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PART I
EXPLANATIONS

THE PURPOSE

The purpose of this book is to provide a ready means for the identification of the species in the usual domestic flora of the continental United States and Canada.

It is manifestly impossible to describe within the limits of a single volume all the plants that may be in cultivation in the territory. Many species are known only in botanic gardens, experiment stations, test-grounds, or in the collections of specialists and fanciers. To attempt to include these species would make a work of unmanageable size, and the subject would necessarily be greatly complicated for the general student; moreover, the species in these institutions and collections are usually well known to those who grow them. Any number of native plants are also likely to be transferred to grounds and many of them are offered by dealers; one never knows what species these may be; to include them all would introduce into the book a good part of the native flora and duplicate the field of the regular manuals of American plants. Most of these native species are not cultivated plants in the sense in which the term is understood in this book, even though they may be planted in grounds: they have not become familiar citizens of gardens, nor have they given rise to varieties and races under cultivation; that is, they are not domesticated.

Persons desiring to go further in the subject must consult special monographs. The Standard Cyclopedia of Horticulture is also available, in which 20,602 species are accounted for, although the Cyclopedia does not include all plants cultivated in North America. Gray's Field, Forest and Garden Botany has been useful in the identification of cultivated plants for more than fifty years. The present Manual includes 3,665 species (in black-face type) and 1,246 genera in 170 natural families, of which 167 are regularly numbered, aside from many Latin-named varieties and incidental references to other plants.

The user of this book must understand that it deals only with species. To include horticultural varieties, even those bearing Latin names, would greatly increase the bulk and complexity of the volume. The number of Latin-named varieties in the Standard Cyclopedia of Horticulture is 6,715. Moreover, the identification of these varieties constitutes quite another problem, and one that is essentially yet new. The varieties must be worked out in mono-

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graphic treatments for the use of specialists and professionals who have charge of test-grounds, parks, landscape gardens, and investigational work. To describe the main varieties of cultivated plants, even those customarily meriting Latin names, requires long and painstaking study, collections for the most part not in existence, historical perspective, a special application of nomenclature, and an appreciation of systematic values yet little developed.

Although the purpose of this book is to describe the species most commonly cultivated, there are three classes of rather marked exceptions: (1) Many plants not offered by dealers nor appearing in printed lists are in cultivation in old houses and private gardens, and are likely to be exchanged from hand to hand; these plants have established themselves in the affections of growers and they should be recorded, even though not common or perhaps in the process of passing out in a commercial epoch. (2) Species of rather recent introduction that promise to be acquisitions but which are not yet well known; it is impossible to forecast which ones are likely to become fairly common or established. (3) Certain species of great historic interest in Europe and other countries that should be known as a matter of general knowledge but which may be little cultivated in North America; an example is *Lupinus albus*, lupine of the ancients and still grown in parts of Europe for human food, forage, and green-manuring, but rarely seen in this country; in this category are many food-plants likely at any time to awaken interest here, and also such things as are frequently grown in "economic collections"; these subjects are always interesting to students in the educational institutions. While some of the species in these three categories may not be common, they may nevertheless be significant to man or to the development of horticulture and agriculture, and therefore are in place in the book.

The limits of the book are necessarily indefinite and subject to personal judgment. What species may be omitted without loss and what should be added will develop with the use of the book; the results may be recorded in a subsequent edition.

The plants entered in this volume represent all parts of the world. They bring the names now current among the specialists of different countries. The application of the International Rules of Nomenclature naturally follows.

The botany or phytophraphy of the species included in this volume, coming from the ends of the earth, is likely to be considerably modified by subsequent investigation. Cultivated plants have not been the subject, for the most part, of critical systematic study, and the knowledge of them is frequently inexact. Such

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plants have been taken for granted or have been considered to be outside the range of regular botanical work. Origins have now been lost. There is little "type" or authentic material. Even as to the wild species from which they come, there is little uniformity of treatment inasmuch as they represent widely separated floras that have been treated by different minds without reference to each other. An author working with the flora of some part of South America, for example, may have a very different conception of his species from one studying the flora of China. When species of a group from these two regions are brought together in a book like this Manual, it may be found that the species-concepts are different in the two cases and that the descriptions do not employ comparable characters. It therefore follows that the situation does not yet admit the consistency of diagnosis to be expected in a flora describing the plants of a single and more or less homogeneous region. Moreover, some of the stocks from which domesticated subjects are descended have not been restudied in modern time; the knowledge of cultivated plants must largely await the critical re-examination of the original species in the countries of their nativity. Anticipating considerable changes, this book is printed directly from type, the composition not having been cast in plates.

