

SCIENCE

VOL. LXXI

FRIDAY, JUNE 6, 1930

No. 1849

Symmetry of Time in Physics: PROFESSOR GILBERT N. LEWIS 569

Obituary:

Shosaburo Watasé: PROFESSOR F. R. LILLIE and DR. SHIGEO YAMANOUCI; *Recent Deaths* 577

Scientific Events:

The Conversazioni of the Royal Society; Research Building of the Mellon Institute; Symposium on the Kidney in Health and Disease; The Pacific Division of the American Association 579

Scientific Notes and News 581

Discussion:

How Old is the Pleistocene?: M. R. HARRINGTON and JAMES A. B. SCHERER. *The Future of Taxonomy*: PROFESSOR T. D. A. COCKERELL. *Inactivity of Chicory*: CHAPMAN REYNOLDS. *Can a Catfish Count?*: IDA MELLEN 585

Scientific Apparatus and Laboratory Methods:

Recording Cerebral Action Currents: S. H. BARTLEY and E. B. NEWMAN. *A Convenient Aid in Balancing Centrifuge Tubes*: DR. H. W. ESTILL 587

The American Association for the Advancement of Science:

The Regular Spring Meeting of the Executive Committee: PROFESSOR BURTON E. LIVINGSTON 588

Special Articles:

The Structure of Glutathione: DR. BEN H. NICOLET. *Transmission Changes in Ultra-violet Glasses during High Temperature Exposure to Light*: C. C. NITCHIE and F. C. SCHMUTZ 589

Science News x

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

THE SCIENCE PRESS

New York City: Grand Central Terminal

Lancaster, Pa.

Garrison, N. Y.

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.

THE SYMMETRY OF TIME IN PHYSICS*

By Professor GILBERT N. LEWIS

UNIVERSITY OF CALIFORNIA

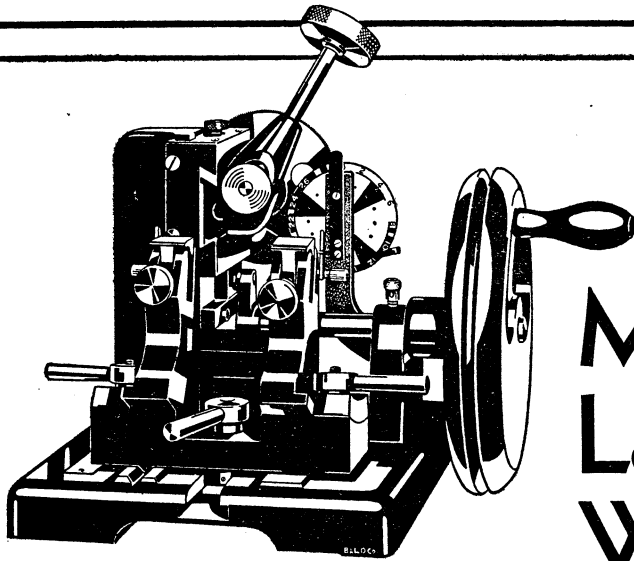
A FEW years ago I presented¹ the outline of a theory of light which required a radical change in our ideas of temporal causality. Instead of assuming the time-honored unidirectional causality, in which cause inevitably precedes effect, it proved necessary to assume that the present phenomena of a system are determined no more by the past states of the system than by its future states. Several recent developments in physics make this assumption seem less startling now than then; indeed I am fully convinced that there is no other way in which we can account for the known phenomena of light. Moreover, new discoveries in wave mechanics indicate that any conclusions concerning the emission of light must be extended to the emission of every kind of material particle.

By such considerations I was led, in "The Anatomy of Science," to examine with some care the meaning

* Address given on the occasion of the presentation of the gold medal of the Society of Arts and Sciences, New York, April 17, 1930.

