be of absorbing interest to all physicists, microscopists, chemists and bio-

chemists.

233 Pages Profusely illustrated

Light Microscopes. Vision. Is Light? Wave Motion and Wave Motion Media. Wave Theory of Electromagnetic
The Electron. Light Accepted. Theory of Light. Dual Theory of Light. Dual Theory of the Electron. Motion of Electrons in Electrical Fields. Electrical Electron Mirrors and Lenses. Electrostatic netic Lenses.

History of Electron

Electrostatic Electron

Electrostatic Electron Microscope. Electrostatic Electron Microscope. Applications of Electrostatic Electron Microscope. round Electron Microscope-Magnetic Type. What the Electron Microscope Can Accomplish. General Bibliog-

raphy. Index.

330 West 42nd St., New York, N. Y.

CONTENTS-

REINHOLD PUBLISHING CORP.

\$3.85



Special Products

NUTRITIONAL RESEARCH

LABORATORY DIET MATERIALS SMACO

PACKED IN HERMETICALLY SEALED TINS

Vitamin A Test Diet—U.S.P. XI Vitamin B Complex Free Diet Rachitogenic Diet No. 2—U.S.P. XI Vitamin Free Casein Salt Mixture No. 2—U.S.P. XI

Bio-assay protocols available upon request

CRYSTALLINE VITAMINS SMACO

Carotene—Crystalline (90% beta—10% alpha)
Alpha Carotene
Beta Carotene
Vitamin A
Thiamine Hydrochloride (Vitamin B₁)
Riboflavin
Pyridoxine Hydrochloride
Nicotinic Acid (Pyridine 3-Carboxylic Acid)
Nicotinic Acid Amide (Pyridine 3-Carboxylic Acid Amide)
Ascorbic Acid (Vitamin C)
2-Methyl-1, 4-Naphthoquinone
p-Aminobenzoic Acid
Choline Chloride
Calcium Pantothenate
Alpha Tocopherol
Biotin Concentrate—Crystalline Biotin (Methyl-Ester)
Crystalline Biotin (Free Acid)

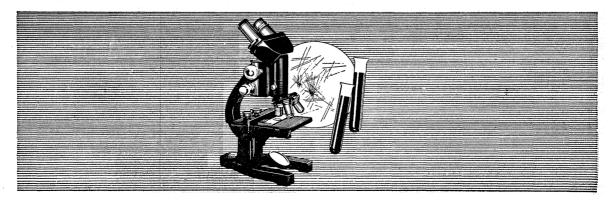
Inositol

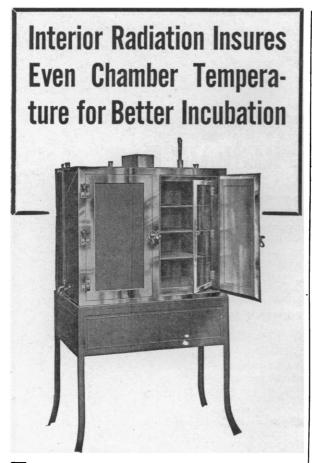
These products are prepared according to methods specifically developed to meet the strict requirements of our own research laboratories.

Complete information on prices, quantities, etc., supplied upon request.

Research Laboratories

S. M. A. CORPORATION . CHAGRIN FALLS . OHIO





THE Castle Precision Incubator No. 554, (as recommended for milk analysis by the agar plate method), features a temperature so uniform throughout that one thermometer is sufficient to secure accurate temperature measurements. This is due to the Castle method of heat transmission by interior radiation rather than by convection. It operates with a constancy of $\pm 1/5^{\circ}$ C. and a uniformity of $\pm 7/8^{\circ}$ C., under full load conditions.

22 gallons of warm water, accurately controlled, provide thousands of calories of reserve heat to compensate quickly for any heat loss.

Other models in varying capacities for various bacteriological applications are available.

Write-

WILMOT CASTLE COMPANY

1212 University Ave., Rochester, N. Y.



ANALYTICAL REAGENTS

Coleman & Bell

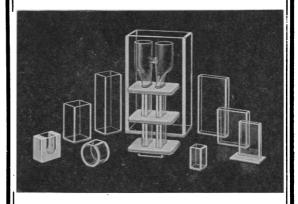
Analytical Reagents are manufactured to meet definite standards of purity, including the specifications of the Committee on Analytical Reagents of the American Chemical Society. Our list includes all of the common items and many rare and unusual compounds suitable for special analytical procedures.

