

SCIENCE

VOL. LXIII JANUARY 1, 1926 No. 1618

SOME PSYCHOLOGICAL EXPERIMENTS¹

CONTENTS

<i>The American Association for the Advancement of Science:</i>	
<i>Some Psychological Experiments:</i> DR. J. McKEEN CATTELL	1
<i>Oceanographic Investigations of the Scripps Institution for Biological Research:</i> DR. T. WAYLAND VAUGHAN	8
<i>National Research Endowment</i>	10
<i>Scientific Events:</i>	
<i>Presentation of the Copley Medal of the Royal Society to Professor Einstein; The Award of Gold Medals by the American Geographical Society; Revision of Educational Methods in the Yale School of Medicine; The 1926 Meeting of the Pacific Division of the American Association</i>	11
<i>Scientific Notes and News</i>	14
<i>University and Educational Notes</i>	17
<i>Discussion and Correspondence:</i>	
<i>Projection of Ultra-Violet Lines:</i> PROFESSOR PAUL F. GAEHR. <i>Influence of Air and Sunshine on the Growth of Trees:</i> DR. W. J. SPILLMAN. <i>An Unusual Strain of Serratia Marcescens:</i> RACHEL SCHREINER and LAETITIA M. SNOW. <i>The Clearness of the Ohio River:</i> DR. FREDERICK EHRENFELD	18
<i>Scientific Books:</i>	
<i>Williston's Osteology of the Reptiles:</i> DR. C. C. MOOK	20
<i>Special Articles:</i>	
<i>The Presence of Sulphate-Reducing Bacteria in Oil Field Waters:</i> PROFESSOR EDSON S. BASTIN	21
<i>The Tennessee Academy of Science:</i> ROSCOE NUNN ..	24
<i>Science News</i>	x

SCIENCE: A Weekly Journal devoted to the Advancement of Science, edited by J. McKeen Cattell and published every Friday by

THE SCIENCE PRESS

Lancaster, Pa. Garrison, N. Y.

New York City: Grand Central Terminal.

Annual Subscription, \$6.00. Single Copies, 15 Cts.

SCIENCE is the official organ of the American Association for the Advancement of Science. Information regarding membership in the association may be secured from the office of the permanent secretary, in the Smithsonian Institution Building, Washington, D. C.

Entered as second-class matter July 18, 1923, at the Post Office at Lancaster, Pa., under the Act of March 3, 1879.

IF one of us lifts a hand as soon as a sound is made, the interval elapsing between the sound and the movement will be in the neighborhood of one seventh of a second. This reaction time is measured in thousandths of a second because it is so short and so regular that a very small unit is required. The symbol σ for a thousandth of a second, corresponding to μ for a thousandth of a millimeter, was introduced by me in psychology before it was needed in any physical science. It is evident that in making such measurements psychology is an experimental and an exact science.

During the brief period of the reaction a complicated process takes place. The sense-organ responds in a selective way, the impulse travels along a sensory nerve and perhaps through the spinal cord to lower centers of the brain, then to a higher center, where a selective impulse is formed and is sent back through motor centers and tracts to a muscle that it innervates. The study of these processes and organs—receptors, conductors, reflectors, effectors—belongs primarily to physiology, but any consciousness that may be involved and the total response of the individual are the province of psychology. The sensori-motor arc is a unit; physiology and psychology are as closely intertwined as are physics and chemistry in the study of the atom.

The time of reaction varies with the stimulus and the movement, with the condition of the sense-organ and the muscle, with the paths of conduction, with the situation in the nervous centers. Thus the time for a given individual may on the average be 1σ —one thousandth of a second—longer with the left hand than with the right. It may be 20σ longer for light than for sound, a photochemical process in the retina being here involved. It may be 2σ shorter when the intensity of a sound is doubled; thus in so far as there is a logarithmic relation we have the beginnings of a mathematical psychology. The time depends on the condition of the brain centers as related to attention, fatigue and other factors.

