

SCIENCE

VOL. 89

FRIDAY, MARCH 31, 1939

No. 2309

Josiah Willard Gibbs: PROFESSOR CHARLES A. KRAUS 275
Obituary:

Professor S. P. L. Sørensen: PROFESSOR WM. MANSFIELD CLARK. *Fabian Franklin*: PROFESSOR F. D. MURNAGHAN. *Earl E. Hoover*: DR. CARL L. HUBBS. *Recent Deaths* 282

Scientific Events:

Excursions at the California Meeting of the American Geological Society of America; Awards of the Alfred P. Sloan Foundation; Election of Fellows of the Royal Society, London; The Establishment of an Institute of Technology at Northwestern University 284

Scientific Notes and News 287

Discussion:

Climate and Reproduction: PROFESSOR M. F. ASHLEY-MONTAGU. *Vitamin B₁ in Soil*: DR. VIRGIL GREENE LILLY and PROFESSOR LEON H. LEONIAN. *Preserving the Viability of Bermuda Onion Seed*: EDGAR BROWN. *Bacteria of the Listerella Group Isolated from Foxes*: DR. H. W. CROMWELL, E. E. SWEEBE and T. C. CAMP. *The Anti-menorrhagic Factor of Mammalian Liver Fat*: DR. HAROLD O. WILES and DR. SIEGFRIED MAURER 290

Scientific Books:

Recent Botanical Books: Economic Botany: PROFESSOR W. W. ROBBINS. *Herbals*: PROFESSOR B. F. LUTMAN. *Plant Pathology*: DR. NEIL E. STEVENS. *Plant Ecology*: PROFESSOR PAUL B. SEARS. *Plant Physiology*: DR. F. E. DENNY. *Structure and Development of the Fungi*: PROFESSOR JOHN N.

COUCH. *Structure of Economic Plants*: PROFESSOR W. W. ROBBINS. *Plant Physiology*: DR. WILLIAM J. ROBBINS. *Bibliography of Eastern Asiatic Botany*: DR. JOHN H. BARNHART 294

Special Articles:

Vitamin Research: PROFESSOR TREAT B. JOHNSON and MARGARET M. ENDICOTT. *The Preparation of Glutathione Containing Radioactive Sulfur*: RACHEL G. FRANKLIN. *Crystalline Horse Liver Catalase*: DR. ALEXANDER L. DOUNCE and ORVILLE D. FRAMP-TON. *Infection of Chicks and Chick Embryos with Rabies*: PROFESSOR JAMES R. DAWSON, JR. 297

Scientific Apparatus and Laboratory Methods:

Use of Luminous Paint for Observation of Animal Movements in the Dark: DR. JOHN H. LOCHHEAD. *Quantitative Transference of Liquids in Solutions*: ROBERT BALLENTINE. *Improvements in Biological Test Material*: DR. ROBERTS RUGH 301

Science News 6

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.

JOSIAH WILLARD GIBBS¹

By Professor CHARLES A. KRAUS

DIRECTOR OF THE METCALF RESEARCH LABORATORY, BROWN UNIVERSITY

On the one hundredth anniversary of his birth, we are here to do honor to the memory of Josiah Willard Gibbs, the greatest physical scientist that America has produced and one of the greatest original thinkers of all time. The occurrence of genius is commonly believed to be a phenomenon of pure chance, and such it may well be so far as native talent is concerned; but talent has merely a potential value; it is fruitful only when it is properly cultivated, indeed, we may say when it is self-cultivated under favorable conditions. Genius may be assisted in this process of self-cultivation but, in all cases, genius flourishes best in an environment of complete intellectual freedom. The history of American science bears this out.

Let us review, briefly, the careers of the American men of genius who contributed to the development of

¹ An address delivered in Yale University on the occasion of exercises held in commemoration of the one hundredth anniversary of the birth of Josiah Willard Gibbs.

physical science from Colonial times up to the last quarter of the nineteenth century. Up to 1880, America had produced five great physical scientists: Benjamin Franklin, Benjamin Thompson (Count Rumford), Joseph Henry, Henry A. Rowland and Josiah Willard Gibbs.

