

SCIENCE

VOL. 89

FRIDAY, MAY 12, 1939

No. 2315

The American Association for the Advancement of Science:
The Interrelation of Soils and Plant, Animal and Human Nutrition: DR. E. C. AUCHTER 421

Obituary:
John Henry Schaffner: DR. ADOLPH WALLER.
Arthur E. Hill: PROFESSOR J. P. SIMMONS 427

Scientific Events:
The Swedish State Institute of National Health; Study of the Distribution of the Ferns and Flowering Plants of Pennsylvania; Honorary Members of the Horticultural Society of New York; The Dundee Meeting of the British Association for the Advancement of Science; The Fiftieth Anniversary of the Johns Hopkins Hospital 429

Scientific Notes and News 431

Discussion:
Will Iodine Come to be Considered an Essential Plant Nutrient?: PROFESSOR W. L. POWERS. *Range Plant Newly Found to be Poisonous:* PROFESSOR A. W. DEEM, FRANK THONE, JR., and PROFESSOR L. W. DURRELL. *The Transport of Water to Anode or Cathode through Non-aqueous Liquids:* DR. CHARLES C. RAINEY. *Proposing the Term, Predatee:* DR. L. D. WOOSTER 434

Societies and Meetings:

The American Philosophical Society: EDWIN G. CONKLIN. *The National Academy of Sciences* 436

Special Articles:

An Intermediate Host for the Swine Influenza Virus: DR. RICHARD E. SHOPE. *A Cutaneous Test for Tuberculosis in Primates:* DR. MARGARET A. KENNARD and OTHERS. *The Quantitative Determination of Soy-bean Protein in Sausage or Other Protein Mixtures:* DR. JOHN H. GLYNN 441

Science News 10

SCIENCE: A Weekly Journal devoted to the Advancement of Science, edited by J. MCKEN 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 INTERRELATION OF SOILS AND PLANT, ANIMAL AND HUMAN NUTRITION¹

By Dr. E. C. AUCHTER

CHIEF OF THE BUREAU OF PLANT INDUSTRY, U. S. DEPARTMENT OF AGRICULTURE

OUR knowledge of many aspects of the interrelations between soils, plants, animals and human beings is limited, but some of the work that has been done in recent years gives us fascinating glimpses of the possibility and importance of further discovery. I would go so far as to say that we can now see the outlines of a whole new field of biological, or shall I say, agricultural, research. From what is already known, this phase of agricultural research should lead to a new orientation of agricultural thinking. Certainly it suggests profound implications for human welfare.

The interrelation of the soil, the atmosphere, the plant and the animal is a cycle in which the same materials are used over and over again. Minerals, moisture

¹ Address of retiring vice-president and chairman of Section O (Agriculture) of the American Association for the Advancement of Science, Richmond, December, 1938.

and certain constituents of the atmosphere under proper conditions of light and temperature enter the plants, and by them compounds of potential energy are made and the excess over their own utilization stored. When such products are eaten by human beings and animals, these compounds are broken down and re-worked, energy becomes available for growth and movement, and parts of the compounds are again released into the air in the form of carbon dioxide and moisture or returned to the soil. Such compounds may then be taken up again by plants and rebuilt into new plant bodies. Thus there is an obvious interrelationship, the animals being dependent upon plants, the plants upon soil, and the soil upon parent rock and the materials that are returned to it through the decay of plants and animal products. Thus a great cycle or *wheel of life*

THE QUANTITATIVE DETERMINATION OF SOY-BEAN PROTEIN IN SAUSAGE OR OTHER PROTEIN MIXTURES

GOVERNMENT restrictions forbidding the use of soy-bean flour in sausage or other meat used in interstate commerce is based on the lack of a reliable test for the quantitative determination of soy-bean protein in such meat. The nutritional value of soy-bean is not questioned. At the present time no strictly chemical method of assay has proven reliable.

We have recently obtained accurate quantitative results by the use of an immunological method which is both simple and rapid. The method is based on a quantitative precipitin test, the "optimal proportions" reaction, first described by Dean and Webb¹ and subsequently proven by Taylor, Adair and Adair² to be well within the limits of accuracy of the best-known chemical methods.

The test depends on the fact that in any antigen-antibody titration system the velocity of the reaction is related to the proportion of antigen to antibody. Thus, for a given antibody, precipitation is most rapid when the ratio of antigen to antibody is at an optimum which can be readily determined. This optimum ratio is a constant for each antibody solution and is independent of the concentrations of either antigen or antibody in any specific test.

For example, suppose a given antigen reacts most rapidly with a given antibody at a ratio of 1 to 50; that is, one part of antigen forms a precipitate with 50 parts of antibody at a faster rate than with 45 or 55 parts of antibody. In fact, any ratio other than 1 to 50 will be slower than this optimum. Then, since this optimum ratio is a constant, the actual concentration of reagents may vary within fairly wide limits. It may be 3 to 150 or 10 to 500 or 25 to 1,250.