Catalog upon request

THE COLEMAN & BELL CO.

MANUFACTURING CHEMISTS
NORWOOD, OHIO, U. S. A.

Klett made ... Glass Absorption Cells



Fused under high temperature with acid, alkali and other solvent resisting cement. Optical flat walls. Many stock sizes.

Special requirements made to order.

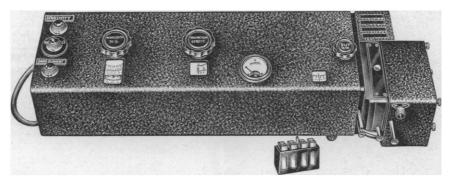
Sole manufacturer in the United States of fused Electrophoresis cells

Makers of complete Electrophoresis Apparatus

Klett Manufacturing Co.

179 East 87th Street, New York, New York

THE BECKMAN QUARTZ SPECTROPHOTOMETER



Available in two models; for absorption measurements in the range 320 to 1000 millimicrons, and from 220 to 1000 millimicrons.

The Beckman Spectrophotometer is a precision instrument, entirely self-contained with a unique electronic circuit for rapid measurement of percentage Transmission and Density. It consists of a quartz monochromator with a light source, sample holder and phototubes. It is remarkably versatile and meets the widely varying requirements of research and control work with no sacrifice in accuracy or convenience.

MONOCHROMATOR—Autocollimating type with selected crystal quartz prism provides high dispersion in the ultraviolet. Wavelength scale graduated from 200 millimicrons in ultraviolet to 2000 millimicrons in infrared, easily readable to 0.1 millimicron in ultraviolet to 1.0 millimicron in the red, with scale accuracy better than 1.0 millimicron. Slits are protected by quartz windows and are continuously adjustable from 0.1 to 2.0 mm. by a unique mechanism.

LIGHT SOURCES—Interchangeable light sources permit ready adaptability to all types of spectrophotometric work. Efficient design provides full-scale accuracy even with low light intensities.

SAMPLE HOLDER—Absorption cells are held in light-tight slide holding 4 cells with light path of 1 cm. or less. Top of cell compartment is removable for titration and other special techniques.

PHOTOTUBES—Compartment holds two phototubes, a sliding knob bringing either tube into position and simultaneously switching electrical connections. Three types of phototubes are available; one having maximum sensitivity in the red, another having maximum sensitivity in the blue, and a third having maximum sensitivity in the ultraviolet.

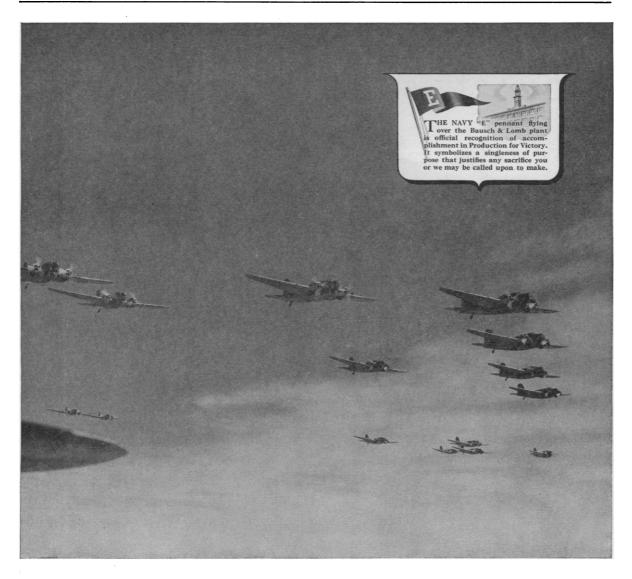
Detailed information will be furnished on request.

WILL CORPORATION, ROCHESTER, NEW YORK

Offices and Warehouses

BUFFALO APPARATUS CORP., Buffalo, N. Y. • WILL CORPORATION, 596 Broadway, New York City

LABORATORY APPARATUS AND CHEMICALS



Confidence Rides With The Dawn Patrol

WHEN the bombers of the Atlantic Patrol thunder into the dawn, their pilots look ahead with confidence—confidence born of faith in their machines and the fuel that drives their motors. American fuels, like American planes, are built to bring back safely those who fly.

Somewhere, in an American refinery, one of America's great army of behind-the-scenes workers, with a Bausch & Lomb Refractometer, is doing his part in making American oils and gasolines so efficient and safely dependable. Modern refractometric methods of control speed refining operations and maintain a greater uniformity and higher quality than ever before.

