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THE CELL AND THE PROBLEM OF ORGANIZATION[1]

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THE third decade of the nineteenth century may well be regarded as the period in which the science of biology began to assume its modern form. The great conceptions of protoplasm as the physical basis of life, of the cell as the unit of plant and animal structure and of the nucleus as an integral part of the cell were then taking shape in the minds of biologists and were beginning to receive their first published expression. My predecessor of seven years ago celebrated the discovery of the nucleus by Robert Brown in 1831. The present year is generally accepted as marking the centennial of a still more important biological idea, that the cell is the unit of structure in all organisms. It was just one hundred years ago that Schleiden's famous paper was published. We need not attempt here to determine what part of the credit for the formulation of the cell theory should be given to Schleiden and Schwann and how much to earlier students of the minute structure of living things. The year 1838 is at least a convenient point from which to measure a century, and 1938 thus provides a natural occasion on which to evaluate the theory in terms of present-day biology. Such is the purpose of a number of scientific programs, at this meeting of the American Association and elsewhere.

It is not my intention here to undertake the ambitious task of reviewing the significant part which the cell theory has played in the history of morphology, physiology, genetics and indeed of every biological discipline. I do propose, however, to discuss briefly with you certain of its implications for one particular field—that most baffling of biological enigmas, the problem of the organized development of living things. An organism is not static. It continually changes, but in such a regular and orderly fashion

[1] Address of the retiring president of the Botanical Society of America at Richmond, Virginia, December 29, 1938.

from the top to the bottom, helps to guide the fluid down and prevents it from clogging the narrow tube and enclosing air bubbles.) By completely exposing the vein to a length of 2–5 cm and using a canula with a fairly narrow opening, blood is prevented from entering the canula. The height of the fluid column is determined by venous pressure and canula resistance and obviously does not influence the inflow from the pipette into the open tube. Incidentally, since it follows venous pressure changes, it might be used to indicate a sharp endpoint in the digitalis assay; the ceasing of the heart action, by increasing the venous pressure, suddenly raises the fluid level; this is followed by a drop, representing the complete arrest of the heart.

The reservoir, which is a burette used as Mariotte-bottle and thus delivers under nearly constant pressure, and the pipette are clamped to one stand, which by means of a rack and pinion can be raised or lowered. The pipette is shortened by cutting it off at the zero level, where it is ground with emery. Its height is adjusted so that it is completely filled from the reservoir without overflowing, the surface tension provided by the dry, ground top preventing the fluid from leaving the lumen even when the air-inlet tube of the reservoir is somewhat above the zero level of the pipette. This preparation of the pipette eliminates a slightly inaccurate filling which would otherwise occasionally occur from the inflow disturbance caused by the air bubbles entering the Mariotte-burette. The venous inflow tube is clamped to a second stand, at a height determined by the position of the animal. The position of reservoir and pipette above the entrance point of the fluid into the inflow tube determines the emptying level of the pipette, which is easily adjusted by turning the pinion, with the motor running. The level to which the pipette empties represents the amount of fluid per "stroke" which, together with the number of revolutions of the stopcock, determines the amount infused per minute. (A revolution counter, driven by the stopcock, allows of calculating the total amount infused at any given time more accurately than can be done by reading the burette level.) The synchronous motor (Telechron, C2M) has one r.p.m. of the shaft, which, by means of two gears, drives the stopcock at 3 r.p.m.; this makes for 6 infusions per minute, which are more or less leveled out in the glass tube. The accuracy of the pump depends solely on the accuracy of the pipette. For our purposes, a "Kahn pipette" (0.2 ml, calibrated in 0.001 ml) is being used.

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AN EASY METHOD FOR MAKING AN INDEX

RECENTLY confronted again with the odious task of preparing an index for a book of more than a hundred pages, I sought for an easier method than writing the entries on twenty-six sheets lettered A to Z and then alphabetizing each sheet. I also wanted a less expensive and time-absorbing technique than using a separate filing card for each entry. The plan hit upon worked very well. Sheets of typewritter paper were fed into the typewriter. On each with double spacing were typed the needed entries, starting each entry on a new line:

Light for photosynthesis 95
Photosynthesis, light for 95
Transpired water 96
Water, transpired 96

With a photographic trimmer, the lines were later chopped apart and sorted into piles A to Z. A roll of Scotch tape was then partly unrolled, placed on the opposite side of the work table with the unwound part toward me, adhesive face up. The Z slips were arranged alphabetically and pressed to the nearer end of the tape, starting with the last of the group. Next the Y slips, and so on. The tape was later cut between slips at about eleven-inch intervals and made satisfactory copy for typing out the complete index, starting at Aa, the last slip fastened in place.

LORUS J. MILNE
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BOOKS RECEIVED

Australasian Antarctic Expedition, 1911–14, Scientific Reports, Series C, Zoology and Botany; Vol. I, Part 3, Parasitic Infusoria from Macquarie Island, by T. Harvey Johnston. Pp. 12. 26 figures. 2/6–; *Vol. II, Part 4, Amphipoda Gammaridea*, by G. E. Nicholls. Pp. 145. 67 figures. 17/6–; *Part 8, Pycnogonida*, by Isabella Gordon. Pp. 40. 8 figures. 5/6–. Paisley, Sydney, Australia.

DIEBNER, KURT and EBERHARD GRASSMANN. *Künstliche Radioaktivität, Experimentelle Ergebnisse*. Pp. 87. S. Hirzel, Leipzig. 12.—.

JONES, INIGO. *The Climate of Australia during the Hypothetical Jovian Sunspot Cycle, 1913–1924, together with the Monthly and Annual Rainfall Observations*. Ninth Paper of the Crohamhurst Observatory. Pp. 111. The Observatory, Brisbane.

SMALL, LYNDON F. and others. *Studies on Drug Addiction with Special Reference to Chemical Structure of Opium Derivatives and Allied Synthetic Substances and their Physiological Action;* Supplement No. 138, *Public Health Reports*. Pp. viii + 143. Illustrated. Superintendent of Documents, Washington. $0.60.

STEWART, OSCAR M. *Physics; A Textbook for Colleges*. Third edition. Pp. x + 750. 500 figures. Ginn. $4.00.

SWIFT, ERNEST H. *A System of Chemical Analysis (Qualitative and Semi-Quantitative) for the Common Elements*. Pp. xx + 589. 32 figures. Prentice-Hall. $6.00.

TRAUB, HAMILTON P., Editor. *Herbertia, Volume 5*. Pp. 218. 2 figures. 34 plates. American Amaryllis Society, Orlando, Florida.

VOKES, HAROLD E. *Molluscan Faunas of the Domengine and Arroyo Hondo Formations of the California Eocene;* Vol. XXXVIII of the *Annals* of the New York Academy of Sciences. January 4, 1939. Pp. iii + 246. The Academy.