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HISTORY IN THE ARCHIVES OF THE ROYAL SOCIETY¹

By Sir WILLIAM BRAGG

DIRECTOR OF THE ROYAL INSTITUTION OF GREAT BRITAIN; PRESIDENT OF THE ROYAL SOCIETY, LONDON

THE archives of the Royal Society are rich in materials that illustrate various aspects of the history of the last three centuries. They have, of course, a special character, since they refer almost entirely to the matters in which the society has concerned itself, grouped under the general title of "The Improvement of Natural Knowledge." But these matters have increased in importance with the passing years and are now a subject of the first concern of the whole world. The effect of science upon social relations and social conditions has become very great, and the gains are obvious. Yet science does not appear to be in all cases beneficent. It has become a matter of anxious consideration whether or no the increase in the knowledge of nature must necessarily bring evil as well as good. Is there a fault to be remedied, and if so where does the fault

lie? These questions have roused a debate which is even now in progress, and some hard thinking is being given to them.

It is of some help, I think, to consider the steps by which the present position has been reached, and the Royal Society archives may be used to provide the necessary illustrations. For that reason I hope that you will find it of some interest if, with that object in view, I refer to some of the papers and letters which they contain.

A few "virtuosi," to use the contemporary phrase, who met for discussion and experiment in the middle years of the seventeenth century were weary of the miseries of the civil war, and were glad to turn their thoughts to the consideration of natural phenomena over which the passions of men had no influence. Experimental science had long tempted thoughtful minds, and now the first founders of the Royal Society threw

¹ Pilgrim Trust Lecture, delivered before the National Academy of Sciences, April 24, 1939.

A THERMOREGULATOR AND RELAY ASSEMBLY¹

STUDIES on longevity in *Drosophila melanogaster* necessitated the construction of an incubator² having a minimum temperature variation. For this reason, it was necessary to construct a temperature control assembly capable of functioning for several months without attention.

Fig. 1 shows the wiring of the incubator. The relay³

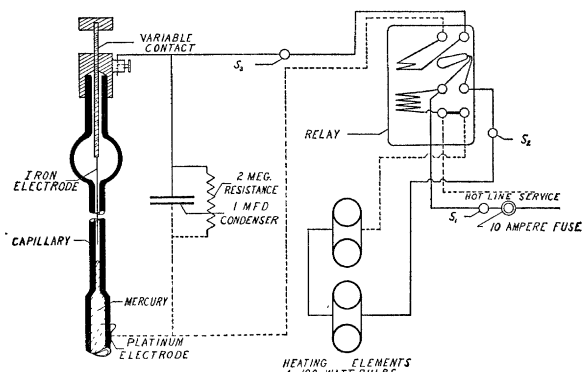


FIG. 1

employed was of the repulsion-transformer type having a "Mercoïd" contact. In this relay the "Mercoïd" element was reversed so that the load line contact would be broken when the pilot circuit was completed by the thermoregulator. The reversal was accomplished by removing the bottom adjusting screw and turning the contact element in its mounting.

By bridging the contact points of the thermoregulator with a one microfarad condenser, it was found possible to eliminate much of the spark caused by the "make" of the pilot circuit. It was found, however, that the charge stored on the condenser caused a fairly heavy spark on the "break" of the pilot circuit. A two megohm resistance was inserted as a shunt to dissipate the energy on the condenser. The resistance was high enough not to interfere with the storing of the charge on the condenser, but it allowed the charge to leak off during the time interval between the storing of the charge and the breaking of the contact. The heating elements were put in series, two-by-two, as recommended by Bridges. It was also thought best to protect the complete assembly through a 10-ampere fuse.

The thermoregulator first used was similar to that employed by Bridges. It was found, however, that a film was formed on the inner surface of the capillary after about one week of continuous operation. This threw out of adjustment the setting of the thermoregu-

lator by shorting the regular contact points. To prevent the film formation, 95 per cent. ethyl alcohol, as recommended by Powsner,⁴ was substituted for the toluene. This substitution aided, but after a time the film formed again. Analysis showed the film to be an amalgam of the silver from the variable contact. Since iron oxide does not form an amalgam, an iron wire was substituted for the silver electrode.

