The Natural History of Plants

Vol. 1
1894

THE

NATURAL HISTORY OF PLANTS

THEIR FORMS, GROWTH, REPRODUCTION, AND DISTRIBUTION

FROM THE GERMAN OF

ANTON KERNER VON MARILAUN

PROFESSOR OF BOTANY IN THE UNIVERSITY OF VIENNA

BY

F. W. OLIVER, M.A., D.Sc.

QUAIN PROFESSOR OF BOTANY IN UNIVERSITY COLLEGE, LONDON

WITH THE ASSISTANCE OF

MARIAN BUSK, B.Sc. AND MARY F. EWART, B.Sc.

WITH ABOUT 2000 ORIGINAL WOODCUT ILLUSTRATIONS AND SIXTEEN PLATES IN COLOURS

VOLUME I.

BIOLOGY AND CONFIGURATION OF PLANTS

LONDON

BLACKIE & SON, LIMITED, 50 OLD BAILEY, E.C.

GLASGOW AND DUBLIN

1894

SWARM-SPORES AND ZYGOSPORES. FORMS OF CHLOROPHYLL-BODIES.

Printed from the originals by the BIBLIOGRAPHISCHES INSTITUT, Leipzig.

THE

NATURAL HISTORY OF PLANTS

PLATE I.

SWARMSPORES AND ZYGOSPORES.

FORMS OF CHLOROPHYLL-BODIES.

a—d Development of swarmspores in the tubular cells of *Vaucheria clavata.*

e—h Swarmspores and resting-cells of "red-snow" (*Sphaerella nivalis*), mixed with pollen-grains of Pines.

i—k Forms of Chlorophyll in cells of Desmidieæ (i. *Closterium Leibleinii;* k. *Penium interruptum*).

l Formation of zygospores and spiral arrangement of Chlorophyll-bodies in cells of *Spirogyra arcta.*

m Star-shaped Chlorophyll-bodies in cells of *Zygnaema pectinatum.*

n—o *Gloeocapsa sanguinea.*

p Protonema of *Schistostega osmundacea.*

q Transverse section of the foliage-leaf of Cress.

r Transverse section of the leaf of the Passion-flower.

s Relative positions of laticiferous tubes and palisade-cells in the leaf of a Spurge (*Euphorbia Myrsinites*).

All the figures greatly magnified.

AUTHOR'S PREFACE

TO THE ENGLISH EDITION OF "PFLANZENLEBEN".

Not long ago two artisans, who had borrowed a copy of *Pflanzenleben* from one of the Vienna public libraries and had studied its pages, called upon me, asking me to show them under the microscope some of the things there described.

It seemed that without any special educational advantages they had availed themselves of leisure moments to extend their knowledge, and had read *Pflanzenleben* with profit. On leaving, they thanked me in simple words for the pleasure, instruction, and stimulus which they had derived from the perusal of my book.

I confess that these words gave me vastly more pleasure than many of the verbose and flattering reviews of *Pflanzenleben* that had appeared in newspapers and scientific journals, many of which conveyed the impression of being the result of hasty skimming of copies sent by the publisher.

The satisfaction which the little incident gave me was the greater, in that it was an assurance that I had achieved in *Pflanzenleben* what had been my intention namely, to write a book which might serve as a source of knowledge, not only for specialists and scholars, but also for the many who, though compelled to follow some practical calling, still take an interest in science, and who wish, each in his own particular degree, to obtain information of its progress.

Popular treatises on the results of scientific investigation are by no means rare with us Germans; but in too many cases scientific problems involving serious thought are touched superficially, and, like the stone in a sweet fruit, are embedded in picturesque and attractive accounts of things purely of subordinate importance. The reader, gratified by the elegant phraseology, passes by the kernel of fact, and derives little profit from the book. Books such as these have brought the art of popular writing into discredit, and we have arrived at the point when educated

people but lightly esteem, or even ignore, the results of careful and laborious investigations and the theories based upon them, if they are produced in a popular manner rather than in the conventional language of science.

