SCIENCE

VOL. 88 FRIDAY, JULY 8, 1938 No. 2271

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 CHEMIST AS DEFENDER OF HIS FATHERLAND[1]

By Professor MARSTON TAYLOR BOGERT
COLUMBIA UNIVERSITY

AT the beginning of man's history upon this planet, the struggle against his environmental enemies did not differ radically from that of other mammalia of that era, nor had he much more control over the forces of his universe. As a reasoning creature, however, he soon learned from experience, and this fund of experience, passed on from generation to generation and steadily augmented, has given him an ever-increasing knowledge of the laws which govern our little world and how they can be made to execute his will.

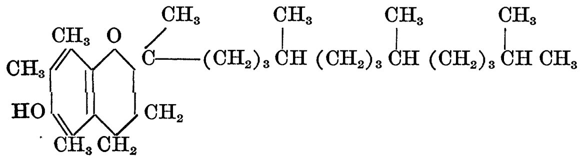
As science advances, warfare changes. Methods of fighting inconceivable to our ancestors occupy the center of the stage to-day, and future wars will see still other methods employed of which we do not as yet even dream. One by one, man's fighting weapons have been rendered obsolete by the appearance of new and more potent ones, or ineffective through the development of an adequate defense. The bow and arrow displaced the war club and grew into the cross-bow; but the archers were put out of business by the introduction of body armor, which lost its value in turn through the discovery of gunpowder and firearms. The contest between artillery and above-ground fortifications was decided definitely in favor of the former in the early days of the world war, and men sought refuge in trenches and dugouts, there to be asphyxiated by the toxic gases later employed, until protection was supplied by gas masks and dugout blankets. In the year 1862, in my own country, the navy boasted of its wooden fighting ships. No one dreamed of ironclads; but in that same year the *Merrimac* destroyed the Union Fleet in Hampton Roads, and wooden war vessels gave place to the steel battleship, which has itself become the prey of the submarine and of the airplane. The operation of both land and sea forces is now subject to domination by the military forces in the air, whether the planes are discharging huge aerial tor-

---

[1] Translation of an address in Italian, delivered on May 20, 1938, before the Tenth International Congress of Chemistry, Rome, Italy, by the Chairman of the Section on Chemistry and Defense.

THE CHEMISTRY OF VITAMIN E. III. PERMANGANATE OXIDATION OF ALPHA TOCOPHEROL

FERNHOLZ,[1] on the basis of his degradation studies, proposed for the structure of alpha tocopherol formula I:



Formula I

By oxidizing alpha tocopherol with chromic anhydride in acetic acid solution, a lactone $C_{21}H_{40}O_2$ was obtained. The origin of such a lactone is easily explicable on the theory that alpha tocopherol contains a chromane ring; if alpha tocopherol contained a coumarane ring, a beta hydroxy acid would be expected.

Karrer and his co-workers,[2] by treating pseudo cumo hydroquinone with phytyl bromide, obtained a synthetic product which apparently is a mixture of alpha tocopherol and its C-2 epimer. Karrer believed that this reaction would yield a coumarane rather than a chromane, and he suggested that Fernholz's gamma lactone arose by rearrangement in acid solution. As example of this rearrangement he referred to work by Pospjechoff,[3] Raichstein[4] and Braun,[5] where beta hydroxy acids on distillation over 20 per cent. H_2SO_4 were converted to the gamma lactones.

As further support for the chromane structure, alpha tocopherol was oxidized in acetone solution with neutral permanganate. No difficulty was experienced in isolating in good yield the $C_{21}H_{40}O_2$ lactone in the form of the benzyl thiuronium salt of its hydroxy acid. On admixture with the corresponding salt obtained by the chromic acid oxidation of alpha tocopherol, there was no depression of the melting point.

Experimental:—1.0 mg of alpha tocopheryl allophanate was saponified in the usual way. To the free tocopherol, in 50 cc of acetone, was added slowly with mechanical stirring 1.87 gm (6 moles) of potassium permanganate. The first 900 mg were rapidly decolorized; then it became necessary to warm the solution slightly. When all the permanganate had been added, the solution was refluxed until the permanganate was entirely reduced.

The solution was cooled, diluted with water, and the manganese dioxide reduced with SO_2. A few drops of HCl were added to make the solution acid to Congo red, and the reaction mixture was extracted with ether. The ether was washed with water and then dilute NaOH to remove free acids. The total neutral fraction weighed 428 mg. This was refluxed with 15 cc of 4 per cent. methyl alcoholic KOH for one hour, then diluted with water and extracted with ether. The ether residue amounted to 238 mg, most of which could not readily be distilled in a molecular still.

The dilute alcoholic KOH solution was acidified, and extracted with ether, giving 155 mg of the lactone fraction. This was distilled in a molecular still at 120 degrees, yielding 117 mg of purified lactone. This was converted to the benzyl thiuronium salt, giving 105 mg of the salt melting at 116 to 118 degrees which gave no depression on admixture with the corresponding salt obtained from the chromic anhydride oxidation of alpha tocopherol.

Analysis: Calculated for $C_{29}H_{52}N_2SO_3$: C 68.45; H 10.30; N 5.50. Found: C 68.77, 68.56; H 10.27, 10.10; N 5.67, 5.61.

OLIVER H. EMERSON
RESEARCH LABORATORIES, MERCK
AND COMPANY, INC., RAHWAY, N. J.,
AND
INSTITUTE OF EXPERIMENTAL BIOLOGY,
UNIVERSITY OF CALIFORNIA, BERKELEY

---

[1] E. Fernholz, *Jour. Am. Chem. Soc.*, 60: 700, 1938.

