

# SCIENCE

VOL. LXX

FRIDAY, DECEMBER 27, 1929

No. 1826

<i>The New Soil Science</i> : DR. P. E. BROWN .....	619	<i>Scientific Books</i> :	
<i>Recent Progress in the History of Ancient Mathematics</i> : PROFESSOR LOUIS C. KARPINSKI .....	622	<i>Libby on Contemporary Civilization</i> : DR. FRED- ERICK E. BRASCH .....	636
<i>Obituary</i> :		<i>Scientific Apparatus and Laboratory Methods</i> :	
<i>Victor Clarence Vaughan</i> : DR. FREDERICK G. NOVY. <i>Memorials; Recent Deaths</i> .....	624	<i>Preserving Certain Green Algae in Natural Colors</i> : MARK WINTON WOODS .....	637
<i>Scientific Events</i> :		<i>Special Articles</i> :	
<i>Gold, Silver, Copper, Lead and Zinc in the Eastern States; Collections for the Field Museum from Eastern Asia; Electrical Apparatus Presented by Columbia University to Edison; The Society for Experimental Biology and Medicine of Southern California</i> .....	626	<i>Ancient Migration Routes of Central Asia</i> : DR. HENRY FAIRFIELD OSBORN. <i>The Structural Correlation of Gitozigenin with digitoxigenin</i> : DR. WALTER A. JACOBS and EDWIN L. GUSTUS .....	638
<i>Scientific Notes and News</i> .....	629	<i>Science News</i> .....	x
<i>University and Educational Notes</i> .....	632		
<i>Discussion</i> :			
<i>The Popularization of Science</i> : WILLIAM A. HAMOR and LAWRENCE W. BASS. <i>The Zodiacal Light</i> : DR. HARLAN T. STETSON. <i>Cranberry False-Blossom Disease Spread by a Leafhopper</i> : DR. IRENE D. DOBROSKY. <i>Cell Fusions in Fungous Hyphae</i> : ILLO HEIN. <i>Information concerning Castoroides</i> : PROFESSOR A. R. CAHN .....	632		

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 NEW SOIL SCIENCE<sup>1</sup>

By Dr. P. E. BROWN

PROFESSOR OF SOILS, IOWA STATE COLLEGE

SOIL science or pedology, as it is now coming to be called, is not new. It is centuries old, as may be readily deduced from an examination of many old books and records. Recently, however, the study of soils has taken on a different aspect and we now have a new concept of soil science. It is this modern, rather recent development of the subject which is referred to as "the new soil science."

As is the case with many of our present-day sciences, the beginnings of soil science lie buried in the dim mists of antiquity. Just when and where it might be said to have originated can not be determined. Perhaps the first observations were made in the Garden of Eden. The writings of Moses indicate that agriculture is as old as man. Isaac and Jacob certainly knew how to grow good crops and they probably

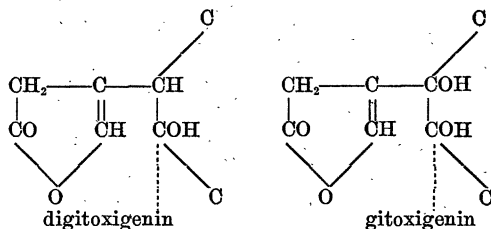
gathered many facts about soils. Observations on soils certainly have been made from the time man began to learn the art of using them for the production of crops.

According to Herbert Spencer, *use* is the underlying cause of the development of all science. In the early stages, the practical phases always receive the most attention, because of the struggle by man toward the utilization of nature. This has been particularly true, and naturally so, in the case of the various agricultural sciences.

But there is another force which is perhaps even more powerful than use in bringing about the evolution of sciences. It is the "unconscious struggle of our natures for the acquisition of abstract knowledge or for the discovery of the laws of phenomena." In any branch of science, this force soon becomes the more significant, and the present status of knowledge

<sup>1</sup> Address of the retiring president of the Iowa State Chapter of Sigma Xi.

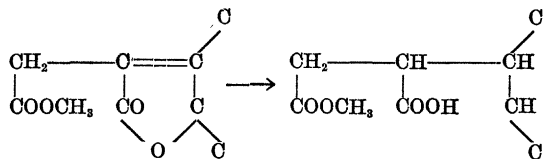
This relationship is shown in the following partial formulas:



In all other respects the two aglucones are structurally identical. These conclusions have been reached from the study of the following series of substances.