Here, again, optical science—with Bausch &

Lomb instruments—is at work helping to strengthen America's front lines of defense. Today, American manufacturers—like the nation's forces of defense—turn to precision optical methods for critical analysis, precise measurement, quality control. Bausch & Lomb's Contour Projectors, Metallographic Equipment and microscopes for inspection and control take their place alongside range finders, gun sights and binoculars in contributing to the vital needs of national defense.

BAUSCH & LOMB

OPTICAL CO. . ROCHESTER, NEW YORK

ESTABLISHED 1853

AN AMERICAN SCIENTIFIC INSTITUTION PRODUCING OPTICAL GLASS AND INSTRUMENTS FOR NATIONAL DEFENSE, EDUCATION, RESEARCH, INDUSTRY AND EYESIGHT CORRECTION

SCIENCE

Vol. 95	FRIDAY, AP	No. 2469		
Science in Music: Professor Carl E. Seat The Tasks Before Us: Dean Wortley F. R		Reports: Fellowships in Science Award heim Foundation		
Obituary: Herbert Fox, 1880-1942: Dr. J. HAROLD Recent Deaths and Memorials Scientific Events: The William Lowell Putnam Mathematical	al Compe-	Special Articles: A New Procedure for Staining Dr. George N. Papanicolaou, ferritin: S. Granick and Dr. Production of Antibodies in Linus Pauling and Dr. Dan	Ferritin and Apo- L. Michaelis. The Vitro: Professor	
tition; The Inter-American Treaty on Na tection; Grants of the Nutrition Found Chinese Scientific Society on West Co- American Society of Mammalogists; The Association of Pathologists and Bacterio	lation; A ast; The American	Scientific Apparatus and Laborar The Use of the Complement Fi Mountain Spotted Fever: Dr. Kenneth Wertman	xation Test in Rocky . HARRY PLOTZ and	
Scientific Notes and News	428	Science News		
Discussion: Carbonate-Apatite and Hydroxyl-apatite in Calculi: Clifford Frondel and Edwin I The Sacral Spot in Bengal: Dr. Elleen Anson Macfarlane. Credidmus Jovem Professor F. H. Pike. A Simple Metho trolling Termites: Professor J. C. Cros boldt Current in 1941: Professor Eliot in	L. PRIEN. W. ERL- Regnare: d of Con- s. Hum-	SCIENCE: A Weekly Journal ment of Science, edited by J. Molished every Friday by THE SCIENCE Lancaster, Pa.	CKEEN CATTELL and pub	
Quotations: Science and War	434	Annual Subscription, \$6.00 SCIENCE is the official organ tion for the Advancement of Scien		
Scientific Books: Organic Chemistry: Professor Marston T	Г. Bogert 434	SCIENCE is the official organ tion for the Advancement of Scie ing membership in the Associati the office of the permanent secr Institution Building, Washington,	etary in the Smithsonian D. C.	

SCIENCE IN MUSIC

By Professor CARL E. SEASHORE

THE STATE UNIVERSITY OF IOWA

Music draws upon a number of basic sciences, such as mathematics, physics, physiology, anatomy, genetics, anthropology and general psychology, in the light of prevailing musical theory and practice. It has become the function of the new applied science, the psychology of music, to integrate all these contributions and fit them as a unified function into the theory and practice of music and to initiate specifically designed experiments for the solving of musical problems. The initiative has been taken by psychologists; but as knowledge of the scientific aspects becomes a part of artistic creation and skill, this work of integration will be taken over more and more by musicians, and the distinction between the scientist and the artist will tend to disappear.

On the occasion of a football game at the University

of Oklahoma in 1939, I saw seventy-seven marching bands on parade. This represented only a section of the state, and the dust bowl state at that. It meant that music is being taught in the public schools of that state on a surprisingly large scale. Out of these popular bands in showy uniform will come a host of musicians of all kinds and degrees. Music is in the public schools to stay on a large scale. Music in America is in the air, literally and figuratively.

In the last ten years, the State University of Iowa, as one of the American universities which have taken cognizance of this problem, has conferred twelve doctor of philosophy degrees and one hundred ninety-seven master of arts degrees in music. The master of arts is coming to be required of all high-school music teachers. From kindergarten up to the graduate

per cent. saline to one fifth of the original volume. The final preparation contained a heavy suspension of Rickettsiae.