Franklin and Rumford were products of pre-revolutionary America; they were self-taught, having received only very meager common school education. The two men, although their lives were, in certain respects, very diverse, had much in common. Both were exceptionally versatile; both were keen observers and ready experimenters; both were of a practical and inventive turn of mind; both were keenly conscious of their social environment and both did much to advance science and learning in other ways than through their scientific contributions. Franklin was active in promoting the establishment of libraries, colleges and

passing paraffin, due to its negligible volume, ease of application and absence of contaminated areas on which a portion of the solution may remain. It is applied by filling the vessel with a one-quarter saturated solution of ferric stearate in benzene, draining, and allowing the solvent to evaporate. This leaves a very thin coating of ferric stearate. The hydrophobic surface so formed is not attacked by thirty minutes' exposure to 0.1 N HCl, 0.1 N NaOH, saturated NaCl, petroleum ether, chloroform or ether. Further it does not adsorb methylene blue as does glass, nor interfere either in respiration or dye reduction in any of the systems so far studied. Ferric stearate may also advantageously replace paraffin in coating micro-capillary pipettes, as employed by Wigglesworth¹ in the micro-estimation of chloride. The sample of ferric stearate employed was prepared by mixing ferric chloride with a warm, concentrated aqueous solution of sodium stearate, followed by filtration and washing (*c.f.* Langmuir and Schaefer²).

ROBERT BALLENTINE

PHYSIOLOGICAL LABORATORY,
PRINCETON UNIVERSITY

AMPHIBIAN GAMETES AS BIOLOGICAL TEST MATERIAL

BIOLOGICAL material suitable for testing physical or chemical variables has not been abundant, dependable nor constantly available. Through the discovery that hibernating frogs can be stimulated by the anterior pituitary hormone to release their gametes, there is now available material which may be the answer to the experimental biologist's needs. Between September and March female frogs can be induced to provide upwards of 2,000 eggs (each) at the identical stage of maturation and 24 hours after pituitary stimulation. The eggs may be stripped from the female as needed, in lots of from 50 to 100, or in case of experiments where quantitative data are desired, entire uteri may be tied off as sacks full of eggs and removed from the body. The eggs from one uterus may be used for control as against the eggs of the other uterus, which are subjected to the experimental variables. The frog testes may either be dissected in Holtfreter's modification of amphibian Ringer's (diluted to 10 per cent.) or the male may be similarly stimulated by hormone treatment to release the spermatozoa into its seminal vesicles. Uniform and concentrated suspensions of spermatozoa may be kept for many hours without loss of inseminating powers. This period is shortened with dilution and high temperatures and may be extended if the suspensions are kept at refrigerator temperatures.

¹ V. B. Wigglesworth, *Biochem. Jour.*, 31: 1719, 1937.

² I. Langmuir and V. Schaefer, *Jour. Am. Chem. Soc.*, 59: 2400, 1937.

In some recent investigations with both low and high voltage x-radiation, embryos from radiated gametes have shown consistent and quite uniform results. With carefully controlled x-radiation of either sperm or eggs, many of the earlier predictions of Hertwig and of Bardeen have been confirmed. There are, however, many new and biologically significant aspects of this radiation problem, which have been revealed by our modern precision equipment and this newly available biological material. It has been impossible, for instance, to render immotile frog spermatozoa with high voltage radiation even up to 120,000 r., although some abnormal embryos appear when the spermatozoa receive as little as 25 r. Early cleavage of eggs fertilized by radiated sperm is perfectly normal in both rate and pattern. There is, however, some evidence that near 10,000 r. the sperm nucleus is sufficiently damaged as to prevent neurulation, but eggs inseminated with spermatozoa which have been exposed to upwards of 30,000 r. will result in quite normal-appearing tadpoles, which may, however, be haploids. Both frog's sperm and eggs are being used to test, from a biological point of view, the qualitative difference between the soft and the hard x-rays.

