SCIENCE

VOL. 86 FRIDAY, NOVEMBER 19, 1937 No. 2238

Charles Frederick Chandler, 1836–1925: DR. HAVEN EMERSON 453

Obituary:
Frank Morley: PROFESSOR A. COHEN. *Recent Deaths* 461

Scientific Events:
The Indian Science Congress; Advisory Committee for the Prevention of Pneumonia; Officers of the American Chemical Society; Award of the Nichols Medal to Dr. Levene 462

Scientific Notes and News 464

Discussion:
Charles Darwin and the Modern Theory of Tropisms: PROFESSOR N. CHOLODNY. *Edward Fremy on the Constitution of Pectose:* DR. AKSEL G. OLSEN. *Three Returns of a Bank Swallow:* DR. DAYTON STONER 468

Special Correspondence:
Foundation of the Pontifical Academy of Sciences: CORRESPONDENT 470

Scientific Books:
The Species Problem: PROFESSOR T. D. A. COCKERELL. *Herpetology:* KARL P. SCHMIDT 472

Special Articles:
Tropospheric Radio Wave Reflections: DR. R. C. COLWELL and PROFESSOR A. W. FRIEND. *Independent Control of Alpha Rhythm and "Psychogalvanic" Response:* DR. T. W. FORBES and DR. HOWARD L. ANDREWS. *Physiological Evidence for the Syncytial Character of Smooth Muscle:* PROFESSOR EMIL BOZLER. *The Inorganic Elements in the Nutrition of the Rat:* PROFESSOR E. V. MCCOLLUM and J. ERNESTINE BECKER 473

Scientific Apparatus and Laboratory Methods:
An Apparatus for the Microdetermination of Cholesterol in Blood: DR. E. M. ABRAHAMSON. *An Improved Protocol for Dilution Series:* PROFESSOR EDWIN H. SHAW, JR. 477

Science News 10

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CHARLES FREDERICK CHANDLER
1836–1925
NEW YORK'S FIRST PUBLIC HEALTH CHEMIST[1]

By HAVEN EMERSON, M.D.

PROFESSOR OF PUBLIC HEALTH PRACTICE, DELAMAR INSTITUTE OF PUBLIC HEALTH, COLLEGE OF PHYSICIANS AND SURGEONS, COLUMBIA UNIVERSITY

THE chemistry of discovery and its interpretation to the laity are almost the commonplaces of every day's news, and no field of human curiosity and exploration is richer in its contribution of great men and women or in its abundant gifts to the fullness of life.

What concerns us particularly is the use of chemistry through government for social ends, and in this Charles Frederick Chandler was a pioneer who shared with Stephen Smith, Edward B. Dalton, Dorman B. Eaton, Elisha Harris and William B. Worthen the distinction of making the Metropolitan Board of Health of the State of New York a power and a tradition in the public health history of this country.

[1] Chandler Memorial Lecture, given at Columbia University on October 20, 1937.

It will be recalled that immediately upon the close of our Civil War the larger municipal communities in the United States took note of their sanitary shortcomings, and, stimulated by the experience of army camps and hospitals, the successes of the volunteer Sanitary Commission and the return to civil life of physicians and other officers of broad experience, and with ambition and energy for reconstruction, social as well as material, there developed public action to save the people from the devastation of epidemics which swept the homes of the rich and poor alike.

To realize the movement of events one must recall that Edwin Chadwick's classical report to the Poor Law Commissioners on the Sanitary Condition of the Labouring Population of Great Britain which led to

I wish to express my appreciation to Eimer and Amend, who constructed the apparatus and furnished the drawings.

E. M. ABRAHAMSON

THE JEWISH HOSPITAL
OF BROOKLYN

AN IMPROVED PROTOCOL FOR DILUTION SERIES

FOR some years, the author has been using a dilution protocol that avoids the inconveniences of the more commonly used dilution series, and has the following desirable properties:

(1) A suitable number of steps (eight) in each decade of the dilution range.

(2) Ease of preparation.

(3) Accuracy in preparation.

(4) The error, that is introduced by the fact that the liminal value of the phenomenon studied lies between the last negative tube and the first positive tube, is constant throughout the dilution range.

(5) Simple numerical expression of the concentration.

The series is based on a geometrical progression of the reciprocals of the powers of the eighth root of ten, yielding eight equal logarithmic steps in the decade. It is prepared by mixing 2.9983 parts of the previous dilution with 1 part of water. The cumulative error, introduced by mixing 3 parts of the previous dilution with 1 part of water, is less than 0.1 per cent. in the decade, or much smaller than the presumptive error involved in the use of pipettes for making the dilutions. To avoid accumulation of error, it is desirable to make a preliminary series of dilutions of 1/10, 1/100, 1/1000 . . . for the start of each decade. Concentrations can be conveniently expressed in a logarithmic notation (pD = − log of the dilution) similar to the commonly used pH. A typical protocol is given in Table I.

