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Edited by Julius Sachs

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Julius Sachs (1832–97) was an important and influential German botanist. He attended Charles University in Prague, gaining his doctorate in 1856. After appointments in Dresden, Chemnitz and Bonn, he took a professorship at the University of Freiburg in 1867. A year later he accepted a chair at Würzburg, where he stayed for the rest of his career. Sachs made important contributions across botanical science, notably in cytology and photosynthesis. He was also largely responsible for the leap in understanding of plant physiology that took place in the second half of the nineteenth century. His famous *Textbook of Botany*, published here in the 1875 English translation of the final German edition (1874), takes the physiological approach that he pioneered and features hundreds of instructive illustrations and a full index. It was the most influential botanical text of its day, and the standard textbook on the subject for many years.

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Morphological and Physiological

JULIUS SACHS
EDITED AND TRANSLATED
BY ALFRED W. BENNETT



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TEXT-BOOK
OF
BOTANY
MORPHOLOGICAL AND PHYSIOLOGICAL

BY
JULIUS SACHS
PROFESSOR OF BOTANY IN THE UNIVERSITY OF WÜRZBURG

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P R E F A C E.

THIS Text-book of Botany is intended to introduce the student to the present state of our knowledge of botanical science. Its purpose is not only to describe the phenomena of plant-life which are already accurately known, but also to indicate those theories and problems in which botanical research is at present especially engaged; the arrangement of the material and the mode of treatment of the separate subjects are adapted to this purpose. Detailed discussions of questions of minor importance have been avoided, as these would only mar clearness of outline in the design; critical remarks have been introduced occasionally where they seemed necessary, in order to determine facts, or to justify the views taken on matters of fundamental importance.

The historical development of botanical views and theories does not seem to come within the scope of a Text-book of Botany, and would only interfere with the unity of design of the work. It would therefore be superfluous to quote scientific works which have only a historical interest. In the references which will be found in the work the chief object has been to introduce the student to those writings in which he will find a fuller discussion of those parts of the subject which have been only touched on briefly. In some cases the writings of others have been quoted because they represent views different from those of the author, and because it is desirable to place the student in a position to form a judgment for himself. Others again of the references are simply for the purpose of citing the authorities on which reliance is placed for statements that have not come within the range of the author's own observation. The reader of this work will at least learn the names and standing of those workers who have in recent times contributed most essentially to the science of which it treats.

By far the greater number of the illustrations are original, many of them the result of laborious investigation. Where they have been copied the name of the author from whom they are borrowed is in each case given in the description; illustrations from other sources are used only when the objects themselves have not been accessible, or when it seemed impossible to obtain better ones.

The Table of Contents will give sufficient indication of the plan of the work; the Index should be consulted for references to other parts of the book where an explanation of technical terms will be found when their meaning does not appear in any particular passage.

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TRANSLATOR'S PREFACE.

In introducing to the English public Sachs's 'Lehrbuch der Botanik' in an English form, the translator believes that he is supplying a want which has long been felt by English botanical students. Our own literature has not at present produced any work at once so comprehensive in its scope and so minute and accurate in its details,—qualities which have recommended the German work to every one familiar with that language.

In the notes the citations of authorities have been somewhat increased. It has also seemed desirable sometimes to depart from the author's rule of passing over authorities whose interest is now chiefly historical. References have been given to English and French translations of many of the papers and memoirs quoted, as these are at any rate often more accessible in this country than the originals.

On several points additional matter has been introduced into the footnotes. With respect to these the translator has to acknowledge the kind help of numerous scientific friends, amongst whom he may more especially mention Professor W. C. Williamson, Mr. H. C. Sorby, and Professor W. R. M^cNab. In the selection of English expressions for German technical terms he has also in many instances had recourse to their advice. One case of great difficulty may be pointed to in 'Stoffwechsel'; as an equivalent to this the term 'Metastasis' has been used. It had already been employed in a more restricted although analogous way by Graham; speaking of the mutability of colloids due to internal molecular rearrangements, that distinguished chemist says, 'Their existence is a continued metastasis' (Journ. Chem. Soc. 1862, p. 217).

The fourth edition of the German work has been passing through the press concurrently with the printing of this edition. Where possible the new matter introduced into it, or the new views adopted by the author, are referred to in the footnotes to the present edition. The new classification of Cellular Cryptogams adopted by Sachs will be found at p. 847.

A. W. B.

LONDON, *February* 1875.

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E R R A T A.

- P. 16, l. 10 *from bottom, and description to Fig. 13; for antheridium read globule.*
- P. 25, l. 4 *from bottom; after Bordered Pits insert reference to footnote 2.*
- P. 30, l. 18, *for exospores read exospore.*
- P. 64, *first line of footnote; for p. 254 read p. 252.*
- P. 65, l. 12 *from bottom; for Salms-Laubach read Solms-Laubach.*
- P. 65, *last line; for Ginkgo biloba read Salisburia adiantifolia.*
- P. 82, l. 2; *for colourless read coloured.*
- P. 101, l. 5; *dele previous.*
- P. 101, l. 6; *for cannot be read has not been.*
- P. 106, l. 19; *for bundle read bundles.*
- P. 112, l. 3; *for Asclepiadæ read Asclepiadæ.*
- P. 147, l. 40; *for root-bearers read rhizophores.*
- P. 148, *footnote; for Oaniopsis read Calliopsis.*
- P. 241; *omit 3rd footnote.*
- P. 254, *footnote; for Rees read Rees.*
- P. 279, l. 6 *from bottom; for p. 287 read p. 291.*
- P. 287, *description to Fig. 207; for antheridia read globules.*
- P. 288, *description to Fig. 208; for antheridium read globule.*
- P. 296, l. 3 *of footnote; for Synopsia read Synopsis.*
- P. 307, *first line of description to Fig. 222; for its read a.*
- P. 327, l. 9 *from bottom; for colourless cells elongated in a parenchymatous manner read elongated colourless parenchymatous cells.*
- P. 340; *the reference in footnote to Ray Society's publication should follow that to Hofmeister's papers.*
- P. 361, l. 4 *from bottom; for the single read a single.*
- P. 454, l. 11 *of footnote; dele entire.*
- P. 456, l. 6 *from bottom; dele the first archeogonium.*
- P. 585, l. 14; *for Balanophoræ read Balanophoreæ.*
- P. 647, l. 9 *from bottom; for Sect. 8 read Sect. 7.*
- P. 770, *footnote; for Ailanthus malabarica read Ailantus excelsa.*

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