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VOL. 90 FRIDAY, SEPTEMBER 8, 1939 NO. 2332

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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.

FILM REACTIONS AS A NEW APPROACH TO BIOLOGY[1]

By Dr. ERIC K. RIDEAL, M.B.E., F.R.S.

PROFESSOR OF COLLOID SCIENCE, UNIVERSITY OF CAMBRIDGE

TOWARDS the end of the last century the biologist and physiologist were agreed that the biological entity was the whole living unit. This century has seen an attack on biological problems by the physical and organic chemist. The study of the living unit has been dropped and in its place we find investigations on specialized processes such as oxidation and reduction or catalytic reactions. It is an unfortunate fact, as the late Sir William Hardy clearly pointed out, that in this method of approach the mechanism of the coordination or the integration of the activities of an assemblage of cells must remain insoluble. It is this very point which I think deserves some consideration. We know for example that at death the catalysts escape from control since the molecular structure of the moving parts gets disorganized. Again, Loeb showed that unfertilized sea urchin's eggs could be made to develop by immersion in salt solutions of sufficient concentration. In development a whole series of complicated chemical reactions are set in operation and it is clear that in the quiescent unfertilized egg all the chemical ingredients for the reactions are present but await some change in organization before reaction sets in. We must conclude that the mechanism of integration is at any rate dependent on a pre-existing organization of at least the major operative portions of the assemblage of cells. This raises a number of important problems such as, what types of organization are to be found in living material; how far control over chemical reactions can be effected by modification of the type or extent of such organization and finally how far different types of organization can modify such important factors as the chemical or physical state of

[1] Address of the president of the Section of Chemistry, British Association for the Advancement of Science, Dundee, August 31, 1939.

men were avoided, and the difference in the two types of pH determinations was maintained within 0.5 unit.

The accompanying Fig. 1 shows the accuracy of the method. The fasting contents of an anesthetized dog were diluted to 100 cc with distilled water and a control recording made. The introduction of 1 gram of sodium bicarbonate in 100 cc of distilled water followed by rinsing through the Levine tube with 50 cc of water caused a prompt increase in the pH value. The peak of this rise is conditioned by the pH of the alkaline solution, whereas the plateau level immediately following is the pH of the alkali and gastric content mixture. The duration of the plateau, shown by the gently sloping curve which is terminated by the sudden drop to a low level, is controlled by the amount of alkali added, the rate of acid secretion and the intermittent emptying of the stomach. The amount of emptying can be calculated if the gastric contents are measured after the pH has returned to the low level. By controlling the variables interesting data may be obtained on the efficacy of antacids and the rate of gastric secretion. Information pertaining to these experiments as well as further details concerning the method will be published elsewhere.

We are greatly indebted to Dr. N. R. Trenner for valuable suggestions as well as the construction of the glass electrodes and to Mr. L. Fernandez, who assisted during the earlier part of the experiments.

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CHROMOSOMES FROM LEAVES

A MODIFICATION of Warmke's[1] method for making root-tip smears has been found by the writer to be effective for studying chromosomes in the leaves of certain plants: place young leaves in Carnoy's solution (3 parts chloroform, 2 parts absolute alcohol and 1 part glacial acetic acid) for five or more minutes; transfer momentarily to a solution of equal parts of 95 per cent. alcohol and concentrated hydrochloric acid; put the leaves back into Carnoy's, and, after several minutes, smear in iron aceto-carmine.

By this method the chromosomes of a number of genera have been investigated: *Smilax* L. (Liliaceae), *Sedum* L. (Crassulaceae), *Cercis* L. (Leguminosae), *Punica* L. (Punicaceae), *Sanicula* L. (Umbelliferae), *Pyxidanthera* Michx., *Diapensia* L., *Shortia* Torr. and Gray, *Schizocodon* Sieb. and Zucc., and *Galax* L. (Diapensiaceae), *Chimaphila* Pursh (Ericaceae), and *Plantago* L. (Plantaginaceae). Metaphase drawings of two species are shown here for purposes of illustration: Fig. 1, *Sedum pusillum* Michx., from Stone Mountain

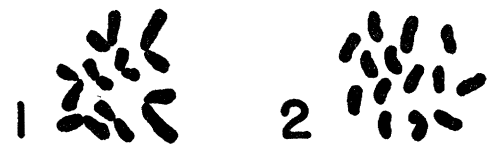

FIG. 1. *Sedum pusillum* Michx., $2n = 8$, *ca.* 3800 ×.
FIG. 2. *Cercis canadensis* L., $2n = 14$, *ca.* 4500 ×.