Gitoxigenin on isomerization by alkali is converted into isogitoxigenin.<sup>1</sup> On saponification of the lactone group of the latter substance, the salt of isogitoxigeninic acid results, which can be oxidized by hypobromite to isogitoxigenic acid. When the latter is treated with concentrated hydrochloric acid, the remaining tertiary hydroxyl is replaced by chlorine with the formation of chloroisogitoxigenic acid. Simultaneously stereo-isomerization occurs under the influence of the reagent on some center of asymmetry in the molecule. The chlorine atom in this acid can be removed under certain conditions as hydrochloric acid with the production of anhydro isogitoxigenic acid.

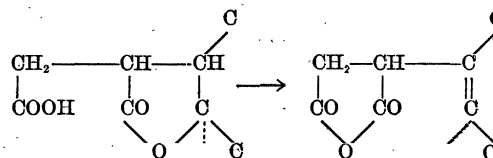
It was hoped that on catalytic hydrogenation this anhydroacid (as the ester) would absorb one mol of hydrogen with the formation of a substance identical, or at least isomeric, with the previously described isodigitoxigenic acid obtained from isodigitoxigenin. The reaction, however, took an abnormal course in that two mols of hydrogen were consumed. Investigation showed that not only was the double bond hydrogenated but the lactone group was cleaved with the formation of a saturated acid in accordance with the following scheme:



On saponification this half ester readily yielded the dibasic acid.

Following a number of unsuccessful attempts the identical dibasic acid was obtained also from digitoxigenin through the following steps. Isodigitoxigenin<sup>2</sup> after saponification was oxidized by hypobromite to isodigitoxigenic acid. On treatment with

concentrated hydrochloric acid the latter was isomerized to  $\gamma$ -isodigitoxigenic acid. When treated with acetic anhydride and acetyl chloride a reaction occurred, which involved cleavage of the lactone group and formation of a substituted succinic anhydride while simultaneously the newly uncovered hydroxyl group was removed as water.<sup>3</sup> The secondary hydroxyl group elsewhere in the molecule was also acetylated. When this anhydro anhydride acetate (acetate of anhydro- $\gamma$ -digitoxenoldiacid)



was treated with methyl alcohol containing one per cent. of hydrochloric acid, the succinic anhydride group was converted into the half ester. Catalytic hydrogenation of the resulting unsaturated half ester gave rise to the saturated substance, the acetate and half ester of  $\gamma$ -digitoxanoldiacid. On saponification  $\gamma$ -digitoxanoldiacid was produced and this substance proved to be identical with the above described dibasic acid obtained from gitoxigenin. This conclusion was substantiated by the comparison of the neutral dimethyl esters prepared from both acids as well as of the stable half esters which resulted on partial saponification of the latter.

WALTER A. JACOBS  
EDWIN L. GUSTUS

THE ROCKEFELLER INSTITUTE  
FOR MEDICAL RESEARCH

## BOOKS RECEIVED

- The American Annual of Photography*. 1930. Vol. XLIV. Edited by Frank R. Fraprie. Pp. 272. Illustrated. The American Photographic Publishing Company. \$1.50.
- APPLETON, A. B. *Laboratory Guide to Vertebrate Dissection*. Pp. xix + 152. Cambridge University Press. 6s.
- CONKLIN, EDMUND S. *Psychology of Religious Adjustment*. Pp. xiv + 340. Macmillan. \$2.00.
- DAMPIER-WHETHAM, W. C. D. *A History of Science*. Pp. xxi + 514. Cambridge University Press. 18s.
- DANIELS, FARRINGTON, J. HOWARD MATHEWS and JOHN WARREN WILLIAMS. *Experimental Physical Chemistry*. Pp. xvi + 475. 132 figs. McGraw-Hill. \$3.50.
- DICKSON, LEONARD E. *Introduction to the Theory of Numbers*. Pp. viii + 183. University of Chicago Press. \$3.00.
- POLLARD, A. F. C. *The Kinematical Design of Couplings in Instrument Mechanisms*. Pp. 64. 25 figs. Adam Hilger, London. 4s. 6d.
- POOL, RAYMOND J. *Flowers and Flowering Plants*. Pp. xx + 378. 191 figs. McGraw-Hill. \$3.50.
- RAMSAY, SIR WILLIAM, and F. G. DONNAN, Editors. *The Effects of Moisture on Chemical and Physical Changes*. Pp. xii + 235. 44 figs. 50 tables. Longmans, Green. \$5.00.
- <sup>3</sup> W. A. Jacobs and E. L. Gustus, *J. Biol. Chem.*, 1929, 84: 183.