The details of these radiation experiments will be reported elsewhere, but it is the purpose of this note to call attention to this extremely abundant and dependable biological test material which can be used along the lines of genetics, cytology, cell physiology and embryology.

ROBERTS RUGH

COLUMBIA UNIVERSITY

BOOKS RECEIVED

- DUNCAN, CARL D. *A Contribution to the Biology of North American Vespine Wasps*. Pp. 272. 255 figures. Stanford University Press. Cloth, \$3.25; paper, \$2.50.
- GOULDEN, C. H. *Methods of Statistical Analysis*. Pp. vii + 277. Wiley. \$3.50.
- Industrial Research Laboratories of the United States, Including Consulting Research Laboratories. Sixth edition, 1938*. Pp. 270. National Research Council, Washington. Cloth, \$3.00; paper, \$2.50.
- KOPACZEWSKI, W. *Traité de Biocolloïdologie, Tome V, État Colloïdal et Médecine; Fascicule I, Le Sang*. Pp. xvi + 151. 60 fr. *Fascicule II, Liquides et Tissus Organiques*. Pp. 153-299. 4 plates. 100 fr. Gauthier-Villars, Paris.
- MACCOLL, SYLVIA H. *A Comparative Study of the Systems of Lewin and Koffka with Special Reference to Memory Phenomena*. Vol. II, No. 1, Serial No. 5, *Contributions to Psychological Theory*. Pp. vii + 160. Duke University Press. \$1.50.
- MCCOLLUM, E. V., ELSA ORENT-KEILES and HARRY G. DAY. *The Newer Knowledge of Nutrition*. Fifth edition. Pp. ix + 701. Illustrated. Macmillan. \$4.50.
- MEDSGER, OLIVER P. *Edible Wild Plants*. Pp. xv + 323. Illustrated. Macmillan. \$3.50.
- RIESENFELD, ERNST H. *Lehrbuch der Anorganischen Chemie*. Pp. xxvii + 706. 90 figures. Deuticke, Wien. R.M. 10.50.
- WITTICK, EUGENE C. *The Development of Power*. Pp. xiv + 164. 148 figures. University of Chicago Press.

Recent

McGRAW-HILL BOOKS

INORGANIC SYNTHESSES. Volume I.

HAROLD S. BOOTH, Western Reserve University, *Editor-in-Chief*. With Five Collaborating Editors. *Inorganic Syntheses Series*. 196 pages, 6 x 9, bound in acid- and alkali-resistant covers. \$3.00

Inaugurating the new *Inorganic Syntheses Series*, this book gives thoroughly tested and dependable methods for the preparation of important inorganic chemicals. Exact methods of procedure and yields to be expected are given in each case. The present volume contains sixty-seven preparations, falling logically into three classes: (1) they may be entirely new; (2) they may be revised and improved methods for the preparation of known compounds; and (3) they may be old methods which have now been standardized.

Diehl—TEXTBOOK OF HEALTHFUL LIVING. *New second edition*

By HAROLD S. DIEHL, M.D., University of Minnesota. 626 pages, 6 x 9. \$2.50

This important new textbook represents a revision and enlargement of the author's well-known *Healthful Living*, which, although intended primarily for the lay reader, nevertheless enjoyed considerable success as a college text. In the present edition the materials have been extensively revised and expanded with both the teacher and the student constantly in mind, and the text is now more closely adapted for classroom use. Besides bringing the book scientifically up to date, Dr. Diehl has incorporated valuable pedagogical aids in the form of tables, charts, and carefully selected questions. A feature of the book is the inclusion of an appendix for a continuous health record of the individual student.

Kraus and Slawson—GEMS AND GEM MATERIALS. *New third edition*

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

This third edition represents an entire resetting to cover developments in the field and to accommodate considerable new informational and illustrative material. As before, the book gives a comprehensive treatment of the forms, properties, formation, occurrence, and characteristics of gems and gem materials. An outstanding feature of the new edition is the inclusion of eighty-one new illustrations, including four imported color plates.

