

SCIENCE

VOL. 89

FRIDAY, APRIL 28, 1939

No. 2313

Edward Orton, Geologist: PROFESSOR A. C. SWINNERTON 373

Obituary:

Jacob Goodale Lipman: DR. A. G. MCCALL. Adolf Carl Noé: PROFESSOR CAREY CRONEIS. Recent Deaths and Memorials 378

Scientific Events:

The Royal Research Ship "Research"; The Puget Sound Entomological Society; The Seventieth Anniversary of the American Museum of Natural History; The American Philosophical Society; Harvey Cushing's Seventieth Birthday 381

Scientific Notes and News 383

Discussion:

On the Path of the Firefly while Periodically Flashing: PROFESSOR CHAS. T. KNIPP. Patents for Acts of Nature: DR. CHARLES E. RUBY. Space Perception by Radio: PROFESSOR MAX F. MEYER. Microbiology of Coal: DR. FRIEDA WEINSTOCK FUCHS 386

Societies and Meetings:

The First South American Botanical Congress: C. O. ERLANSON 390

Special Articles:

Sex Mechanism in Polyploids of *Melandrium*: DR. H. E. WARMKE and DR. A. F. BLAKESLEE. Broad Protective Action of Rabbit *Antipneumococcus* Serum in Rats: DR. H. M. POWELL and W. A. JAMIESON. The Availability of Manganese in Avian Digestion: DR. H. S. WILGUS, JR., and DR. A. R. PATTON. Movement of Radiophosphorus in Bean Seedlings: DR. ORLIN BIDDULPH 391

Science News 10

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.

EDWARD ORTON, GEOLOGIST*

By Professor A. C. SWINNERTON

ANTIOCH COLLEGE

INTRODUCTION

SCIENTISTS whose names survive are associated mostly with innovations. Newton and gravitation, Darwin and evolution, Agassiz and glaciation, are inseparable. Recognition is seldom granted the humbler role of the interpreter. Now and again, however, there arises an interpreter whose knowledge is so broad, whose judgment is so sound, whose touch with common folk is so full of understanding and whose integrity is so far beyond reproach that recognition is given spontaneously.

Edward Orton was an interpreter. As one studies his life one finds that Orton's contributions to education, to the state and to science lay largely in the

wisdom gained from the discoveries of others, in the perception of values and in the interpretation of them to his fellow men. His contributions in geology can be understood and appraised only by an examination of the man himself; hence this review of his career in science must include a survey of his early years.

I. EARLY YEARS

Edward Orton was born on March 9, 1829, when the presidency of the swashbuckling Andrew Jackson was but five days old. When he went to Hamilton College in 1845, conflict with Mexico was stirring emotions. All through his early years many conflicting views raged over political, economic and regional issues. The emotional tensions of people must have been similar in quality to those of our present day, the primary causes similar, though differing immensely in their applications. Candor in speech, honesty and objectivity in

* Part of an address delivered at the dedication of a monument and park—a memorial to Edward Orton—presented to the State of Ohio by Hugh Taylor Birch, of Yellow Springs, Ohio, October 26, 1938.

grow for varying lengths of time in a nutrient solution containing radiophosphorus (obtained through the courtesy of E. O. Lawrence) at the approximate concentration of 3.5 uc/cc. The bean seedlings had been previously grown without phosphorus, and at the time of use gave slight evidence of phosphorus deficiency by the dark color of the leaves. When placed in the solution containing radiophosphorus, the opposite leaves and the first alternate leaf appeared fully mature. The third alternate leaf was just unfolding.

The plants were placed, one after another, in the radiophosphorus containing nutrient solution. After the required interval of time the plant was removed, the roots carefully washed and the plant dissected and placed in the drying oven. When thoroughly dry the parts were ground to a fine powder and samples weighed for analysis. Each sample was placed in a thin Cellophane (du Pont #3100) cone, which was mounted immediately above the sensitive window of a Geiger counter. The Neher-Harper "High Speed Geiger-Counter Circuit"² in connection with "A Direct-Reading Counting Rate Meter for Random Pulses"³ was used for detecting radiophosphorus in the plant samples. The results are shown in Table I.