The antigen was titrated with a known guinea pig serum as well as with two known human sera. A 4 plus fixation was obtained with dilutions of the antigen up to 1:6. The antigen was found to be anticomplementary in a dilution of 1:2. An antigen dilution of 1:4 was used in all tests.

The usual hemolytic system, consisting of sheep cells, guinea pig complement and rabbit anti-sheep cell amboceptor was employed. The amboceptor was diluted to contain 3 M.H.D. in 0.25 cc. Equal amounts of amboceptor dilution and a 3 per cent. suspension of sheep cells were mixed together. The fresh complement was titrated on the day of the test.

Sera were inactivated at 56° C. for 30 minutes. Serum dilutions were made ranging from 1:3 to 1:192 using 0.25 cc amounts of each dilution in the test. Complement was diluted to contain 2 full units in 0.5 cc. A suitable antigen dilution was added in 0.25 cc amounts. Fixation was carried out for 20 hours in the ice box (4° C.) following which 0.5 cc of sensitized sheep cells were added to each tube and incubated for 30 minutes at 37° C. One and two units of complement in the presence of 0.25 cc of antigen dilution were also set up to indicate the validity of the results by showing the actual amount of free complement at the time the hemolytic system was added. The results of the tests are shown in Table 1.

TABLE 1

Human sera	Date of illness	Dis- ease	1:3	1:6	1:12	1:24	1:48	1:96	1:192	Serum control
RO WE PA SH SH SM RA HO LO 2 cases 11 sera 8 sera 2 sera 11 sera	1941 1938 1940 1941 1940 1941 1937 1941 Variou case: Wassei posi: "Q" fe	rmann tive ver	4 4 4 4 4 4 4 4 4 4 0 0 0	4 4 4 4 4 4 4 4 4 0 0 0	4 4 3 4 4 4 4 3 4 0 0 0	4 3 2 4 4 4 4 4 2 4 0 0 0	4 2 1 4 3 4 4 - 3 - -	2 0 0 3 2 2 4 - 2	1 0 0 2 1 1 2	0 0 0 0 0 0 0 0 0 0

We have examined the sera from nine cases of Rocky Mountain spotted fever and obtained positive complement fixation reactions in all. The oldest case (HU) had the disease $4\frac{1}{2}$ years prior to the examination of the serum, while the most recent serum (LO) examined was obtained on the 12th day of illness. This latter finding is significant, for if in subsequent cases it can be shown that antibodies can be demonstrated so early in the disease the complement fixation test may prove to be a real aid in diagnosis. In three

cases, (PA), (SH) and (SM), several specimens of serum were examined over a period of three and six months and no significant change in titre was noted.

There were two cases where the possible diagnosis of typhus fever was made. The subsequent course of the disease, a negative fixation test for typhus fever and a positive test for Rocky Mountain spotted fever indicated that we were dealing with the latter disease.

TABLE 2

Guinea pig sera	Disease	1:3	1:6	1:12	1:24	1:48	1:96	1:192	Serum control
No. 761 " 743 " 379 " 489 " 227 " 220 " 486 " 498 " 490 7 sera 6 sera 3 sera 15 sera	6 days after drop Temp. 12 days after drop Temp. R.S.F. R.S.F. R.S.F. R.S.F. R.S.F. R.S.F. R.S.F. Endemic Epidemic "Q" fever Normal	0 44 44 34 44 30 00 00	0 44 33 44 44 20 00 00	$0 \\ 3 \\ 4 \\ 4 \\ 4 \\ 2 \\ 0 \\ 0 \\ 0 \\ 0$	$0 \\ 3 \\ 4 \\ 2 \\ 1 \\ 4 \\ 3 \\ 1 \\ 0 \\ 0 \\ 0 \\ 0$	- 2 3 1 1 3 3 1 -	- 0 1 - 1 2 0 -	- 0 0 - 0 0 0	0 0 0 0 0 0 0 0 0

In guinea pigs (Table 2), fixation was obtained with eight sera. It is of interest to note that one guinea pig gave a negative reaction six days after the return of temperature to normal, while another gave a positive test after twelve days. The occurrence of fixing antibodies during the course of the illness in guinea pigs and monkeys is now being studied. No fixation was obtained with sera from endemic typhus, epidemic typhus or "Q" fever.

The results obtained in the tests described indicate that the complement fixation test may be employed in diagnosing Rocky Mountain spotted fever.

