

PREFACE.

EDWARD HAMILTON ACTON died in the early part of the present year. This is not the place to speak of what we, his friends, have lost by his death, nor of his promising career as a man of science. All that I can do here is to explain in what way I have dealt with that part of the book for which he was especially responsible.

Part II, on the chemistry of metabolism, was entirely written by Mr Acton, and is here reprinted practically as he left it. The only changes are two or three corrections found in his interleaved copy of the book, and a few verbal and typographical alterations introduced for the sake of uniformity.

The book (as explained in the preface to the 1st Edition) originated in the following way.

In 1883 I began a course of instruction in the physiology of plants, of which the chief feature was the demonstration of experiments in the lecture-room. Some

years later a different arrangement was made; the students were required to perform the experiments for themselves, and at the same time laboratory work in the chemistry of metabolism was organised by Mr Acton. To enable the students to carry out their work, written instructions were needed, and the present book is the result of an extension and elaboration of what we prepared for our classes.

The book makes no pretence to completeness, it contains merely such a selection of experimental and analytical work as seems suitable for botanical students.

Part I, which deals with general physiology, is necessarily of a somewhat more elementary character than Part II, which treats a particular department of physiology in a more special manner, and presupposes a greater amount of knowledge on the part of the student.

A few experiments which experience has shown to be unsuitable have been omitted in the present edition. The chief additions are:—Exps. 5 and 52 (Timiriazeff's eudiometer), Exp. 33 (the importance of stomata in gaseous interchange), Exps. 118 A, 118 B, 118 C (Stahl's cobalt method), Exp. 205 A (Pfeffer and Czapek's method of localising geotropic irritability in roots), Exp. 249 A (chemotaxis in Bacteria), Exps. 249 B and C (chemotaxis in pollen-tubes)

The references to the literature of Part I have been increased in number, and they now give a fuller, though still but a rough guide to the published authorities. The references to Sachs' books appear to have been a source of difficulty to some of our readers. I therefore give the full titles of those to which reference is made.

Physiologie Végétale, recherches sur les conditions d'existence des plantes, et sur le jeu de leurs organes. Traduit de l'Allemand avec l'autorisation de l'auteur, par Marc Micheli. Paris, V. Masson et Fils, 1868. [This is the translation of Sachs' *Handbuch der Experimental-Physiologie der Pflanzen*, being volume IV of Hofmeister's *Handbuch der Physiologischen Botanik*, Leipzig, 1865.]

Arbeiten des botanischen Instituts in Würzburg, herausgegeben von Prof. Dr Julius Sachs. Leipzig, Engelmann. Band I. 1874, Band II. 1882, Band III. 1888.

Text-book of Botany, morphological and physiological, by Julius Sachs, Professor of Botany in the University of Würzburg. Edited with an Appendix by Sidney H. Vines, M.A., D.Sc., F.L.S., Fellow and Lecturer of Christ's College, Cambridge. Second Edition, Oxford, at the Clarendon Press, 1882. [This is a translation of Sachs' *Lehrbuch der Botanik* (Edit. 1874).]

Vorlesungen über Pflanzen-Physiologie von Julius Sachs. Leipzig, Englemann, 1882. [An English trans-

lation was published in 1887 by the Clarendon Press under the title *Lectures on the Physiology of Plants.*]

Gesammelte Abhandlungen über Pflanzen-Physiologie von Julius Sachs. Leipzig, Engelmann. Band I. 1892, Band II. 1893. [This is referred to in the text as Sachs' *Collected Papers.*]

I gladly take this opportunity of expressing my thanks to Mr F. F. Blackman, Demonstrator of Botany in the University, for much valuable help in the arrangement of the experiments in Part I. Also to the Cambridge Scientific Instrument Company for the use of the clichés for Figs. 25 and 26.

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