TABLE I

DISTRIBUTION OF RADIOPHOSPHORUS IN VARIOUS PARTS OF BEAN SEEDLINGS

Length of time in solution	48 hrs. 4 mg.	24 hrs. 10 mg.	2½ hrs. 10 mg.
Mg. of sample used.....	Counts/min.	Counts/min.	Counts/min.
Roots	2,364*	1,968	1,092
Hypocotyl	804	744	228
Stem		468	
Opposite leaves	1,104	504	144
First alternate leaf	1,934	888	204
Second alternate leaf ..	2,124	1,380	240
Third alternate leaf ..	2,364*		216
Background	36		

* Counter reached end of scale. True value slightly higher.

It was possible, under conditions of the experiment, to detect radiophosphorus in the uninjured plant by moving the shielded counter tube over the leaves and stem. In order to get away from stray radiation, the following technique was adopted.

Discs of fresh leaf tissue were cut from a plant which had been in the radiophosphorus containing nutrient solution for two and one half hours. They were held over the sensitive window of the Geiger counter. A lead shield with a circular hole 7.5 mm in diameter was used to determine the area of leaf tissue exposed to the sensitive window of the counter tube. The results are shown in Table II.

² H. V. Neher and W. W. Harper, *Phys. Rev.*, 49: 940, 1936.

³ N. S. Gingrich, R. D. Evans and H. E. Edgerton, *R. S. I.*, 7: 450, 1936.

TABLE II
DISTRIBUTION OF RADIOPHOSPHORUS IN FRESH LEAF TISSUE

	Counts/min.	Distance from base of hypocotyl
Opposite leaves	10	18.0 cm
First alternate leaf,		
tip leaflet	46	25.5 "
lateral leaflet	54	23.4 "
Second alternate leaf,		
tip leaflet	20	22.3 "
lateral leaflet	62	20.6 "
Third alternate leaf,		
tip leaflet	38	18.7 "
lateral leaflet	33	17.8 "
Background	36	

The results indicate that phosphorus may be absorbed by the apparently uninjured roots of phosphorus-deficient plants and transported at a rate exceeding 10 cm/hr. From the distribution of radiophosphorus in the plant it appears that movement in the aerial parts is dependent on the transpiration stream, and that the "excretion" of phosphorus into the xylem occurs only after considerable accumulation has taken place in the living cells of the root. Detailed results will be published elsewhere.

ORLIN BIDDULPH

DEPARTMENT OF BOTANY,
STATE COLLEGE OF WASHINGTON

BOOKS RECEIVED

- Annual Review of Physiology*, Vol. I, 1939. JAMES M. LUCK, Editor. Pp. vii + 705. 3 figures. Annual Reviews, Stanford University. \$5.00.
- BAITSELL, GEORGE A., Editor. *Science in Progress*. Pp. xiv + 322. 90 figures. Yale University Press. \$4.00.
- BOGOMOLETZ, A. A., S. J. STEINBERG and M. M. LANGER, Editors. *La Médecine Expérimentale; Organe de l'Institut de Médecine Expérimentale de l'Ukraine*, No. 3, 1938. Pp. 110. Ukrainian Association for Cultural Relations with Foreign Countries, Kiev.
- CANNON, WALTER B. *The Wisdom of the Body*. Revised edition. Pp. xviii + 333. 40 figures. Norton. \$3.50.
- MCCOLLUM, E. V., ELSA ORENT-KEILES and HARRY G. DAY. *The Newer Knowledge of Nutrition*. Fifth edition, revised. Pp. ix + 701. 14 figures. Macmillan. \$4.50.
- MCCOY, ELIZABETH and L. S. MCCLUNG. *The Anaerobic Bacteria and their Activities in Nature and Disease, a Subject Bibliography; Vol. I, Chronological Author Index*. Pp. xxiii + 295. Vol. II, *Subject Index*. Pp. xi + 602. University of California Press.
- NORTHROP, JOHN H. *Crystalline Enzymes; the Chemistry of Pepsin, Trypsin and Bacteriophage*. Pp. xv + 176. 48 figures. Columbia University Press. \$3.00.
- NEWMAN, H. H. *The Phylum Chordata; Biology of Vertebrates and their Kin*. A revision of *Vertebrate Zoology*. Pp. xii + 477. 235 figures. Macmillan. \$3.60.
- University of Illinois Bulletin: Vol. XXXVI, No. 23, An Investigation of Rigid Frame Bridges; Part I, Tests of Reinforced Concrete Knee Frames and Babelite Models*. Pp. 48. 14 figures. \$0.50; No. 28, Part II, *Laboratory Tests of Reinforced Concrete Rigid Frame Bridges*. Pp. 78. 39 figures. \$0.85. No. 29, *The Effects of Errors or Variations in the Arbitrary Constants of Simultaneous Equations*. Pp. 54. \$0.60. No. 37, *A Survey of Sulphur Dioxide Pollution in Chicago and Vicinity*. Pp. 32. 1 figure. \$0.40. No. 42, *Fatigue Tests of Butt Welds in Structural Steel Plates*. Pp. 58. 20 figures. \$0.65. The University, Urbana.