[2] P. Karrer, H. Fritsche, B. H. Ringier and N. H. Salomon, *Helv. Chim. Acta*, 21: 520, 1938.

[3] Pospjechoff, *Jour. Russ. Phys. Chem. Soc.*, 29: 372, 1897.

[4] Raichstein, *Jour. Russ. Phys. Chem. Soc.*, 39: 587, 1907.

[5] Braun, *Monatshefte f. Chemie*, 17: 210, 1896.

BOOKS RECEIVED

ASHLEY-MONTAGU, M. F. *Coming Into Being Among the Australian Aborigines.* A Study of the Procreative Beliefs of the Native Tribes of Australia. Pp. xxxv + 362. Illustrated. Dutton. $5.00.

BAKER, ROBERT H. *Astronomy; A Textbook for University and College Students.* Third edition. Pp. x + 527. Illustrated. Van Nostrand. $3.75.

HEGNER, ROBERT, and others. *Parasitology; With Special Reference to Man and Domesticated Animals.* Pp. xxi + 812. 308 figures. Appleton-Century. $7.00.

LANDAU, L. and E. LIFSHITZ. *Statistical Physics.* Pp. viii + 234. 54 figures. Oxford University Press. $6.00.

LOWELL, A. LAWRENCE. *What a University President Has Learned.* Pp. vi + 150. Macmillan. $1.75.

Memorial Técnico del Ejército de Chile; Año VI, No. 22, 1938. Pp. viii + 159. Illustrated. Instituto Geográfico Militar, Santiago, Chile.

MOULTON, FOREST R., Editor. *Tuberculosis and Leprosy; The Mycobacterial Diseases.* Pp. 133. Illustrated. The American Association for the Advancement of Science. $2.50.

Science in General Education. Report of the Committee on the Function of Science in General Education, Progressive Education Association. Pp. xiii + 591. Appleton-Century. $3.00.

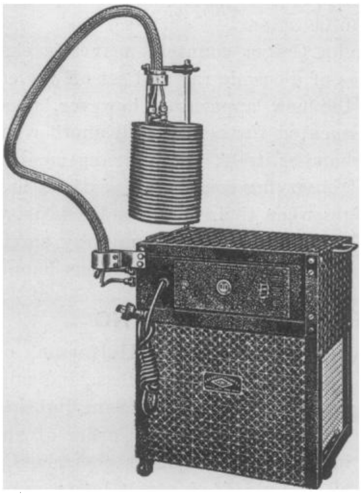
Science Reports of the Tôhoku Imperial University; First Series (Mathematics, Physics, Chemistry); Vol. XXVI, No. 4, April, 1938. Pp. 415–748 + 8. Illustrated. Maruzen Company, Tokyo and Sendai.

ZEIGER, K. *Physikochemische Grundlagen der Histologischen Methodik; Wissenschaftliche Forschungsberichte, Band 48.* Pp. 204. Theodor Steinkopff, Dresden and Leipzig. RM 11.25.

AMINCO

Portable Constant Temperature BATH COOLERS

. . . for maintaining bath or tank liquid at operating temperature equal to or below room temperature



Close Temperature Control . . . to within ± 0.1° C.

Quickly Put Into Service . . . merely roll the cooling unit to the bath or tank, immerse coil in bath liquid, set the thermoregulator and place it in the bath, plug in to the current supply, throw the switch, and unit is ready for duty.

No Installation Required . . . no pipe connections to be made . . . no valves to operate . . . no adjustments to be made other than the thermoregulator setting . . . no boring of holes or breaking of pressure connections . . . . no brine or water-cooling systems required.

Compact—Portable . . . the unit consists of a suitable refrigerator, cooling coil, and automatic expansion valve. The refrigerator (12 x 15 x 21 in. high) is mounted on ball-bearing casters and is moved about easily.

Fully Described in Bulletin 1055-A

The Complete Aminco Line of Chemical and Biological Instruments is Described in the New Catalog 38-A

Apply for literature on your business stationery

AMERICAN INSTRUMENT CO.

8010–8020 Georgia Ave. Silver Spring, 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 8″x 10″.

Catalogue of Laboratory Reagents Upon Request

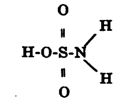
THE COLEMAN & BELL CO.

C&B

MANUFACTURING CHEMISTS

NORWOOD, OHIO, U. S. A.

LA MOTTE SULFAMIC ACID (Cryst).



$HOSO_2NH_2$

Pure—Standardized

A new compound offering tremendous possibilities in research and practical application.

SOME OF ITS UNIQUE PROPERTIES

1. Colorless, odorless, crystalline solid. (Melting Point 205° C.)
2. Non-hygroscopic; soluble in water.
3. Highly ionized (strongly acidic) in aqueous solution; approaching HCl and other strong mineral acids.
4. Forms stable salts and shows promise as new standard in acidimetry.
5. Barium, Lead and Amine Salts, soluble in water.

Full information will be sent on request.

LaMotte Chemical Products Company

418 Light Street Baltimore, Md.

THE SCIENCE PRESS PRINTING COMPANY

PRINTERS OF

SCIENTIFIC AND EDUCATIONAL JOURNALS, MONOGRAPHS AND BOOKS

Correspondence Invited

LANCASTER, PENNSYLVANIA