Gray's Manual of Botany

REVISED EDITION

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MANUAL

OF

BOTANY

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BOTANY

OF

THE NORTHERN UNITED STATES.

MANUAL

OF

THE BOTANY

OF THE

NORTHERN UNITED STATES,

INCLUDING THE DISTRICT EAST OF THE MISSISSIPPI AND NORTH OF NORTH CAROLINA AND TENNESSEE.

By ASA GRAY,

LATE FISHER PROFESSOR OF NATURAL HISTORY IN HARVARD UNIVERSITY.

Sixth Edition.

REVISED AND EXTENDED WESTWARD TO THE 100th MERIDIAN,

BY

SERENO WATSON,

CURATOR OF THE GRAY HERBARIUM, HARVARD UNIVERSITY,

AND

JOHN M. COULTER,

PROFESSOR OF BOTANY IN WABASH COLLEGE,

ASSISTED BY SPECIALISTS IN CERTAIN GROUPS.

WITH TWENTY-FIVE PLATES,

ILLUSTRATING THE SEDGES, GRASSES, FERNS, ETC.

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NOTE.

In this second issue of the Manual are given all such needed emendations of every kind as have come to our notice. Wherever it could be conveniently done, these alterations have been made in the plates. The remainder will be found in supplementary "Additions and Corrections" near the end of the volume.

PREFACE.

The first edition of Gray's Manual was published in 1848. It was to a great extent rewritten and its range extended in 1856, and it was again largely rewritten in 1867. The great advances that have since been made in systematic botany and in the knowledge of our flora have for several years past made another revision desirable, which Dr. Gray before his death was purposing to undertake.

The present editors, acting to the best of their ability in his stead, have endeavored throughout to follow his methods and views. The original plan, so long retained by Dr. Gray and so generally approved, has been closely adhered to, the characters and descriptions of the last edition have been left essentially unchanged so far as possible, and in the numerous alterations and additions that have been considered necessary or advisable, his conclusions and principles have governed in every matter of importance, so far as they could be known. The effort especially has been to maintain that high standard of excellence which has always made the Manual an authority among botanists.

In the treatment of the genera and species, Gray's Synoptical Flora has been made the basis in the revision of the Gamopetalous Orders, and his manuscript in continuation of that work, so far as prepared, for the Polypetalous Orders which precede *Leguminosæ* (excepting *Nuphar*, the *Cruciferæ*, *Caryophyllaceæ*, *Vitis*, and the small Orders numbered 18, 22, 23, 25–27, and 29). The genus *Salix* has been rewritten for this edition by M. S. Bebb, Esq., the genus *Carex* by Prof. L. H. Bailey, and the Ferns and allied orders by Prof. D. C. Eaton. For the rest, all known available sources of information have been made use of, and much willing help has been received from botanists in all parts of our territory.

The increasing interest that is taken in the study of the Cellular Cryptogams, and the desire to encourage it, have led to the inclusion again of the Hepaticæ, which were omitted in the last edition. These have been prepared through the kindness of Prof. L. M. Underwood, though the limits of the volume have necessitated somewhat briefer descriptions than he considered desirable. The three fine plates illustrating the genera of these Orders, which were used in the early editions, are also added, with a supplementary one, as well as an additional one in illustration of the Grasses, thus increasing the number of plates to twenty-five. A Glossary of botanical terms is appended, to meet an expressed need of those who use the Manual alone, and a Synopsis of the Orders in their sequence is given, to contrast more clearly their characters, and to show the general principles which have determined their present arrangement. This should be a useful adjunct to the more artificially arranged Analytical Key.

Geographical Limits, and Distribution. — The southern limit of the territory covered by the present work is the same as in the later previous editions, viz. the southern boundary of Virginia and Kentucky. This coincides better than any other geographical line with the natural division between the cooler-temperate and the warm-temperate vegetation of the Atlantic States. The rapid increase of population west of the Mississippi River, and the growing need of a Manual covering the flora of that section, have seemed a sufficient reason for the extension of the limits of the work westward to the 100th meridian, thus connecting with the *Manual of the Flora of the Rocky Mountain Region* by Prof. Coulter. These limits, as well as that upon the north, have been in general strictly observed, very few species being admitted that are not known with some degree of certainty to occur within them. The extreme western flora is no doubt imperfectly represented.

The distribution of the individual species is indicated somewhat more definitely than heretofore in many cases, so far as it could be satisfactorily ascertained. The extralimital range is also sometimes given, but the terms "northward," "southward," and "westward" are more frequently employed, signifying an indefinite range in those directions beyond the limits of the Manual. Where no definite habitat is specified, the species may be understood as found more or less generally throughout the whole area, or at least to near the western limits.

Nomenclature, Accentuation of Names, etc. — In case of question respecting the proper name to be adopted for any species, Dr. Gray's known and expressed views have been followed, it is believed, throughout the work. While reasonable regard has been paid to the claims of priority, the purpose has been to avoid unnecessary changes, in the belief that such changes are in most cases an unmitigated evil. Synonyms are rarely given except where changes have been made. As a guide to correct pronunciation, the long sound of the accented vowel (modified often in personal names) is indicated, as heretofore, by the grave accent (`), and the short sound by the acute (´). In regard to the derivations of generic names, many valuable suggestions have been due to W. R. Gerard, Esq., of New York.