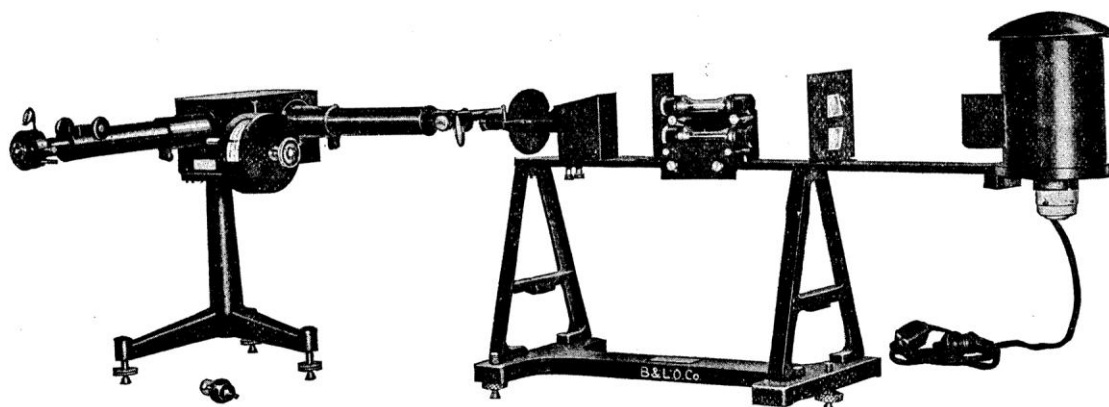
As there is no break in continuity between the fertilized ovum and the adult, or, apart from mutations or possible critical points, between the unicellular organism and the highest vertebrate, so

¹ Address of the retiring president of the American Association for the Advancement of Science, given at Kansas City on December 28, 1925.

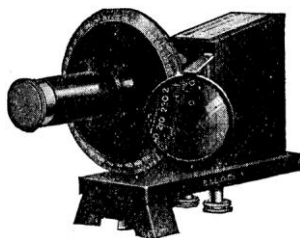
BAUSCH & LOMB

Complete Spectrophotometric Outfit

No. 2675



The Bausch & Lomb Complete Spectrophotometric Outfit consists of a No. 2700 Constant Deviation Prism Type Spectrometer and a Photo-metric Stand No. 2750 that is completely equipped with a Martens Polarization Photometer No. 2735, a ventilated lamp house with Mazda bulb, specimen tubes with adjustable holders and a double lens and prism system. A front view of the Martens Photometer is shown below. Send for illustrated circular of Spectroscopes.

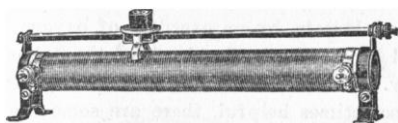


Bausch & Lomb Optical Co.

632 St. Paul Street, Rochester, N. Y.

BRANCH OFFICES AND DISPLAY ROOMS

New York Chicago Boston Washington San Francisco London Frankfurt



JAGABI RHEOSTATS

are wound on enameled tubes, as illustrated above. By means of sliding-contacts the resistance can be varied from zero to full capacity, in exceedingly small steps.

In resistance ratings, JAGABI Rheostats vary from 0.34 ohm up to 30,000 ohms, and in corresponding current values from 25 amperes down to .1 ampere

Especially suited for use in Educational, Research and Industrial Laboratories. Write for Bulletin S-1040
JAMES G. BIDDLE, 1211-13 ARCH ST., PHILADELPHIA

Improved MacMichael Viscosimeter

Suitable for factory control,—Also for laboratory research.

Write for Bulletin 320

EIMER & AMEND

Est. 1851

Inc. 1897

Third Avenue, 18th to 19th Street New York, N. Y.

New Museum Catalog

Listing Turtox Skeletons, Dissections, Museum Preparations, Life Histories, etc., is ready.

Write for your copy today.



The Sign of the Turtox Pledges Absolute Satisfaction

General Biological Supply House

761-3 E. 69th Place

Chicago, Illinois

SCIENTIFIC ARTIST

Line Drawing and Line Rendering of Pencil Sketches a Specialty

H. C. CREUTZBURG

The Wistar Inst. of Anatomy and Biology
Philadelphia, Pa.

Second Edition: Revised and Enlarged

THE RAT: DATA AND REFERENCE TABLES

Memoir No. 6: 458 Pages. Bibliography: 2206 Titles

HENRY H. DONALDSON

Published by THE WISTAR INSTITUTE

Philadelphia, Pa., U. S. A.