In the study of the flora of a region, the habitat and range afford clues to the species; but with cultivated plants such aids are usually not available, as even the part of the world from which a given subject comes may be wholly unknown to the collector; one must approach the subject in a different attitude and rely on diagnoses alone. In this Manual, the tendency is to conceive genera and species rather broadly. It is easy to go to such a degree of refinement that the subdivision ceases to have utility.

So far as possible, the original orthography is followed in the name unless there is evidence of misprint or error. Thus *Wisteria* is written as originally spelled, even though it is made in compliment to Caspar Wistar (a family name sometimes spelled *Wister*); names of plants are not primarily commemorative; Nuttall had the right to spell his genus as he chose, and he may have considered *Wisteria* a more conformable and euphonious Latin; at all events, he appears to have so spelled the name deliberately. Similarly, *Kennedia* is restored to its original spelling, although named for Lewis Kennedy; there is no *y* in words of original Latin, and undoubtedly Ventenat preferred to follow classical form. Similar cases occur in *Malcomia* and *Mathiola*; Robert Brown was a critical student, and his spelling of these generic names must be accepted as intentional.

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A word should be said in explanation of the color designations. The colors of flowers, leaves, and fruits are indicated only in a general sense. Thus, if in keys or diagnoses flowers are said to be "yellow," it is meant that they are of the yellow series rather than of the red, blue, or other series, and no attempt may be made to distinguish the particular kind or degree of yellow. In cultivated plants, it is difficult briefly to state distinctions of colors that may arise within a species; but the special point to be understood is that the purpose of citing color in diagnoses of this kind is only to aid in identification of species, and the citation is never intended as a color analysis or discriminating appreciation.

It may interest the reader to know that a book of this kind was begun by the author more than forty years ago. In the meantime he has maintained his interest in the subject, ever with the hope that the present volume might eventuate. It has required the growing of very many of the species and the assembling of a considerable herbarium collection. So far as possible, the diagnoses in the book are drawn or verified from the specimens themselves. The book is, therefore, not a compilation, but is written new.

So far as the author is aware, there is no other manual of this kind in any language, in which the domestic flora of a country is attempted to be separately covered from the point of view of the systematic botanist. The subject is one of special perplexity because plants from many parts of the world must be placed in juxtaposition; this requires the contrasting and keying of species that may not have been associated in this way before. In fact, this perplexity is marked even with plants from Europe, inasmuch as there is no descriptive flora of that region as a whole.

The author hopes that this limited and imperfect book may be a contribution to both botany and horticulture: to botany by suggesting a delightful and promising field for keen biological study; to horticulture by stimulating definiteness and exactness in the knowledge of the kinds of plants. The study of the species of plants that chance to be subjects of cultivation should be approached in the same spirit as is the study of those that happen not to be cultivated.

Throughout the work the author has had the devoted aid of his daughter, Ethel Zoe Bailey, in both the botanical and editorial sides, as well as in the development of the herbarium on which so much of the enterprise is based. In the later months, Dr. Lulu M. Newlon, attached to the office and herbarium, has written many of the diagnoses.

THE HERBARIUM

If one is to make a serious effort to study the species of plants, one must keep a record of them. This record is an herbarium; and an herbarium is prepared by properly pressing, drying, and mounting the plants.

Assuredly, plants should be studied as far as possible in the growing state; but a record of them is essential. They must be preserved for future consultation. One must go to them again and again for verification and to make new comparisons and to refresh the memory, as one returns again and again to printed descriptions, to photographs, to documents, and to other evidences.

Moreover, it is not often possible to obtain fresh specimens of related kinds at the same time for comparison; they do not last long; memory soon becomes dim and faulty. For it must be known that the identification of species is not accomplished accurately by easy observation of striking or superficial characters. One reason why the species of cultivated plants are so little understood is because good preserved specimens are not available. The habit of critical study of them cannot be developed in living specimens alone.

In the careful study of cultivated plants one must distinguish between features that are pleasing or useful to a grower and those more permanent and perhaps subtle characters that mark a series or species as a whole. Such technical botanical characters are common to domesticated plants as well as to wild ones.