Three Outstanding New Books

GEOMORPHOLOGY

By A. K. LOBECK, Columbia University. In press—ready in June

This long-awaited text in the fundamental principles of geomorphology will be of immediate interest to teachers of geography, geology, and related subjects. It is intended for the beginning student, and covers Rocks and Structures, Weathering, Underground Water, Streams, Alpine Glaciation, Continental Glaciation, Waves, Wind, Organisms, Coastal Plains and Plateaus, Dome Mountains, Block Mountains, Folded Mountains, Complex Mountains, Volcanoes, and Meteor Craters. The book offers outstanding pedagogical aids in (1) the correlation of exceptional illustrative material with accompanying text matter; (2) synopses preceding each chapter; (3) use of maps of foreign countries, and (4) collections of questions and study topics.

GEOLOGY. Principles and Processes.

New second edition

By WILLIAM H. EMMONS, GEORGE A. THIEL, CLINTON R. STAUFFER, University of Minnesota, and IRA S. ALLISON, Oregon State College. 451 pages, 6 x 9. \$3.75

This standard text for the elementary student gives, as before, a thorough, balanced treatment of all the essential topics, covering the materials of the earth and the processes that operate at the earth's surface. The new edition represents a thorough revision of the text, intended to meet more adequately the needs of the first course in Physical Geology. The chapter on the atmosphere and the work of the wind has been reorganized and enlarged; the treatment of varved glacial lake sediments has been expanded; the chapter on diastrophism has been enlarged to include the structures of rocks; and the selection of illustrations has been improved.

GEM AND GEM MATERIALS. *New third edition*

By EDWARD H. KRAUS and CHESTER B. SLAWSON, University of Michigan. 285 pages, 6 x 9. \$3.50

This third edition of a well-known book represents an entire resetting to cover developments in the field and to accommodate considerable new informational and illustrative material. The chapter dealing with manufactured gems has been completely rewritten; a new order has been introduced; and material dealing with synthetic gems has been brought up to date. Diamond and gem cutting are discussed in greater detail than formerly. The descriptions of the individual gems have all been revised and brought up to date. An outstanding feature of the new edition is the inclusion of eighty-one new illustrations, including four imported color plates.

Send for copies on approval

McGRAW-HILL BOOK COMPANY, INC.

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

Aldwych House, London, W.C.2

NEW WILEY BOOKS

Published Spring 1939

PROCEEDINGS OF THE SIXTH SUMMER CONFERENCE (1938) ON SPECTROSCOPY AND ITS APPLICATIONS

Edited by GEORGE R. HARRISON, *Professor of Physics, Massachusetts Institute of Technology*

This volume contains, in somewhat abbreviated form, the thirty-one papers which were presented during the three days of the 1938 conference on spectroscopy and its applications. Although space limitations decreed that not much more than half of the orally presented material be included, the condensations have been carried out by the respective authors, and little essential material has been neglected. The volume constitutes an important compilation of discussions of a rapidly developing field from various aspects.