It is a simple matter to standardize any particular antibody against a known antigen in terms of optimal ratio. Using this ratio the concentration of antigen in any unknown mixture can be determined.

In the specific instance of quantitative assay of soy-bean protein in sausage, the test is performed as follows:

Rabbits are immunized against a 5 per cent. NaCl extract of soy-bean flour. For practical purposes, it is unnecessary to use purified glycinin. Several courses of injections over three or four months are usually necessary to produce a serum of satisfactory potency. The serum is collected and standardized against known soy-bean flour extract. Its optimal ratio is determined

as accurately as possible. This ratio is then a constant for that particular serum.

Sausage containing soy-bean flour is extracted with 5 per cent. NaCl. This unknown extract is then titrated against the standard serum and its ratio determined. By dividing the test ratio by the standard ratio the percentage of soy-bean protein in sausage is given.

For example, a standardized serum had a ratio of 1 to 30 against pure soy-bean flour extract. An extract of sausage gave a ratio of 1 to 3 with this serum. Therefore the sausage contained 10 per cent. of soy-bean flour. The accuracy of the method is limited only by the care with which the test is performed; that is, the ability of the operator to distinguish the most rapidly precipitating tube in a rack of ten or twelve tubes. The specificity of the method is limited only by the phylogenetic relationship of the protein mixture under test, a well-established immunological fact.

Details of the test will appear in a subsequent publication.

JOHN H. GLYNN

THE ARMOUR LABORATORIES,
CHICAGO

BOOKS RECEIVED

- GODWIN, H. *Plant Biology; an Outline of the Principles Underlying Plant Activity and Structure*. Third edition, revised. Pp. x+308. 83 figures. Cambridge University Press, Macmillan. \$2.25.
- HENDERSON, I. F. and W. D. HENDERSON. *A Dictionary of Scientific Terms; Pronunciation, Derivation and Definition of Terms in Biology, Botany, Zoology, Anatomy, Cytology, Embryology, Physiology*. Third edition, revised by J. H. KENNETH. Pp. xii+383. Oliver and Boyd, Edinburgh. 16/-.
- HENRICI, ARTHUR T. *The Biology of Bacteria; an Introduction to General Microbiology*. Second edition. Pp. xiii+494. 112 figures. Heath. \$3.60.
- JORDAN, EMIL L. *Americans; a New History of the Peoples Who Settled the Americas*. Pp. 459. Illustrated. Norton. \$3.50.
- Thalès; *Recueil Annuel des Travaux et Bibliographie, 1936; Université de Paris, Institut d'Histoire des Sciences et des Techniques et de leurs Rapports avec l'Histoire des Idées et de la Civilisation*. Pp. 265. Félix Alean, Paris.
- TURNER, C. E. *Personal and Community Health*. Fifth edition. Pp. 652. 127 figures. Mosby. \$3.00.
- Water Pollution in the United States; Third Report of the Special Advisory Committee on Water Pollution; House Document No. 155, 76th Congress*. Pp. xiv+165. 37 figures. U. S. Government Printing Office, Washington.
- WEISS, PAUL. *Principles of Development; a Text in Experimental Embryology*. Pp. xix+601. 124 figures. Holt. \$5.00.
- WOOD, ROBERT W. *Supersonics, the Science of Inaudible Sounds*. Pp. viii+158. 42 figures. Brown University, Providence, R. I. \$2.00.
- Woods Hole Oceanographic Institution; Collected Reports, 1938*. Illustrated. The Institution, Woods Hole, Mass.

¹ H. R. Dean and R. A. Webb, *Jour. Path. and Bact.*, 29: 473, 1926.

² G. L. Taylor G. S. Adair and M. E. Adair, *Jour. Hyg. Camb.*, 32: 340, 1932.

Recent

McGRAW-HILL BOOKS

Loomis and Shull's—EXPERIMENTS IN PLANT PHYSIOLOGY

By WALTER E. LOOMIS, Iowa State College, and CHARLES A. SHULL, University of Chicago.
McGraw-Hill Publications in the Botanical Sciences. 208 pages, 6 x 9. \$2.00

A revision and expansion of the first half of the authors' *Methods in Plant Physiology*, this new manual is intended primarily to meet the requirements of the beginning student. The laboratory experiments have been simplified, more advanced work omitted, and the material adapted to use as a laboratory text in elementary and intermediate courses in plant physiology.

Haupt's—AN INTRODUCTION TO BOTANY

By ARTHUR W. HAUPT, University of California at Los Angeles. *McGraw-Hill Publications in the Botanical Sciences.* 396 pages, 6 x 9. \$3.00

This comprehensive, well-balanced textbook presents clearly and concisely the fundamental facts and principles concerning the structure, functions, and life relations of plants. Special attention is given to evolution, heredity, adaptation, and other topics of general biological interest having cultural rather than technical value. This approach makes the book particularly suitable for a one-term survey course. Morphology is emphasized throughout the book.

