Life Sciences

Until the nineteenth century, the various subjects now known as the life sciences were regarded either as arcane studies which had little impact on ordinary daily life, or as a genteel hobby for the leisured classes. The increasing academic rigour and systematisation brought to the study of botany, zoology and other disciplines, and their adoption in university curricula, are reflected in the books reissued in this series.

The Ferns (Filicales)

Frederick Orpen Bower (1855–1948) was a renowned botanist best known for his research on the origins and evolution of ferns. Appointed Regius Professor of Botany at the University of Glasgow in 1885, he became a leading figure in the development of modern botany and the emerging field of paleobotany, devising the interpolation theory of the life cycle in land plants. First published between 1923 and 1928 as part of the Cambridge Botanical Handbook series, The Ferns was the first systematic classification of ferns according to anatomical, morphological and developmental features. In this three-volume work Bower analyses the major areas of comparison between different species, describes primitive and fossil ferns and compares these species to present-day fern species, providing a comprehensive description of the order. Volume 1 describes and analyses the features of ferns which Bower uses in his system of classification.
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The Ferns (Filicales)

Treated Comparatively with a View to their Natural Classification

Volume 1: Analytical Examination of the Criteria of Comparison

F. O. Bower
Cambridge Botanical Handbooks
Edited by A. C. Seward and A. G. Tansley

THE FERNS

VOLUME I
View in the Kibble House, Botanic Garden, Glasgow, from a photograph by Mr Fullarton; showing the double-headed specimen of *Cyathea dealbata*, its trunk covered with *Trichomanes venosum*, with Dicksonias right and left, and with *Todea barbara* at its foot, together with other Ferns.
THE FERNS
(FILICALES)

TREATED COMPARATIVELY WITH A VIEW TO THEIR NATURAL CLASSIFICATION

VOLUME I

ANALYTICAL EXAMINATION OF THE CRITERIA OF COMPARISON

BY

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CAMBRIDGE
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PREFACE

“Little do ye know your own blessedness; for to travel hopefully is a better thing than to arrive, and the true success is to labour.” R. L. Stevenson, Essay on “El Dorado.”

In this passage Stevenson enunciates a truth that applies with singular force to those who enter on morphological enquiry. To travel hopefully is the chosen pursuit of all who study large groups of organisms with a view to reducing them to order, so as to throw light on their origin and evolution. In such quests no one need expect under present conditions to arrive at the final destination of complete and assured knowledge. If any one should indulge this hope his disappointment is certain. Even if he did so arrive, and found himself able fully to demonstrate the whole truth, how greatly would the quest lose in its interest. It is in the pursuit of his “El Dorado” of evolutionary history, not in the arrival there, that the true blessedness of the morphologist lies. It behoves then those who travel on this journey not to hurry unduly, but to consider with critical care the manner of their journeying, rather than to seek short cuts to an elusive goal.

Bacon in the Novum Organum laid it down that there are only two ways in which knowledge can be sought: viz. by anticipations of Nature, and by interpretations of Nature. In the former method men pass at once from particulars to the highest generalities, and thence deduce all intermediate propositions. In the latter they rise by gradual induction, and successively from particulars to axioms of the lowest generality, then to intermediate axioms, and so to the highest. He asserts that this is the true way. There will be good ground for hope, he says, when any one can be found content to begin at the beginning, and to apply himself to “experience and particulars.”

It will depend in some degree upon the data available for study of the question in hand which of these two methods shall be used. Where the facts are few and disconnected the former may appear preferable. But the fewer the facts the less reliable will be the conclusions: till at last the results arrived at by the deductive method may be little better than speculations, liable to be modified or refuted by any positive discovery. The deductive study of evolution is in fact the refuge of those who, finding themselves destitute of the necessary data, are still determined to arrive at some conclusion. They accordingly use their imagination to make up the deficiency. The inductive method will be preferred in any case where the facts are many and cognate, so that they can be arranged in continuous sequences. It is true that the data may be read in divers ways, according as greater or less weight is assigned to one detail or to another. But against this criticism it may be
PREFACE

urged that the several sequences of facts may be so linked into a coherent web that they will mutually support or check one another. It should be the constant practice of the morphologist to use them in this way. Stability will thus be given to the more general conclusions, and these will be based not upon preconceptions but upon the orderly use of “experience and particulars.”