To one accustomed to look first to the external beauty or yield of a plant, a dried pressed specimen may seem a meaningless object, but to the trained eye its characters are full of significance. The habit of the plant is shown in many cases; whether hairy or glabrous, and the character of the hairiness; the arrangement, size, and shape of leaves, with serratures, veining, glands, pubescence, and other marks; the flowers, even though pressed, retain their main features, and the student knows how to boil a dry flower, to dissect it, and to discover its intimate structure; the fruits and seeds, even when more or less fleshy, may also retain their essential characters. The botanist is able to make a correct description from good herbarium material, and the characters he uses for his diagnoses are consequently those that are least transient.

Such features as are likely to vanish in the curing of the dried specimen should be seen, if possible, by the student; if he cannot see the growing plant, then these features should be recorded by

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the collector in written notes or on the label; such characters as color and fragrance of flowers and sometimes the time of day in which they open are thus to be noted. Special coloration of foliage is often an important diagnostic character; dates should always be given. If an herb, whether annual, biennial, or perennial may well

be stated. The complete method is the living plant for direct observation and the herbarium specimen for subsequent study and record.

If the student has several species under consideration or is concerned with the flora of a region or of gardens, he cannot assemble all the needful living material at one time; and he must make comparisons between many specimens. He cannot bring together living flowers and fruits in good condition at one moment.



FIG. 1. A single specimen on a sheet.

He cannot submit such specimens to specialists for determination. He must keep his specimens until sufficient supply accumulates to afford him a dependable basis for study.

Most species of plants were first described from dried specimens. If we were obliged to make diagnoses from living subjects alone, the plants of the world would yet be mostly unknown. Plants can seldom be named as they are collected in the wild. They must be compared with other specimens that have been the subject of careful study. Books must be consulted. In exploration, the col-

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lector is not often able to determine his discoveries. He will not have time or facilities. He probably will not know what is new. The facts are brought out after the collection is gone over carefully by students of the region or by specialists in different groups.

Even in cultivated plants, it may not be possible to name them offhand. Often the determination requires much study, with consultation of authorities. In the case of hybrids and marked variants, the need for cautious study without haste is specially great.

These remarks are intended to explain the importance of a good herbarium collection to the study of species of plants and to say that there is special need of such material for cultivated plants. Photographs of the living plants are good supplements to pressed specimens but are by no means substitutes for them.

The drying of flowers and leaves as souvenirs does not produce herbarium material, however much these fragments may add, as do other mementoes, to the remembrance of places and journeys. Real herbarium specimens are attached on separate sheets of suitable size, so that they may be arranged according to a system and so that any number of them may be taken out for study. A good herbarium is a card index to the vegetable community, the plants themselves being on the cards.



FIG. 2. Two collections on a sheet.

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How to make the herbarium

The specimen should be put in press when fresh and dry, before it wilts. It should represent the entire plant, if the plant is only a foot or two high, with root and top; or a characteristic part if the plant is larger. A standard herbarium sheet in North America is $11\frac{1}{2} \times 16\frac{3}{8}$ inches; the specimen when put in press should come within these bounds or be capable of being trimmed to these limits. Bulbs and other thick parts may be split. Very large fruits and seeds are separately preserved. Specimens may be bent over or folded, as shown in Fig. 1. So far as possible, the specimen or specimens on a single sheet should show the essential technical nature of the plant; height, habit, color, duration, and other features, as well as habitat and date, may be entered on the label.

The press consists of blotting-papers or soft builder's felts cut to about 12 x 18 inches. Ordinary blotting-paper is too thin and fragile for the work. Botanical supply-houses carry regular stock suited to the purpose. For a few specimens and not of fleshy plants, several thicknesses of newspaper may be used. The specimen is preferably put in a folder (to serve as a carrier and to keep it in place), which is a double sheet of newspaper or similar material, and this folder is laid between the driers. At first the driers are changed every day, but the specimens are not removed from the folders—the folders are merely slipped from one pile to another into dry driers. The folder keeps the specimens straight and any detached parts are not lost out.

A heavy weight is placed on the pile, heavy enough to flatten the specimens out. In traveling, strong straps or cords may be drawn around the bundle—which is provided with stiff sides—but unless the straps are tightened as the plants dry, the pressure will soon be released and insufficient. Some plants dry and cure in four or five days; others require as many weeks. Ten days to two weeks is the usual time with most specimens. Special methods of drying and pressing are known to botanists, to whom the intending collector should apply for suggestions.

Although the specimens are not taken from the folders when changed, yet the folder should be opened to see that the plant is drying properly; at the first changes, the leaves and other parts should be straightened out and arranged. Crumpled, twisted, broken, bunched, and scrappy material is not worthy the name of botanical specimens. The collector should train the eye to choose specimens that will make trim, neat, and attractive objects on the sheet.