Assuming that the actual liminal value of the phenomenon studied lies midway between the last negative tube and the first positive tube, the error of the result is constant over the entire dilution range at 14.3 per cent. of this mid-value. In the case of the commonly used dilution series, 1/10, 1/20, 1/30 . . . , this error varies from 5.26 per cent. to 33.33 per cent. and averages 12.59 per cent. Should it seem desirable to have the value of pD refer to this probable liminal mid-value, the series can be started with a stock solution that is 1.143/10 instead of 1/10.

TABLE I

PROTOCOL FOR A DILUTION SERIES BASED ON THE RECIPROCALS OF THE POWERS OF THE EIGHTH ROOT OF TEN

Dilution	Concentration grams per 100 ml.	pD	Preparation of series	
			ml. of previous dilution	ml. of water
1/10.....	10.000	1.000	stock solution	
1/13.34	7.499	1.125	3	1
1/17.78	5.623	1.250	3	1
1/23.71	4.217	1.375	3	1
1/31.62	3.162	1.500	3	1
1/42.17	2.371	1.625	3	1
1/56.23	1.778	1.750	3	1
1/74.99	1.334	1.875	3	1
1/100.....	1.000	2.000	1 of 1/10 stock solution	9
1/133.4	0.7499	2.125	3	1
1/177.8	0.5623	2.250	3	1
and continuing				

Similar protocols could be developed based on the geometrical progression of the reciprocals of the powers of the other roots of ten. These protocols would be useful for the production of coarser or finer series of dilutions. The author has investigated those series from the square root of ten to the tenth root of ten, and none of them seem as convenient for application as the one described.

EDWIN H. SHAW, JR.

UNIVERSITY OF SOUTH DAKOTA

BOOKS RECEIVED

AUDUBON, JOHN J. *The Birds of America.* Pp. x + xxvi. 500 colored plates. Macmillan. $12.50.

CATTELL, R. B., J. COHEN and R. M. W. TRAVERS, Editors. *Human Affairs.* Pp. xi + 360. 17 plates. Macmillan. $4.25.

Contributions to the Calculus of Variations, 1933–1937; Theses Submitted to the Department of Mathematics of the University of Chicago. University of Chicago Press. $3.00.

Contributions to Virginia Geology. Bulletin 46, Virginia Geological Survey. Pp. x + 211. Illustrated. State Commission on Conservation and Development, University, Virginia.

DINGLE, HERBERT. *Through Science to Philosophy.* Pp. vi + 363. Oxford University Press. $5.00.

Scientific Reports of the Great Barrier Reef Expedition, 1928–29. Vol. I, No. 12, G. W. OTTER, *Rock-destroying Organisms in Relation to Coral Reefs.* Pp. 323–352. 5 figures, 6 plates. British Museum, London. 5/–.

Scientific Reports of the John Murray Expedition, 1933–34: Vol. IV, No. 5, SIDNEY J. HICKSON, *The Penntulacea.* Pp. 109–130. 2 figures. No. 6, K. H. BARNARD, *Amphipoda.* Pp. 131–201. 21 figures. No. 7, G. STIASNY, *Scyphomedusae.* Pp. 203–242. 14 figures, 1 plate. No. 8, C. C. A. MONRO, *Polychaeta.* Pp. 243–321. 28 figures. British Museum, London. 5/– each.

SIGERIST, HENRY E. *Socialized Medicine in the Soviet Union.* Pp. 378. Illustrated. Norton. $3.50.

SIMPSON, GEORGE G. *The Fort Union of the Crazy Mountain Field, Montana, and its Mammalian Fauna.* Pp. x + 287. Illustrated. 80 figures. U. S. National Museum Bulletin 169. Smithsonian Institution. U. S. Government Printing Office. $0.45.

Smithsonian Institution. *Annual Report, 1936.* Pp. xiv + 446. Illustrated. U. S. Government Printing Office. $1.50.

STETSON, HARLAN T. *Sunspots and Their Effects from the Human Point of View.* Pp. xv + 201. 15 figures. Whittlesey House, McGraw-Hill. $2.00.

TOLMAN, C. F. *Ground Water.* Pp. xvii + 593. 189 figures. McGraw-Hill. $6.00.

WHEELER, WILLIAM M. *Mosaics and other Anomalies among Ants.* Pp. 95. 18 figures. Harvard University Press. $2.00.

WILLIAMS, SAMUEL R. *Experimental Physics.* Pp. 158. Illustrated. Ginn. $1.00.

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