in Georgia, with 8 somatic chromosomes, the lowest number known for the extremely varied family; and Fig. 2, *Cercis canadensis* L., four trees on the grounds of the College of William and Mary, with 14 somatic chromosomes. Senn[2] reported a $2n$-number of 12, n-number of 6, for this species; his drawing of meiotic chromosomes suggests an interpretation of two bivalents in contact to be a single bivalent; his somatic number (not figured) was determined from an anther-wall division. The only other investigated species of *Cercis* has 14 and 7 chromosomes, respectively.[3]

J. T. BALDWIN, JR.
COLLEGE OF WILLIAM AND MARY

[1] H. E. Warmke, *Stain Technology*, 10: 101–103, 1935.

[2] H. A. Senn, *Bibliogr. Genetica*, 12: 175–336, 1938.

[3] R. Corti, *Nuovo Giorn. Bot. Ital.*, N. S., 37: 679–680, 1930.

BOOKS RECEIVED

DE BROGLIE, LOUIS. *Matter and Light; the New Physics.* Pp. 300. Norton. $3.50.

FLEMING, J. A., Editor. *Terrestrial Magnetism and Electricity.* Vol. VIII, *Physics of the Earth.* Pp. xii + 794. Illustrated. McGraw-Hill. $8.00.

FRASER, CHELSEA. *Heroes of the Air.* Pp. xl + 846. Illustrated. Crowell. $2.50.

FURNAS, C. C. *The Storehouse of Civilization.* Pp. xx + 562. Illustrated. Teachers College, Columbia University. $3.25.

GASSER, HERBERT S. and others. *Symposium on the Synapse.* (Reprinted from the *Journal of Neurophysiology.*) Pp. 361–474. 25 figures. Charles C Thomas.

GRAHAM, HARVEY. *The Story of Surgery.* Pp. xv + 425. 23 plates. Doubleday, Doran. $3.75.

HAUSMANN, ERICH. *Physics.* Second edition. Pp. vi + 756. 469 figures. Van Nostrand. $4.00.

HIBBEN, JAMES H. *The Raman Effect and its Chemical Applications.* Pp. 544. Reinhold. $11.00.

HUDDLESON, I. FOREST and others. *Brucellosis in Man and Animals.* Pp. xvii + 339. 40 figures. Commonwealth Fund, New York. $3.50.

MACDOUGALL, F. H. *Thermodynamics and Chemistry.* Third edition. Pp. ix + 491. Wiley. $5.00.

ROBBINS, WILLIAM J. and HAROLD W. RICKETT. *Botany; a Text-book for College and University Students.* Third edition. Pp. vii + 658. 440 figures. Van Nostrand. $3.75.

ROUSH, G. A. *Strategic Mineral Supplies.* Pp. xvii + 485. McGraw-Hill. $5.00.

SZEGÖ, GABOR. *Orthogonal Polynomials.* Vol. XXIII, American Mathematical Society Colloquium Publications. Pp. ix + 401. The Society, New York.

Treatment in General Practice; the Management of Some Major Medical Disorders. A symposium. Vol. I, pp. x + 259. Vol. II, pp. xii + 436. Little, Brown. $7.50.

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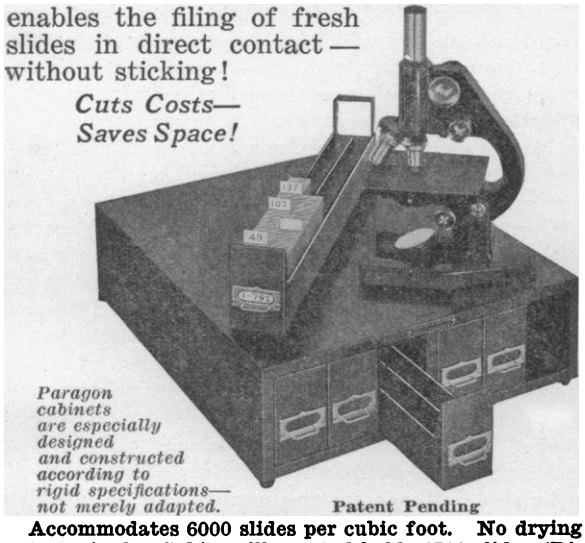

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