With the English, however, it is otherwise. I have long regarded with admiration the men of science whom you number amongst your countrymen, who present the results of their studies in words intelligible to all who seriously desire knowledge.

To follow in the path of such men has always been my aim in my work and in my writings, and this was particularly before me in the production of *Pflanzenleben.*

This confession will explain my pleasure on hearing that my esteemed colleague had in contemplation an English edition of *Pflanzenleben* for English readers. The book will now be available to a vastly increased number of persons, and be welcomed by many to whom German works are inaccessible.

If by this means a knowledge of the Life of Plants is promoted far and wide, it is largely to the credit of the Translators, to whom, in conclusion, I tender my grateful thanks for the pains which they have taken.

A. KERNER VON MARILAUN.

VIENNA, *December, 1893.*

EDITOR'S PREFATORY NOTE.

PROFESSOR KERNER has stated very succinctly, in the preface which he has been good enough to write for the English edition of *Pflanzenleben*, the main idea which guided him in the writing of that book. Consequently little remains for me to add save a few observations on the book in its present form. On the appearance of the original, the parts as they were issued were widely scanned, and the work soon enjoyed a large circulation. Here was a book at once attractive to the ordinary reader, and retaining unimpaired its value to trained naturalists. The scale of the undertaking was such that it was possible to give a presentment worthy of the subject. Hitherto, though Astronomy, Geology, and other branches of natural knowledge had been long accessible to the ordinary reader in popular books of the greatest value, this service had not been done for Botany. Long before the issue of *Pflanzenleben* was complete, the idea of an English edition suggested itself to me and to my friend, Mr. Walter Gardiner, of Cambridge. It was my hope that we should, jointly, undertake its preparation. To my great regret, Mr. Gardiner was prevented from co-operating by other duties; thus the whole responsibility of this edition falls to my lot. To my colleagues in this undertaking, Mrs. Busk and Miss Ewart, the chief credit is due for this translation. Indeed, without their hearty collaboration, the production of *The Natural History of Plants* would have been impossible. In the main, the original text has been faithfully adhered to. The translation, though not everywhere precisely literal, never departs from the spirit of the German edition. The Index to the complete work, together with a Glossary, will be appended to the concluding volume.

F. W. O.

KEW, *November*, 1894

THE BIOLOGY
AND CONFIGURATION OF PLANTS

CONTENTS OF VOLUME FIRST.

INTRODUCTION.

THE LIVING PRINCIPLE IN PLANTS.

ABSORPTION OF NUTRIMENT.

CONDUCTION OF FOOD.

FORMATION OF ORGANIC MATTER FROM THE ABSORBED INORGANIC FOOD.

METABOLISM AND TRANSPORT OF MATERIALS.

GROWTH AND CONSTRUCTION OF PLANTS.

PLANT-FORMS AS COMPLETED STRUCTURES.

ILLUSTRATIONS.

FROM ORIGINAL DRAWINGS BY E. HEYN, H. v. KÖNIGSBRUNN, E. v. RANSONNET, J. SEELOS, F. TEUCHMANN, O. WINKLER, AND OTHERS.

COLOURED PLATES.

ILLUSTRATIONS IN THE TEXT.

THE
NATURAL HISTORY OF PLANTS.

INTRODUCTION.

THE STUDY OF PLANTS IN ANCIENT AND IN MODERN TIMES.

Plants considered from the point of view of utility.—Description and classification of plants.—Doctrine of metamorphosis and speculations of nature-philosophy.—Scientific method based on the history of development.—Objects of botanical research at the present day.

PLANTS CONSIDERED FROM THE POINT OF VIEW OF UTILITY.