The Class of the Filicales stands pre-eminent as a field for the practice of this inductive method. It is represented by many thousands of living species, spread over all quarters of the globe. These plants have characters in common which seldom leave a doubt of the “Filical” nature of any species. Nevertheless the Ferns vary so greatly, and, as it is found, so consistently in their details that ample material is at hand for their comparison, and phylogetic seriation. Besides this the Class is so well represented among the fossils that the sequences traced by comparison of living types may often be effectively checked by the order of occurrence of the several forms in the successive geological strata. But such a study of Ferns with a view to visualising their own inter-relationships need not be the sole aim before us here. If their comparison leads to a clear conception of some general type of primitive organisation from which in the long distant past the whole phylum may have sprung, this should serve to indicate probable relationships with other primitive phyla: and so the comparative study of their phylesis may contribute to still wider views on the Descent of Land-Living Plants. This has been in part the aim of the author in undertaking the present work. Primarily it is a treatise on the Filicales: but secondarily, it will touch broader questions of Morphology and of Evolution.

It has not been the author’s intention to give an exhaustive summary of all knowledge relating to Ferns, nor will complete citations of the profuse literature of the subject be attempted. Instead of this, when works of other writers are quoted in which a special branch of the literature is fully cited, the fact will be noted. Readers will thus be given clues to the whole literature, which may readily be followed up by them; while the present volume will be relieved of much unnecessary print.

Where illustrations have been borrowed the debt is acknowledged in the legends, and here grateful thanks are accorded to their authors; some particular acknowledgments appear on p. viii. A large proportion of the figures in this book are original, and to them no author’s name is attached. In the production of these, and in the general illustration of this volume, the author desires to acknowledge substantial assistance given by the Carnegie Trustees. By aiding the publication of results obtained during the present period of high prices, they promote the advancement of Science in a most practical way, and deserve not only the thanks of the immediate recipient, but the general regard of men of Science.

F. O. BOWER.

GLASGOW,
December, 1922.
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View in the Kibble House, Botanic Garden, Glasgow

Frontispiece
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LIST OF WORKS OF GENERAL USE
IN THE STUDY OF THE FILICALES

I. SWARTZ. Synopsis Filicum. 1866.
II. SCHUH. Die Farnkräuter. Wittemberg. 1809. 219 Plates.
III. PRESL. Tentamen Pteridographiae. Pragae. 1836.
IV. PRESL. Supplementum Tentaminis Pteridographiae. Pragae. 1845.
VI. BAUER & HOOKER. Genera Filicum. London. 1842. 120 Plates.
VII. HOOKER & GREVILLE. Icones Filicum. 2 Vols. London. 1851. 240 Plates.
VIII. HOOKER. Species Filicum. 5 Vols. London. 1846–1864. 304 Plates.
IX. HOOKER & BAKER. Synopsis Filicum. 2nd Edn. London. 1883.
XII. METTENIUS. Filices Horti Lepsiensis. 1856. 30 Plates.
XIV. BEDDOME. Ferns of British India. Madras. 1867–8. 345 Plates.
(The literature on Ferns of Central Europe is here fully quoted.)
XVII. CHRIST. Die Farnkräuter der Erde. Jena. 1897.
(Fern-Floras are here fully quoted.)
(The general literature on Ferns is here fully quoted.)
(The literature on microscopic analysis is here fully quoted.)
XXIII. VAN ROSENBURGH. Malay Ferns. Batavia. 1908.
(An alphabetical list of all names of Ferns.)
XXVII. BOWER. Studies on Spore-Producing Members. I–V. Phil. Trans. 1894–1903.
(The general literature on Ferns is here very fully quoted.)
(The fossil literature is here fully quoted.)
XXXI. VON GOEBEL. Organographie. 2nd Edn. Part II. Jena. 1918.
Organic Nature is the better understood by consulting the fossils that illuminate its history. It is like an ancient and enduring document, whose diction may seem clear, but is found to be more intelligible and fuller of meaning when the text is studied historically, due thought being given to the conditions under which it was written.