<sup>1</sup> W. A. Jacobs and E. L. Gustus, *J. Biol. Chem.*, 1928, 79: 553; 1929, 82: 403.

<sup>2</sup> W. A. Jacobs and E. L. Gustus, *J. Biol. Chem.*, 1928, 78: 573.

---

**McGraw-Hill**

---

*announces*

# Experimental Physical Chemistry

*By Farrington Daniels**Professor of Chemistry, University of Wisconsin**J. Howard Mathews**Professor of Chemistry, University of Wisconsin**and John Warren Williams**Assistant Professor of Chemistry, University of Wisconsin***475 pages, 3½ x 8, illustrated, \$3.50***International Chemical Series*

THIS latest volume in the International Chemical Series presents 78 experiments in physical chemistry. Many of these are new; some are based on researches described in the literature of physical chemistry, and some are classical. Considerable choice is possible so that suitable selections may be made on the basis of available apparatus and of the maturity and ultimate aims of the student.

At the beginning of each experiment a brief statement of the theory involved is included.

The second part of the book describes laboratory apparatus and methods of using it and also the technique of experimentation. This material is designed to encourage students to undertake special work and to aid them in later years in the solution of practical problems.

The book aims to illustrate the principles of physical chemistry; to train the student in careful experimentation; to develop familiarity with apparatus; to give the student confidence in using physical chemical measurement; to encourage ability in research.

*Send for a copy on approval*

**McGRAW-HILL BOOK COMPANY, INC.**

370 Seventh Avenue

Penn Terminal Building

New York

*Ready in January*

# EDUCATIONAL BIOLOGY

*By* JOHN C. JOHNSON

*Professor of Biology and Head of Science Department, State Teachers College, West Chester, Pennsylvania*

*The American Teachers College Series,*

Edited by JOHN A. H. KEITH and WILLIAM C. BAGLEY

IT has long been recognized by educators and biologists that there are certain well-established biological facts, principles, and laws as a background for the understanding of the child and as a basis for the solution of many teaching problems. The author of EDUCATIONAL BIOLOGY has collected, selected, interpreted, and organized these facts in book form on the basis of a course in the subject which he has been teaching for the last eighteen years.

Planned primarily for use in the course in biology now generally recognized as a basic one in the professional education of teachers, this textbook should serve as a foundation for the intelligent study of principles of education, educational psychology, educational sociology, philosophy of education, and similar courses. It should also form a substantial basis for the more specific courses in nature study, elementary and general science, hygiene, and health education.

The scientific facts of each of the many divisions of biology which have been discussed have been carefully attested by specialists in these fields. The book presents accurate and comprehensive material fundamental to the study of education.

Chapter	TABLE OF CONTENTS
I	INTRODUCTION
II	THE CHIEF SUB-DIVISIONS OF BIOLOGY
III	TWO BASIC LAWS OF BIOLOGY
IV	VARIATION
V	NATURE'S METHOD OF SELECTION
VI	MAN'S METHOD OF SELECTION
VII	ADAPTATION
VIII	ISOLATION AND GEOGRAPHICAL DISTRIBUTION
IX	COLOR AS EXPRESSED IN PLANTS, ANIMALS, AND MAN
X	CLASSIFICATION
XI	THE PRIMATES
XII	MAN AS AN ANIMAL
XIII	INSTINCTS IN THE ANIMALS AND IN MAN
XIV	DEGENERATION AND PARASITISM
XV	THE PALEONTOLOGICAL RECORD
XVI	THE CELL: THE UNIT OF LIFE
XVII	OPEN-CELLED VERSUS MANY-CELLED ANIMALS
XVIII	THE EMBRYOLOGICAL RECORD
XIX	MATURATION OF THE REPRODUCTIVE CELLS AND FERTILIZATION
XX	THEORIES CONCERNING INHERITANCE BEFORE THE YEAR 1900
XXI	MENDEL'S LAWS OF INHERITANCE
XXII	HUMAN INHERITANCE
XXIII	THE IMPROVEMENT OF THE HUMAN SPECIES
XXIV	INHERITANCE OF ACQUIRED CHARACTERS
XXV	CIVIC BIOLOGY
XXVI	OUTSTANDING EPOCHS IN THE HISTORY OF BIOLOGY
XXVII	THE BRAIN
	BIBLIOGRAPHY

