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978-1-107-58631-4 - Botany: A Senior Text-Book for Schools

D. Thoday

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A SENIOR TEXT-BOOK FOR SCHOOLS

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BOTANY

A SENIOR TEXT-BOOK FOR SCHOOLS

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CAMBRIDGE

AT THE UNIVERSITY PRESS

1950

Cambridge University Press
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CAMBRIDGE
UNIVERSITY PRESS

University Printing House, Cambridge CB2 8BS, United Kingdom

Cambridge University Press is part of the University of Cambridge.

It furthers the University's mission by disseminating knowledge in the pursuit of education, learning and research at the highest international levels of excellence.

www.cambridge.org

Information on this title: www.cambridge.org/9781107586314

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First edition 1915

Second edition 1919

Reprinted 1920, 1921

Third edition 1923

Reprinted 1925

Fourth edition 1929

Fifth edition 1935

Reprinted with corrections 1938, 1950

First paperback edition 2015

A catalogue record for this publication is available from the British Library

ISBN 978-1-107-58631-4 Paperback

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PREFACE

THIS book is intended primarily for use in connexion with the Senior Cambridge Local Examinations; but it is hoped that certain special features may make it of more general service, to teachers as well as to scholars in the upper forms of secondary schools.

No previous knowledge of Botany is assumed. The subject matter is divided into sections, each more or less self-contained, with cross-references, so that the more elementary parts of the book may be read in some other order if circumstances should make it desirable.

The treatment of physiology aims at giving each experimental fact and its interpretation a logical place in the whole. A necessary minimum of physics and chemistry is supplied. Special attention has been given to a clear exposition of certain matters (for example, the distinction between gaseous exchange and the processes of photosynthesis and respiration; geotropism; the balance between absorption and loss of water) which some years of experience as an examiner have convinced me are widely misconceived or imperfectly grasped. This has entailed a more fundamental consideration of some points than is usual in elementary books, a course which seemed educationally preferable to evading difficulties that many intelligent children feel. It is of course assumed throughout the book that the experiments will be performed by the students themselves, or at least demonstrated to them,

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and that specimens will be examined by each student individually.

The subject of classification is approached in close connexion with, and in illustration of, the problems of evolution. Special care has been taken (by emphasising the wide range of forms included in some of the Families) to combat the prevalent misconception, implicit if not explicit in much of the teaching of 'Natural Orders,' that certain 'typical characters' determine the limits of each Family. The special morphology of flowers and fruits is included incidentally.

Notes on common plants, other than those selected for the illustration of fundamental principles, and hints for extended work, as well as certain subsidiary or less elementary parts of the subject matter, are printed in smaller type.

I undertook to write this text-book after Mr A. Malins Smith had relinquished the task owing to the pressure of other duties. His draft MS, dealing with part of the subject matter of Sections I to III, was placed at my disposal and I have great pleasure in acknowledging my indebtedness to it. My scheme of arrangement is largely a modification of his; and in some parts, notably in Section I, I have been glad to avail myself of his simple and lucid descriptions.

I wish to record my gratitude to many friends who have put their special knowledge at my service and helped me with suggestions and criticisms. I am indebted to Prof. A. C. Seward, for suggestions made in the course of reading the proofs; to my colleague Mr R. S. Adamson, for revising Sections IV and V and part of Section III; and especially to my wife and workmate, who has at every point given ungrudgingly of her time and labour, and to whose criticism is due the removal of many blemishes which would else have disfigured these pages.

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A certain number of the illustrations are from original line drawings. The sources of the others are acknowledged individually. Many are taken from Marshall Ward's *Trees*, Willis's *Flowering Plants* and other books already published by the Cambridge University Press. A few are reproduced from Strasburger's Text-book. A number of others are from Baillon's *Natural History of Plants*, by the courtesy of Messrs L. Reeve and Co.

My best thanks are due to Mr A. G. Tansley for three blocks from *Types of British Vegetation*; to Sir Francis Darwin, for allowing me to use the figures from his *Practical Plant Physiology*; to the Editors of *The Annals of Botany* for permission to reproduce Figure 202; to Mr Gurney H. Wilson, Editor of *The Orchid World*, for Figure 169, from Veitch's *Orchid Manual*; and to the Macmillan Company for Figure 104, from Osterhout's *Experiments with Plants*. I am also indebted for other illustrations to Prof. J. Shelley, Mr H. Hamshaw Thomas, Mr S. Mangham and my wife.

D. T.

BOTANICAL DEPARTMENT
UNIVERSITY OF MANCHESTER
June 1915

PREFACE TO THE SECOND EDITION

THE opportunity of a second edition has been taken to add a supplementary section on Cryptogams so as to cover the syllabus for the Cambridge Higher School Certificate and other similar examinations.

In this Section as in others it is assumed that the students will examine specimens for themselves. Stress is laid on features that can be seen with the naked eye or with the aid of a hand lens. Microscopic details of which the significance cannot be understood, or which are relatively unimportant, at this stage are omitted.

The illustrations with four exceptions are original or from books published by the Cambridge University Press. Figs. 219 and 227 I. are reproduced by arrangement with J. M. Dent and Sons, Ltd, Figs. 221 and 225 by arrangement with Messrs J. and A. Churchill. War conditions have necessitated the omission of some other illustrations which I hoped to be able to use, and circumstances have not allowed me to make substitutes; but the want of them should not be seriously felt if specimens are thoroughly examined.

I am indebted to Prof. W. H. Lang for valuable criticism and suggestions in the Chapters on Bryophyta and Pteridophyta; to Mr W. Robinson for help in the Chapter on Fungi; and once more to my wife who has assisted at every point, and on whom has fallen the task of seeing the new edition through the press in my absence.

D. T.

LONDON.
2 September 1918.

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PREFACE TO THE FIFTH EDITION

THIS edition has undergone a thorough revision. Most of the corrections are in relative details; but more extensive alterations will be found in parts dealing with the water-relations of plants, aimed at removing ambiguities and inadequacies without introducing a more advanced treatment of the subject. A new potometer is substituted, which is easier to set up in working order than Farmer's apparatus: I am indebted to the Editor of the *School Science Review* for permission to reproduce the figure of this potometer. A very simple form of Joseph Priestley's demonstration that plants renovate vitiated air has been added: it is taken from *The Food of Plants*, by A. P. Laurie (Macmillan, 1893; Expts. 27 and 28, pp. 44-46). It brings the actual performance of this fundamental experiment within easy reach of everyone. The treatment of evolution has been modified, but without adding any specific reference to Mendelism, which properly belongs to a more advanced stage.

Since this book was first written the system of school examinations has undergone considerable reorganisation and syllabuses have been overhauled. Nevertheless, after careful consideration, it seems best to leave the book covering the same ground as in the second edition. Some teachers may find less than they would wish in one respect or another; particularly perhaps in the treatment of chemical phenomena, and of the lower plants. The formal

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chemistry now required by many School Certificate syllabuses, however, could not properly be dealt with in a short introductory chapter; and the Supplementary Chapter on the lower plants provides as it stands a basis on which further detail can be added by the teacher if required. Considerable addition of detail to the book would involve a danger of loss of balance.

Many years of experience confirm me in the opinion that the general plan of the book is sound and meets a real need for a view of plant biology corresponding as closely as may be with the logical and historical construction of our knowledge. If for examination purposes it needs to be otherwise classified and tabulated, the process is best carried out by pupil and teacher in co-operation.

D. T.

DEPARTMENT OF BOTANY
MEMORIAL BUILDINGS
UNIVERSITY COLLEGE OF NORTH WALES
BANGOR.
November 1934.

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