Price, \$5.00

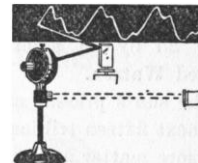
PHONELESCOPE

TEACHES THROUGH THE
The Movies for all
SOUND

WAVE MOTION

ELECTRICITY

HERBERT GROVE DORSEY GLOUCESTER, MASSACHUSETTS



Marine Biological Laboratory

Woods Hole, Mass.

Biological Material



1. ZOOLOGY. Preserved material of all types of animals for class work and for the museum.

2. EMBRYOLOGY. Stages of some invertebrates, fishes (including Acanthias, Amia and Lepidosteus), Amphibia, Reptiles and some mammals.

3. BOTANY. Preserved material of Algae, Fungi, Liverworts, Mosses, Ferns and Seed Plants.

4. MICROSCOPE SLIDES in Bacteriology, Botany and Zoology.

5. LIFE HISTORIES, Germination Studies and Natural History Groups.

Catalogues furnished on application to

GEORGE M. GRAY, Curator

WOODS HOLE

MASSACHUSETTS

FOR SALE—Seven Bausch and Lomb Tessar lenses, series: Ic, F: 4. 5, size 5 x 8; all fitted with iris diaphragms. One, ditto, size 5 x 7; one, ditto, size 3 1/4 x 4 1/4. Address: Physics Department, Kalamazoo College, Kalamazoo, Michigan.

THE MICROSCOPE

By SIMON H. GAGE, of Cornell University

Revised Edition (14th) Ready

The Old and the New in Microscopy, with a special chapter on Dark-Field Methods and their Application.

Postpaid, \$3.50

COMSTOCK PUBLISHING CO., ITHACA, N. Y.

THE SCIENCE PRESS PRINTING COMPANY

PRINTERS OF

SCIENTIFIC AND EDUCATIONAL JOURNALS
MONOGRAPHS AND BOOKS

A. E. URBAN, General Manager

Correspondence Invited

LANCASTER, PENNSYLVANIA

Laboratory Apparatus and Supplies



PARIS
EXPOSITION:
Eight Awards and Medals

PAN-AMERICAN
EXPOSITION:
Gold Medal

Our General Laboratory and Museum Supplies Include:

Scientific Apparatus and Instruments, Chemicals, Anatomical Models, Natural History Specimens and Preparations, Wall Charts, Museum and Naturalists' Supplies, Glass Jars, Microscopes and Accessories.

THE KNY-SCHEERER CORPORATION OF AMERICA

Dept. of Natural Science,
G. Lagai, Ph.D.

119-125 7th Ave.
(Cor. 17th St.)
New York City

NATURAL HISTORY SPECIMENS AND MODELS

We have been getting together specimens for over fifty years, so are in an exceptional position to supply material for the following sciences:

Mineralogy, Geology, Paleontology,
Conchology, Ornithology, Zoology
and Entomology

Some of our recent circulars are

- S-220 Mineral and Rock Collections
- S-243 Wooden Crystal Models
- S-223 Relief Maps
- S-242 Interesting Fossils
- S-241 Microscope Slides of Parasites
- S-235 Special Dissections of Animals
- S-223 Biological Material for Dissection
- S-229 Life Histories of Insects of Economic Importance
- SC-37 Human Anatomical Models
- SC-38 Comparative Zoology Models
- SC-33 Entomological Supplies
- SC-31 Taxidermy catalogue

WARD'S NATURAL SCIENCE ESTABLISHMENT

148-02 College Ave. Rochester, N. Y.

FOR THE Biological Sciences

Naturalists' Supplies
Microscope Slide Preparations
Preserved Material
Display Material
Lantern Slides
Charts, Botanical and Zoological
Microscopes, Microtomes and
Accessories
Dissecting Instruments
Laboratory Glassware
Chemicals
Bacteriological Reagents

We have now ready for distribution our new Cat. No. 6P with an extensive list of preserved and museum material; Cat. 6G of models and charts; and Supplement to Cat. 6L, with a large list of photomicrographs of unusual interest and quality. Copy on request.

Prompt
Service



Guaranteed
Quality

New York Biological Supply Co.
34 Union Square New York, N. Y.