SOME years ago I rambled over the mountain district of North Italy in the lovely month of May. In a small sequestered valley, the slopes of which were densely clad with mighty oaks and tall shrubs, I found the flora developed in all its beauty. There, in full bloom, was the laburnum and manna-ash, besides broom and sweet-brier, and countless smaller shrubs and grasses. From every bush came the song of the nightingale; and the whole glorious perfection of a southern spring morning filled me with delight. Speaking, as we rested, to my guide, an Italian peasant, I expressed the pleasure I experienced in this wealth of laburnum blossoms and chorus of nightingales. Imagine the rude shock to my feelings on his replying briefly that the reason why the laburnum was so luxuriant was that its foliage was poisonous, and goats did not eat it; and that though no doubt there were plenty of nightingales, there were scarcely any hares left. For him, and I daresay for thousands of others, this valley clothed with flowers was nothing more than a pasture-ground, and nightingales were merely things to be shot.

This little occurrence, however, seems to me characteristic of the way in which the great majority of people look upon the world of plants and animals. To their minds animals are game, trees are timber and fire-wood, herbs are vegetables (in the limited sense), or perhaps medicine or provender for domestic animals, whilst flowers are pretty for decoration. Turn in what direction I would, in every country where I have travelled for botanical purposes, the questions asked by the inhabitants were always the same. Everywhere I had to explain whether the plants I sought and gathered were poisonous or not; whether they were efficacious as cures for this or that illness; and by what signs the medicinal or otherwise

useful plants were to be recognized and distinguished from the rest. And the attitude of the great mass of country folk in times past was the same as at the present day. All along anxiety for a livelihood, the need of the individual to satisfy his own hunger, the interests of the family, the provision of food for domestic animals, have been the factors that have first led men to classify plants into the nutritious and the poisonous, into those that are pleasant to the taste and those that are unpleasant, and have induced them to make attempts at cultivation, and to observe the various phenomena of plant life.

No less powerful as an incentive to the study of herbs, roots, and seeds, and to the minute comparison of similar forms and the determination of their differences, was the hope and belief that the higher powers had endowed particular plants with healing properties. In ancient Greece there was a special guild, the "Rhizotomoi," whose members collected and prepared such roots and herbs as were considered to be curative, and either sold them themselves or caused them to be sold by apothecaries. Through the labours of these Rhizotomoi, added to those of Greek, Roman, and Arabic physicians, and of gardeners, vine-growers, and farmers, a mass of information concerning the plant-world was acquired, which for a long period stood as botanical science. As late as the sixteenth century plants were looked upon from a purely utilitarian point of view, not only by the masses but also by very many professed scholars; and in most of the books of that time we find the medicinal properties, and the general utility of the plants selected for description and discrimination, occupying a conspicuous position and treated in an exhaustive manner. Just as men lived in the firm belief that human destinies depended upon the stars, so they clung to the notion that everything upon the earth was created for the sake of mankind; and, in particular, that in every plant there were forces lying dormant which, if liberated, would conduce either to the welfare or to the injury of man. Points which might serve as bases for the discovery of these secrets of nature were eagerly sought for. People imagined they discerned magic in many plants, and even believed that they were able to trace in the resemblance of certain leaves, flowers, and fruits to parts of the human body, an indication, emanating from supernatural powers, of the manner in which the organ in question was intended to affect the human constitution. The similarity in shape between a particular foliage-leaf and the liver did duty for a sign that the leaf was capable of successful application in cases of hepatic disease, and the fact of a blossom being heart-shaped must mean that it would cure cardiac complaints. Thus arose the so-called doctrine of Signatures, which, brought to its highest development by the Swiss alchemist Bombastus Paracelsus (1493–1541), played a great part in the sixteenth and seventeenth centuries, and still survives at the present day in the mania for nostrums. The inclination of the masses is now, as it was centuries ago, in favour of supernatural and mysterious rather than simple and natural interpretations; and a Bombastus Paracelsus would still find no lack of credulous followers. In truth, the great bulk of mankind regard Botany as subservient to medicine and agriculture, they look at it from the purely