HARRY PLOTZ
KENNETH WERTMAN

ARMY MEDICAL SCHOOL

BOOKS RECEIVED

BAYLES, ERNEST E., and BURNETT, R. WILL. Biology for Better Living. Illustrated. Pp. xiv + 754. Silver Burdett Company. \$2.28.
BORING, EDWIN G. Sensation and Perception in the His-

Boring, Edwin G. Sensation and Perception in the History of Experimental Psychology. Pp. xv+644. D. Appleton-Century Company. \$5.00.

Appleton-Century Company. \$5.00.
BURTON, E. F., and W. H. KOHL. The Electron Microscope. Illustrated. Pp. 233. Reinhold Publishing Corporation. \$3.85.

Corporation. \$3.85.

KAYE, G. W. C., and T. H. LABY. Tables of Physical and Chemical Constants and Some Mathematical Functions.

Ninth edition. Pp. 181. Longmans, Green and Co. \$5.00.

RASTALL, R. H., and LAKE. Textbook of Geology. Fifth edition. Illustrated. Pp. viii to 491. Longmans, Green and Co. \$8.50.

SVERDRUP, H. U. Oceanography for Meteorologists. Illustrated. Pp. xv + 246. Prentice-Hall. \$3.50.

Who's Who in Philosophy. Vol. I. Anglo-American Philosophers. Pp. 293. Philosophical Library, Inc.;

New York.

Two Important Laboratory Books

Mellan—Organic Reagents In Inorganic Analysis

Methods employing organic reagents are sensitive, specific, time-saving and accurate—They are presented in this book in a genuinely usable way for teachers, students and research workers in chemistry. The limitations of each test are stated. Interfering substances are listed, and clear instructions are given for the elimination of these interferences. 243 organic reagents are described. 699 graphical formulas are given. 501 procedures are presented. A classification of reagents by reactive groupings is included. The reagents recommended are easily available in the United States. By Ibert Mellan, Ph.G., M.Sc., F.A.I.C. 682 Pages \$9.00 (1941)

Snell—Biology of the Laboratory Mouse

Abundantly illustrated, this book comprehensively presents the fundamental facts about the laboratory mouse in a clear, direct manner. Information about the mouse, widely scattered through the literature has been assembled and gaps in the literature were filled in by special research projects. By The Staff of the Roscoe B. Jackson Memorial Laboratory. Edited by George D. Snell. 172 Illus., 497 Pages \$7.00 (1941)

THE BLAKISTON COMPANY, Philadelphia

The

Foundations of Science

By H. POINCARÉ

Pp. xi + 553.

Containing the authorized English translation by George Bruce Halsted of "Science and Hypothesis," "The Value of Science" and "Science and Method," with a special preface by Poincaré, and an introduction by Josiah Royce. *Price*, postpaid, \$5.00.

THE SCIENCE PRESS
Lancaster, Pa. Garrison, N. Y.

Manual of the Southeastern Flora

(ILLUSTRATED)

Being Descriptions of the Seed-Plants growing naturally in North Carolina, South Carolina, Georgia, Florida, Alabama, Mississippi, Tennessee and Eastern Louisiana

By JOHN KUNKEL SMALL

This Manual replaces the author's Flora of the Southeastern United States, published in 1903 (second edition 1913), for the Southern States east of the Mississippi River. It embodies the results of continued exploration and study, thus bringing up to date our knowledge of this floral region.

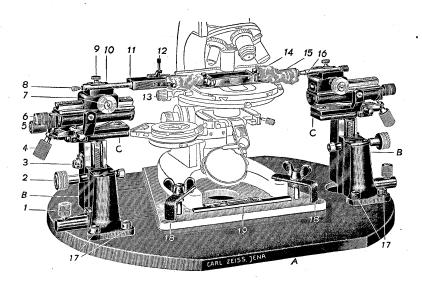
There are xxii + 1554 pages and over 1500 illustrations, one illustration of a species of each genus.

Price \$10.50 Postpaid

THE SCIENCE PRESS PRINTING CO. LANCASTER, PENNSYLVANIA

ZEISS MICROMANIPULATOR

after Janse and Péterfi



With the Micromanipulator, bacteria or other living microscopic objects, such as cells, can be singly treated, operated upon, injected, or exposed to physical or chemical influences. Inanimate microscopic objects, such as minute amounts of chemical substances, fibres, crystals, and the like, may similarly be rendered accessible to experimental investigation under the microscope.

WE BUY, REPAIR, RECONDITION, RESELL USED

ZEISS INSTRUMENTS

CARL ZEISS INC.

485 Fifth Avenue, New York

728 So. Hill Street, Los Angeles

Callery W. S.