**THE MACMILLAN COMPANY,** 60 FIFTH AVENUE  
New York City

CHARLES SCRIBNER'S SONS  
NEW YORK   \   \   LONDON

## Henry Fairfield Osborn

*Biological Series (1894-1929)*

### I. FROM THE GREEKS TO DARWIN

New and completely revised edition of this standard work. 12mo. 3d thousand. \$2.50

### II. IMPRESSIONS OF GREAT NATURALISTS

Sequel to Vol. I. Darwin, Wallace, Huxley, Balfour, Bryce, Pasteur, Leidy, Cope, Butler, Burroughs, Muir, Roosevelt. With portraits. 12mo. New and extended edition. 4th thousand. \$2.50

### III. EVOLUTION AND RELIGION IN EDUCATION

Discussion with Bryan and other Fundamentalists of the years 1922-25. 12mo. 12th thousand. \$2.00

### IV. CREATIVE EDUCATION

*in School, College, University, and Museum*

Fifty years' observation and experience in school, college, and university education and the training of biologists and geologists. "I rejoice that you have put your ripe experience into this brilliant book. It is tonic."—WILLIAM McANDREW. With portraits. 12mo. \$2.50

*Life History of Earth and Man Series  
(1907-1928)*

### I. THE ORIGIN AND EVOLUTION OF LIFE

On the theory of action, reaction, and interaction of energy. Profusely illustrated. 8vo. 12th thousand. \$4.00

### II. THE AGE OF MAMMALS

New and revised edition now in preparation. Profusely illustrated. 8vo. \$6.00

### III. EVOLUTION OF MAMMALIAN MOLAR TEETH

Foundation of the tritubercular theory of human mammalian dentition. Profusely illustrated. 8vo. \$2.75

### IV. MEN OF THE OLD STONE AGE

*Their Environment, Life, and Art*

Standard work in human archaeology. Profusely illustrated. Thirteenth printing. Cr. 8vo. 20th thousand. \$5.00

*Princeton University Press*

### V. MAN RISES TO PARNASSUS

Intellectual and spiritual evolution of man to close of New Stone Age. Sequel to Vol IV. Illustrated. 8vo. 3d thousand. \$2.50

## A New Publishing House



## RICHARD R. SMITH, INC.

has opened offices at 12 East 41st Street, New York City. Mr. Smith, who recently resigned as a Director of the Macmillan Company, has for the past twenty years been in charge of the College Department of Macmillan's and, according to *The Publishers' Weekly*, "built up a list of books recognized in both publishing and educational circles as of unquestioned leadership with a volume of business exceeding in amount the entire business of many publishers."

The new company will give particular emphasis to textbooks for use in the college field and at the same time will expand definitely as a trade publisher. It has purchased the Religious Department of Doubleday, Doran & Company, Inc., and thus begins with an assured volume of business from a series of titles of the very highest importance in the religious book field and the field of the general trade as well. This, of course, adds to the stability of the new house, a stability assured by the experience and previous success of its personnel.

Associated with Mr. Smith, are James E. Van Toor, formerly assistant manager of the College Department, and Ray Critchlow, formerly Eastern traveling representative of Macmillan's; also Charles W. Ferguson, already a successful author, Clarence C. Dittmer and Harry G. Doud, formerly of Doubleday, Doran and Company.

Authors desiring to submit manuscript may count upon careful and sympathetic consideration and upon receiving constructive suggestions whenever these can be made by the publishers or their readers.

*Manuscripts should be addressed to*

**Richard R. Smith, Inc.**

*Publishers*

**12 East 41st Street, New York**