The temperature was checked every twelve hours during a continuous run of three months, and was found to vary less than $\pm 0.05^\circ \text{C}$. At the end of the experiment the thermoregulator was removed and the capillary examined. The only mark on the capillary was a faint black ring just above the contact end of the electrode.

DONALD GREIFF

MARQUETTE UNIVERSITY

⁴ L. Powsner, *Physiol. Zool.*, 8: 475, 1935.

BOOKS RECEIVED

- ALLEN, GLOVER M. *Bats*. Pp. x+368. 57 figures. Harvard University Press. \$4.00.
- CALLOW, A. BARBARA. *Food and Health; an Introduction to the Science of Nutrition*. Second edition. Pp. vi+168. 9 figures. Oxford University Press. \$1.75.
- CRUM, ROY W., Editor. *Highway Research Board; Proceedings of the Eighteenth Annual Meeting, Washington, D. C., November-December, 1938; Part I*. Pp. 405. Illustrated. National Research Council, Washington.
- FAUNCE, FRANCES A. and FREDERICK G. NICHOLS. *Secretarial Efficiency*. Pp. xii+601. Illustrated. McGraw-Hill. College edition, \$2.75; Trade edition, \$3.50.
- GARDNER, VICTOR R., FREDERICK C. BRADFORD and HENRY D. HOOKER, JR. *The Fundamentals of Fruit Production*. Second edition. Pp. xvi+788. 76 figures. McGraw-Hill. \$5.00.
- Harvey Cushing Society. *A Bibliography of the Writings of Harvey Cushing Prepared on the Occasion of His Seventieth Birthday, April 8, 1939*. Pp. xv+108. Charles C Thomas. \$5.00.
- HOLMES, ROGER W. *The Rhyme of Reason; an Invitation to Accurate and Mature Thinking*. Pp. xiv+516. Illustrated. Appleton-Century. \$3.75.
- HOUGHTON, H. G. and W. H. RADFORD. *Papers in Physical Oceanography and Meteorology: Vol. VI, No. 3; On the Local Dissipation of Natural Fog*. Pp. 63. Illustrated. \$1.00; No. 4, *On the Measurement of Drop Size and Liquid Water Content in Fogs and Clouds*. Pp. 31. Illustrated. \$0.75. Massachusetts Institute of Technology, Cambridge, and Woods Hole Oceanographic Institution.
- PARK, ORLANDO, W. C. ALLEE and V. E. SHELFORD. *A Laboratory Introduction to Animal Ecology and Taxonomy*. Pp. x+271. 17 figures. University of Chicago Press. \$2.00.
- THOMSON, THOMAS and M. R. K. JERRAM. *An Outline of Forestry*. Pp. viii+208. 11 figures. 5 plates. Nordemann. \$2.25.
- U. S. Department of Agriculture. *Experiment Station Record, Vol. 80, No. 4, April, 1939*. Pp. 435-576. \$0.15; *Report on the Agricultural Experiment Stations, 1938*. J. T. JARDINE and F. D. FROMME, Editors. Pp. 199. \$0.25. Superintendent of Documents, Washington.
- VAN DYKE, H. B. *The Physiology and Pharmacology of the Pituitary Body, Vol. II*. Pp. xiv+402. 28 figures. University of Chicago Press. \$4.50.

¹ I am indebted to Mr. Edwin L. Cordes, of the Marquette Physics Department, for helpful suggestions.

² C. B. Bridges, *Amer. Nat.*, 66: 250-265, 1932.

³ The relay is manufactured by The Mercoïd Corporation, Chicago, Illinois. The type number is V2-3A.