179 pages; 91 illustrations; 7½ by 10; \$3.00

METHODS OF STATISTICAL ANALYSIS

By C. H. GOULDEN, *Honorary Lecturer in Statistics, University of Manitoba*

A well-balanced, concise presentation of statistical methods for research work. The book is designed for the use of those who have studied as a prerequisite a moderate amount of general theory and principles. It will be particularly useful for students intending to specialize in biological research. A series of actual examples covering a wide scope is given. The first half of the book is written so that, in reviewing, the student is brought into contact immediately with the structure of actual experiments. The later chapters present a well-illustrated discussion of the application of statistical principles and methods to the designing of experiments and the analysis of results of the experiments so designed.

277 pages; 15 illustrations; 6 by 9; \$3.50

HIGH-FREQUENCY ALTERNATING CURRENTS

By KNOX MCILWAIN, *Associate Professor, and J. G. BRAINERD, Assistant Professor; both of the Moore School of Electrical Engineering, University of Pennsylvania*

"McIlwain and Brainerd" contains the material for a course designed for senior or first-year graduate students in electrical engineering. Among the chief revisions and additions in this edition are discussions of the application of the theory to class A, B and C amplifiers, to high-level modulators, etc. The vacuum-tube notation has been brought in close accord with the standard notation proposed by the Institute of Radio Engineers. Lagrange's equation is developed and used in the discussion of electromechanical systems. The proof of this equation is presented in a form which may be taught to undergraduates.

Second Edition

530 pages; 526 illustrations; 6 by 9; \$6.00

TRIGONOMETRY

By HOWARD K. HUGHES, *Assistant Professor of Mathematics, and GLEN T. MILLER, Instructor in Mathematics; both at Purdue University*

This book is intended for use in a first course in trigonometry for students in the freshman year in college. The solution of triangles has been placed early in the text, while analytical trigonometry has been placed later. Features of especial importance are: the early introduction of the definitions of the trigonometric functions; the rather complete discussion of approximate numbers; the chapter on logarithms; the brevity of the individual articles; the large number of exercises; the illustrative examples; the teachability and flexibility of the book.

Text, 189 pages; Tables, 79 pages; 95 illustrations; 5% by 8%; With tables, \$2.00; Without tables, \$1.50

JOHN WILEY & SONS, INC., 440-4th Ave., New York

NEW PUBLICATIONS!

A Resurvey of the Development of Lymphatics and Associated Blood Vessels in Anuran Amphibia by the Method of Injection

HENRY McE. KNOWER
*Osborn Zoological Laboratory,
Yale University*

**The American
Anatomical Memoir, No. 18**

April, 1939

126 pages. Five text figures and
nineteen plates (forty figures)

Price \$2.00

PRACTICAL ANTHROPOMETRY

ALEŠ HRDLIČKA
*U. S. National Museum,
Washington, D. C.*

PRACTICAL ANTHROPOMETRY is not a product of the mere instructor in Anthropometry, but one embodying the experience of a life-long practice in the field under the most varied conditions.

It is written throughout with the object of being helpful to the student as well as to the worker in Anthropometry in the many difficulties which are encountered.

LATEST INFORMATION ON: Measurements of the Brain; Treatment of Data; Deformations; Identifications; Blood Tests; Fingerprinting; Treatment for Preservation of Skeletal Material.

April, 1939

246 pages

Twenty figures

Cloth Bound \$3.50

Send orders to

THE WISTAR INSTITUTE OF ANATOMY AND BIOLOGY

Woodland Avenue and Thirty-sixth Street

Philadelphia, Pa.

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.

The Manual is the only complete illustrated work on the flora of the Southeast by a recognized authority.

In addition to analytical keys to the various plant groups, and descriptions of the orders, families, genera and species, regional or altitudinal and geographic distribution, 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 COMPANY

LANCASTER, PENNSYLVANIA