Miller's—PLANT PHYSIOLOGY. *New second edition*

By EDWIN C. MILLER, Kansas State College. *McGraw-Hill Publications in the Botanical Sciences.* 1201 pages, 6 x 9. \$7.50

Designed both as text for advanced students and as a reference book for investigators, this well-known book gives a complete survey of the field of plant physiology, with reference to the green plant. In the new edition practically every chapter has been revised and enlarged to include the investigations and findings that have been made during the past seven years. The book is now strictly up to date, and contains over 6,000 references covering every aspect of the subject.

Maximov's—PLANT PHYSIOLOGY. *New second edition*

By N. A. MAXIMOV, University of Saratov, U.S.S.R. Edited by R. B. HARVEY, University of Minnesota, and A. E. MURNEEK, University of Missouri. *McGraw-Hill Publications in the Botanical Sciences.* 473 pages, 6 x 9. \$4.50

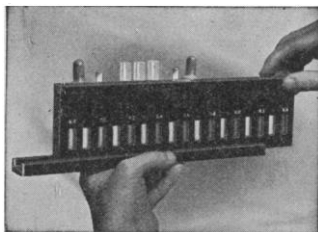
The present revision of this standard text is an entirely new book, rearranged and rewritten, with new materials from the data of current research on growth and reproduction, the application of hormones, respiration photosynthesis, mineral nutrition, etc.

Send for copies on approval

McGRAW-HILL BOOK COMPANY, INC.

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

Aldwych House, London, W.C.2

TAYLOR NON-FADING LIQUID**COLOR STANDARDS**

are ideal for general pH control work. Taylor Slide Comparators are molded from plastic for durability and work on the slide principle for ease and simplicity of operation.

Full information on request.

W. A. TAYLOR & CO., INC.
891 Linden Ave. Baltimore, Md.

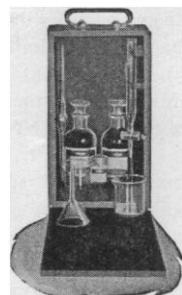
Electrophoresis Apparatus

according to Prof. A. Tiselius, Upsala for separation and characterization of high molecular substances as albumins, sera, immune sera, ferments, virus and other biologically important colloidal substances.

Full information on request.

F. Hellige & Co.
Freiburg i/Br., Germany.

The National Research Council of Canada invites applications for a Junior Research Engineer to carry out research under direction in electrical engineering. Initial salary \$2100 to \$2700 depending on qualifications. Applicants must possess a degree in electrical engineering or electrical physics from a recognized university; preference granted to British subjects. They should possess aptitude and experience qualifying them to undertake research in electrical engineering. Applications and credentials should be forwarded to the Secretary-Treasurer, National Research Council, Ottawa, and should include a statement of age, race, nationality, academic accomplishments, training and experience, indicating in particular if the candidate has been associated with high voltage engineering. Applications should be received by 1 June, 1939.

LaMOTTE BLOOD UREA OUTFIT

For study of urea retention (urea nitrogen by factor). Result is read directly from special Urea Burette supplied. No calculations required. Accurate to 4 mg. urea per 100 cc. blood. Complete estimation takes only 15 to 20 minutes.

Price, complete with instructions, \$18.50 f.o.b. Baltimore, Md.

LaMotte Chemical Products Company

418 Light Street Baltimore, Md.

INDICATORS

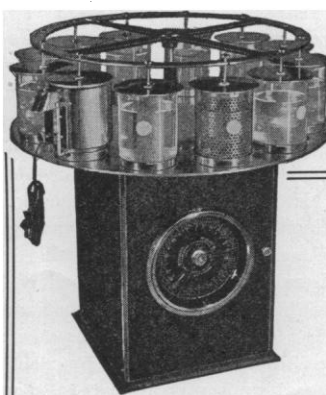
The Coleman & Bell Company manufacture a complete list of indicators including all of the common indicators used in analytical and biological work, the hydrogen-ion indicators recommended by Sorensen and Clark & Lubs, and in addition many rare indicators suitable for special work. These indicators are available in both the dry form and in solution, ready to use. Certain indicators are offered in the form of Test Papers in vials containing 100 strips, and in sheets 2" x 10".

Catalogue of Laboratory Reagents upon Request

THE COLEMAN & BELL CO.



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



*Your
Laboratory
Needs*

Empire Autotechnicon

The Empire Autotechnicon Fixes, Clears, Dehydrates and Impregnates Tissue Automatically; Deparaffinizes and stains Micro-Slides. It eliminates human error and saves at least 50% of the time usually required.

No "waiting over" from the close of one day to the next, since the Autotechnicon works automatically once it is set.

Write us for complete information, prices and fully illustrated catalog

EMPIRE LABORATORY SUPPLY CO., INC.
507-559 West 132nd Street New York, N. Y.
Everything in supplies and glassware for the laboratory