NECESSARY TO ALL BACTERIOLOGISTS

Bergey—MANUAL OF DETERMINATIVE BACTERIOLOGY

Edited by DAVID H. BERGEY, ROBERT S. BREED, E. G. D. MURRAY, A. PARKER HITCHENS, with 25 Contributors. *Fifth edition (1939)*, 6 x 9, xi + 1032 pp., \$10.00.

Bergey's MANUAL long since established itself as indispensable to bacteriologists throughout the English-speaking world. Delayed by the lamented death of Dr. Bergey this greatly enlarged and revised edition was eagerly awaited, and received with enthusiastic appreciation. It incorporates not only the work of Dr. Bergey and his editorial successors but a vast amount of research by a large group of contributing specialists.

The first edition sixteen years ago tabulated 832 species of bacteria with reference to the original place of publication of 1577 descriptions. The new edition gives description of 1335 species with a reference to the original place of publication of 5600 descriptions. The editors confidently hope that the classification used in the Manual will be employed generally because of its intrinsic worth.

The contributors include: R. E. Buchanan, H. J. Conn, E. B. Fred, I. L. Baldwin, W. H. Burkholder, C. D. Kelly, A. W. Hofer, Sara E. Branham, Karl F. Meyer, Alice C. Evans, Margaret Pittman, G. J. Hucker, J. M. Sherman, C. S. Pederson, L. F. Rettger, C. B. Van Niel, M. W. Yale, Frederick Smith, F. D. Chester, R. S. Spray, G. B. Reed, T. E. Roy, S. A. Waksman, A. T. Henrici, G. P. Van Eseltine.

Allen—SEX AND INTERNAL SECRETIONS

Edited by EDGAR ALLEN (Yale), CHARLES H. DANFORTH (Stanford) and EDWARD A. DOISY (St. Louis U.), 27 Contributors. *Second edition (1939)*, 6 x 9, xxxvi + 1334 pp., 454 illus., 2 color plates, numerous tables, \$12.00.

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The contributors include: Edgar Allen, W. M. Allen, R. W. Bates, C. B. Bridges, C. H. Danforth, E. A. Doisy, L. V. Domm, E. T. Engle, H. L. Fevold, W. U. Gardner, R. G. Gustavson, C. G. Hartman, F. L. Hisaw, F. C. Koch, F. R. Lillie, K. E. Mason, C. R. Moore, W. O. Nelson, W. H. Newton, J. P. Pratt, Oscar Riddle, A. E. Severinghaus, P. E. Smith, C. P. Stone, C. W. Turner, B. H. Willier, Emil Witschi.

Cowdry—PROBLEMS OF AGEING

Edited by EDMUND VINCENT COWDRY, A.B., PH.D., Professor of Cytology, Department of Anatomy, Washington University. Cloth, 6 x 9, xxx + 758 pp., 121 illus., \$10.00.

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The contributors include: Edgar Allen, Lewellys F. Barker, W. B. Cannon, A. J. Carlson, A. E. Cohn, E. V. Cowdry, Macdonald Critchley, William Crocker, John Dewey, Louis I. Dublin, E. T. Engle, Jonas S. Friedenwald, S. R. Guild, G. V. Hamilton, L. O. Howard, A. C. Ivy, H. S. Jennings, E. B. Krumbhaar, Karl Landst€rner, C. M. McCay, Wm. deB. MacNider, Walter R. Miles, Jean Oliver, T. Wingate Todd, Fred D. Weidman, Clark Wissler.

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In his previous two-volume work, "Foundations of the Theory of Algebraic Numbers," Professor Hancock made a major contribution to the extension of the fields of arithmetic and algebra. The present work is a sequel to those volumes. By making use of the concepts of geometry, the author broadens the substructures of the generalized realms that are founded on algebra, numbers and geometry, and ascertains further the teleological nature of such realms.

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By I. E. Melhus and G. C. Kent. To be ready May 23rd. \$4.50 (probable)

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Macmillan, New York