¹ Nature, 117: 236, 1926.

of time, as the word is used in physical science. It often happens that a common concept of daily life may profitably be simplified or refined when it is to be employed in a single branch of science. In studying the vastly complex phenomena of nature, as they come to us through our sense impressions, we could make little headway did we not segregate and idealize certain groups of like phenomena for the purpose of special study. Such segregations define the several branches of science, of which one of the most highly specialized and idealized is physics. Only a few types of phenomena are included within its bounds, and in its study we consciously abstain from employing many of our commonest ideas, such as purpose, goodness, beauty. In the physical sciences a statue of Praxiteles is a certain mass of crystalline calcium carbonate; the shape may or may not be mentioned. It was the scientific arrogance of a previous age that called a law of physics a law of nature. To speak so is to forget the bounds that we have ourselves established.



A New Microtome for Laboratory Work » »

THE simplified model of the Minot Rotary Microtome has been completely redesigned to give you an instrument of utmost dependability for laboratory work.

The specimen holder, a 25mm disc, works by a ball and socket so it can be oriented to give any desired cutting angle. A single screw holds it rigidly in place.

Feeding mechanism operates automatically and provides for cutting sections from 2 microns up to 26 microns. The counterbalanced drive wheel is grooved to permit the use of a belt where a motor is to be used. The base of the instrument is very heavy to give stability when in use.

The entire instrument is constructed with characteristic B & L precision and workmanship.

Write for circular D-21 which gives complete details.

BAUSCH & LOMB OPTICAL CO.

642 ST. PAUL STREET

ROCHESTER, N. Y.



BAUSCH & LOMB

Makers of Orthogon Eyeglass Lenses for Better Vision

School of Medicine Western Reserve University

Cleveland, Ohio

NEW LABORATORIES AND
HOSPITALS

RESTRICTED CLASSES

THOROUGH INSTRUCTION

LARGE CLINICAL FACILITIES

HIGH STANDARD OF SCHOLAR-
SHIP

Admission confined to students having aca-
demic degrees and to Seniors in Absentia.

For information address:

THE REGISTRAR

2109 Adelbert Rd.

CLEVELAND

JOHNS HOPKINS UNIVERSITY SCHOOL OF MEDICINE

The School of Medicine is an Integral Part of the University and is in the Closest Affiliation with the Johns Hopkins Hospital.

ADMISSION

Candidates for admission must be graduates of approved colleges or scientific schools with two years' instruction, including laboratory work, in chemistry, and one year each in physics and biology, together with evidence of a reading knowledge of French and German.

Each class is limited to a maximum of 75 students, men and women being admitted on the same terms. Applications may be sent any time during the academic year but not later than June 15th.

If vacancies occur, students from other institutions desiring advanced standing may be admitted to the second or third year provided they fulfill the requirements and present exceptional qualifications.

INSTRUCTION

The academic year begins the Tuesday nearest October 1, and closes the second Tuesday in June. The course of instruction occupies four years and especial emphasis is laid upon practical work in the laboratories, in the wards of the Hospital and in the dispensary.

TUITION

The charge for tuition for 1930-31 will be \$600 per annum, payable in two installments. There are no extra fees except for certain expensive supplies, and laboratory breakage.

Inquiries should be addressed to the
Recorder of the School of Medicine, Johns Hopkins
University, Washington and Monument Sts.,
Baltimore, Md.

Graduates in Medicine who satisfy the requirements of the heads of the departments in which they desire to work are accepted as students for a period not less than three quarters. Tuition charge is \$50 a quarter.

School of Medicine and Dentistry THE UNIVERSITY OF ROCHESTER

Medical School, Strong Memorial Hospital, School of Nursing and Out-Patient Department of the University of Rochester and the Municipal Hospital of the City of Rochester, all under one roof. Medical, Surgical, Obstetric, Pediatric, Dental, Contagious and Neurological patients admitted. Unusual opportunities for school and hospital cooperation in medical and graduate dental teaching.

Admission

Medical candidates must have completed three years of college work with special requirements in chemistry, physics and biology. The entering class will not exceed 50, men and women being admitted on equal terms.

Tuition

Charge for tuition will be \$400 per annum, payable in equal installments at the beginning of each semester.

For information address

THE DEAN

School of Medicine and Dentistry
Crittenden Boulevard, Rochester, N Y.

BOSTON UNIVERSITY SCHOOL OF MEDICINE

ORGANIZED IN 1873

ANNOUNCEMENT

may be obtained by application to

THE REGISTRAR

80 East Concord Street,

Boston

Massachusetts