Prominent Characters are indicated by the use of *Italic type* for the leading distinctions of the Orders, and generally in the specific descriptions for those points by which two or more nearly allied species may be most readily distinguished. The ready discrimination of the genera is provided for by a Synopsis of their leading characters under each order. Whenever a genus comprises several species, pains have been taken to render important differences conspicuous by proper grouping, and when needed by a series of subordinate divisions and subdivisions. The headings of these various groups are to be considered as belonging to and forming a part of the specific characters of the several species under them, — a fact which the student should always bear in mind.

Arrangement of the Orders. — The Natural Orders are disposed in very close accordance with the method followed by Bentham and Hooker in the *Genera Plantarum*, the principles of which are concisely shown in the Synopsis of Orders which precedes the Analytical Key. The *Gymnospermæ* are retained as a Subclass following the Angiospermous Dicotyledons, with which they have an obvious relationship, in preference to placing them, as some authorities would do, next before the Pteridophytes, to which their affinity, if no less certain, is nevertheless obscure. A more natural arrangement than either would be the withdrawal of the Endogens, placing them at the beginning, in perhaps an inverse order.

ANALYTICAL KEY TO THE ORDERS. — As stated in Dr. Gray's Preface to the last edition, this is designed to enable the student to refer readily to its proper Order any of our plants, upon taking the pains to ascertain the structure of its flowers, and sometimes of the fruit, and by following out a series of easy steps in the analysis. It is founded upon the most obvious distinctions which will answer the purpose, and is so contrived as to provide for all or nearly all exceptional instances and variant cases. Referring to the Order which the Key leads him to, the student will find its most distinctive points brought together and printed in Italics in the first sentence of the ordinal description, and thus can verify his results. The Synopsis which follows will then lead him to the genus, to be verified in turn by the full generic description in its place; and the progress thence to the species is facilitated, when there are several to choose from, by the arrangement under divisions and subdivisions, as already explained.

It will be seen that the Key directs the inquirer to ascertain, first, the Class of the plant under consideration, — which, even without the seeds, is revealed at once by the plan of the stem, as seen in a cross-section, and usually by the veining of the leaves, and is commonly confirmed by the numerical plan of the flower; — then, if of the first Class, the Subclass is at once determined by the pistil, whether of the ordinary kind, or an open scale bearing naked ovules. If the former, then the choice between the three Divisions is determined by the presence or absence of the petals, and whether separate or united. Each Division is subdivided by equally obvious characters, and, finally, a series of successively subordinated propositions, — each set more indented upon the page than the preceding, — leads to the name of the Order sought for, followed by the number of the page upon which it is described in the body of the work.

The book is now submitted to those for whose benefit it has been prepared, in the trust that its shortcomings will meet with friendly indulgence, and with the earnest request that information be kindly given of any corrections or additions that may appear to be necessary.

SERENO WATSON.

CAMBRIDGE, MASS., Dec. 26, 1889.

SYNOPSIS OF THE ORDERS OF PLANTS

DESCRIBED IN THIS WORK.

SERIES I. PHÆNOGAMOUS OR FLOWERING PLANTS: those producing real flowers and seeds.

CLASS I. DICOTYLEDONOUS OR EXOGENOUS PLANTS.

Stems formed of bark, wood, and pith; the wood forming a zone between the other two, and increasing, when the stem continues from year to year, by the annual addition of a new layer to the outside, next the bark. Leaves netted-veined. Embryo with a pair of opposite cotyledons, or in Subclass II. often three or more in a whorl. Parts of the flower mostly in fours or fives.

SUBCLASS I. ANGIOSPERMÆ. Pistil consisting of a closed ovary which contains the ovules and becomes the fruit. Cotyledons only two.

DIVISION I. POLYPETALOUS: the calyx and corolla both present; the latter of *separate* petals. (Apetalous flowers occur in various Orders, as noted under the subdivisions.)

A. THALAMIFLORÆ. Stamens and petals hypogynous (free both from the calyx and from the superior ovary), upon a usually narrow receptacle (not glandular nor discoid, except in Reseda, sometimes stipe-like). (Stamens and petals upon the partly inferior ovary in some Nymphæaceæ.) Apetalous flowers occur in the Ranunculaceæ and Caryophyllaceæ.

* 1. Carpels solitary or distinct (or coherent in Magnoliaceæ); sepals and petals deciduous (except in Nymphæaceæ); leaves alternate or radical, without stipules (sometimes opposite or whorled and rarely stipular in Ranunculaceæ); embryo (except in Nelumbo) small, in fleshy albumen

1. **Ranunculaceæ** (p. 34). Sepals (3 or more), petals (as many, in regular flowers, or none), stamens (usually many), and carpels (1 – many) all distinct. Fruit achenes, follicles, or berries. Mostly herbs.
2. **Magnoliaceæ** (p. 49). Sepals and petals colored alike, in three or more rows of three, imbricate. Fruit cone-like, formed of the numerous cohering pistils. Trees.
3. **Anonaceæ** (p. 50). Sepals (3) and petals (6, in two rows) valvate. Fruit pulpy. Shrubs or small trees.
4. **Menispermaceæ** (p. 51). Sepals and petals in twos or threes, imbricate. Pistils becoming 1-seeded drupes. Dicœcious woody climbers, with palmate or peltate leaves.