Loomis and Shull—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

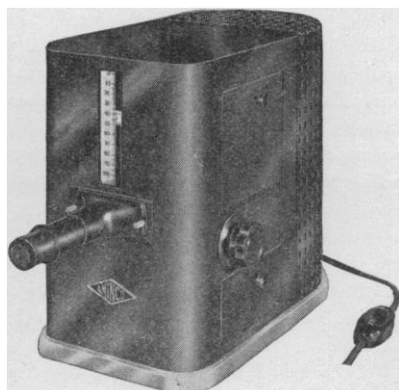
A revision and expansion of the first half of the authors' *Methods in Plant Physiology*, this new manual is intended primarily to meet the requirements of the beginning student. The laboratory experiments have been simplified, more advanced work omitted, and the material adapted to use as a laboratory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

Send for copies on approval

McGRAW-HILL BOOK COMPANY, INC.

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

Aldwych House, London, W.C.2



*Ideally Suited for the Precise
Determination of:*

Ammonia . . . Arsenic . . . Bismuth . . . Carotene . . . Chlorophyll . . . Color of Water, Oils, Beverages, etc. . . . Copper . . . Creatinine . . . Cystine . . . Deguelin . . . Dextrose . . . Fluorescein . . . Fluorine . . . Hydrogen Sulphide . . . Indole . . . Iron . . . Lactic Acid . . . Lactoflavin . . . Lead . . . Manganese . . . Methanol . . . Organic Spray Residues such as Nicotine and Phenothiazine . . . Oxyhaemoglobin . . . Phosphorus . . . Rotenone . . . Sulfanilamide . . . Titanium . . . Turbidimetric Measurements . . . Vanadium . . . Vanillin . . . Yeast and Bacteria Suspensions . . . Xanthophyll . . . practically all clinical determinations using color reactions, such as blood and urine analyses.

Write for Bulletin 1150-A

*For Precise Photometric Analyses by
"Colorimetric" Methods*

NEUTRAL  WEDGE

PHOTOMETER

- A permanent glass wedge is used as a standard. Once calibrated, it remains so indefinitely.
- Measurements are made at wavelengths where maximum absorption by the solution occurs, giving great sensitivity and easy brightness matching due to lack of hue differences.
- Quantities less than 1/10 cc. can be used.
- Quantities as small as 10⁻⁴ gram of certain substances are accurately measured. In the analysis of lead by the dithizone method, for example, it is possible to split the range 0 to 1 gamma into 20 parts.
- A great time saver, because preparation of standards is not repeated.
- Accurate abridged spectrophotometric curves are produced for any colored solution.
- Precision glass filters with centroids held to ± 1 m μ and with band widths at 50% T from 10 to 20 m μ are available for all parts of the visible spectrum from 424 to 720 m μ .
- Many mechanical features make for years of troublefree service.

SOME PROMINENT USERS

U. S. Dept. Agriculture . . . U. S. Navy . . . U. S. Treasury . . . Bur. Internal Rev. . . Natl. Inst. of Health . . . Dupont Co. . . Wallerstein Laboratories . . . Natl. Canners Assn. . . Maryland State Health Dept. . . Univ. Minnesota . . . Mass. Inst. Tech. . . and others.

AMERICAN INSTRUMENT CO.

8010-8020 Georgia Ave.

Silver Spring, Md.

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.

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 CO.
LANCASTER, PENNSYLVANIA

LaMotte Enslow Chlorine Comparator

This outfit is especially recommended for control in chlorination of sewage and industrial wastes, pre-chlorination of water and in sterilization of swimming pool water. The tests are accurate and reliable. The results are given in parts of chlorine per million parts water. Complete with instructions \$12.50 F.O.B. Baltimore, Md.

LaMotte Chemical Products Co.

418 Light St.

Baltimore, Md.

NOW AVAILABLE

VITAMIN 'A' Concentrates, agreeable taste and odor without Vitamin D.

PRO-VITAMIN 'A' (Carotene) crystals, concentrates in vegetable oil and also powder form.

EFF LABORATORIES, INC.

418-J REPUBLIC BLDG. CLEVELAND, OHIO

CAROTENE PRODUCTS BY THE GRAM OR CAR