

SCIENCE

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BOTANICAL GARDENS¹

CONTENTS

<i>The American Association for the Advancement of Science:—</i>	
<i>Botanical Gardens: I.</i>	
<i>Relations of Botanical Gardens to the Public: DR. N. L. BRITTON</i>	641
<i>The Place of Botanical Gardens in Collegiate Instruction: PROFESSOR W. F. GANONG</i>	644
<i>A University Botanical Garden: PROFESSOR DUNCAN S. JOHNSON</i>	648
<i>The Relation of Applied Science to Education: PROFESSOR CYRIL G. HOPKINS</i>	655
<i>Attendance of Students at Foreign Universities: PROFESSOR GUIDO H. MARX</i>	659
<i>Elections to the American Philosophical Society</i>	659
<i>The George Washington Memorial Building..</i>	661
<i>Scientific Notes and News</i>	662
<i>University and Educational News</i>	665
<i>Discussion and Correspondence:—</i>	
<i>The Planet Mars: PROFESSOR C. D. PER- RINE. Kircher and the Germ Theory of Disease: DR. WM. A. RILEY. Kahlenberg's Chemistry: PROFESSOR JAS. LEWIS HOWE..</i>	665
<i>Scientific Books:—</i>	
<i>Magnetic Work of the British Antarctic Expedition: DR. L. A. BAUER. De Mar- tonne's Geographie physique: DR. A. E. ORTMANN. Eyferth's Einfachste Lebens- formen des Tiers- und Pflanzenreiches: PROFESSOR CHARLES A. KOFOID. Rowe on Habit Formation and the Science of Edu- cation: PROFESSOR EDGAR JAMES SWIFT ..</i>	668
<i>Notes on the Teaching of Zoology and Plans for its Improvement: DR. W. J. BAUM- GARTNER</i>	673
<i>Special Articles:—</i>	
<i>An Expression for the Bending Moment at any Support of a Continuous Girder for any Number of Equal Spans: ARTHUR R. CRATHORNE</i>	675
<i>Societies and Academies:—</i>	
<i>The Botanical Society of Washington: W. W. STOCKBERGER. The Anthropological Society of Washington: I. M. CASANOWICZ. The Biological Society of Washington: D. E. LANTZ. The Society for Experimental Biology and Medicine: DR. EUGENE L. OPIE. Rhode Island Section of the Amer- ican Chemical Society: ALBERT W. CLAF- FLIN</i>	676

RELATIONS OF BOTANICAL GARDENS TO THE PUBLIC

BOTANICAL gardens are important factors in public education, and are, at the same time, places for public recreation and enjoyment. They are highly specialized parks in which the plantations are formed and arranged primarily with regard to botanical facts and theories. Inasmuch as the great majority of their visitors have little time to spend, the information they carry away is more generally by impressions than by closer observation, although individual plants and groups of plants will often be remembered by casual visitors for long periods of time. Botanical gardens are, therefore, in effect museums of living plants, and the plants, treated as museum objects, suitably labeled, are installed to illustrate not only the objects themselves, but their relation to other objects. This museum feature is then a direct and immediate function in imparting information to the public.

The grouping of plants in botanical gardens is susceptible of widely different treatments, depending upon the character and the area of land available, the expense involved, and the facts and theories selected for illustration; also in the temperate zones, at least, upon the amount of greenhouse space available; also on the relative importance given to landscape considerations and upon the areas retained as natural forest, thicket or meadow. Facts and theories

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capable of demonstration may be grouped in a general way as (1) biological relationships, (2) morphological and physiological features, (3) economic applications, (4) geographical distribution, (5) esthetic and landscape features. Practical considerations enter largely into groupings of any kind.

1. *Biological Relationships*.—In this installation it is sought to illustrate species of the various plant families in juxtaposition, the groups thus formed being located in relation to each other in some predetermined sequence; this sequence in recently planted botanical gardens is usually one which seeks to demonstrate not alone affinity, but the progressive increase in floral complexity, in other words, an evolutionary sequence. In such installations practical considerations render the sequence necessarily incomplete in any one set of plantations; sunshine-requiring herbaceous plants and shrubs can not be successfully grown close to trees, and some natural families, such as Papilionaceæ and Rubiaceæ contain herbs, shrubs and trees; climatic considerations prevent many families being brought into any one sequence; the biological grouping must then be obtained piecemeal; the most satisfactory and least expensive method is to grow the collections of trees (arboretum), of shrubs (fruticetum), of vines (viticetum), and of herbaceous plants, for the most part, at least, in separate areas; families principally composed of plants inhabiting climates other than that of the locality require artificial environment, such as glass houses for tropical and warm-temperate zone plants in gardens of the cold-temperate zone; it would be an interesting experiment to ascertain if arctic plants could be grown successfully in the temperate zones by some system of refrigeration. By a suitable arrangement of land and water, aquatic

plants may be brought to some extent into juxtaposition with those of the same or related families requiring dry soil. One advantage in the biological grouping of large collections is the facility with which any species represented may be found when wanted. By the formation of a museum of prepared plants, of fruits, seeds and other organs, of photographs and drawings, the biological sequence adopted may be quite completely illustrated.

By indicating on the labels the native regions of plants biologically grouped, much simple information bearing on geographic distribution may be given. Casual observers are often as much interested to learn where a plant came from as to learn if it has any useful or ornamental features; the biological grouping also teaches them, by suggestion, that plants even from remote regions are related to other plants which they may know something about, and thus opens up new lines of thought for many people.

2. *Morphological and Physiological Features*.—The demonstration and illustration of structure and function presupposes some acquaintance with elementary botany, which the great majority of visitors do not at present have. The rapid development of nature-study in schools will render groupings of plants, arranged from these standpoints, much more generally significant than they are at present. It is possible and practicable to form groups of plants selected to illustrate the gross morphology and the simpler phenomena of physiology. These groups are more likely to be elaborated in gardens established primarily for students than in those laid out primarily for the use of the public. To a certain extent groupings illustrating ecological considerations can also be established with advantage, although areas remaining in the natural state are more useful.

3. *Economic Applications.*—Plants grouped and labeled with reference to their uses, or the uses of their products, are of very direct interest to the public, coming, perhaps, closer to ordinary lines of thought than any other features of the vegetable world, except those of beauty. The arrangement illustrates the subject of forest products without the necessity for a separate grouping of trees. Economic features of shrubs and herbaceous plants are best brought out by a special installation classified as food plants, drug plants, fiber plants and otherwise. As in the case of systematic grouping, economic installation has to be piecemeal, using glass houses for tropical economic plants and for those from warm-temperate regions. The elaboration of labels is of great importance and is, perhaps, the most expensive feature in the satisfactory display of useful plants. These subjects can be very thoroughly illustrated by the formation of museums of economic plant products and this is usually accomplished in highly developed botanical gardens. A system of cross references on labels between the living collections and the museum collections is a great desideratum. The expense of such a system is, however, very great, and it requires constant attention, because the death of a living plant, which can not at once be replaced, complicates it.

4. *Geographical Distribution.*—Groups of plants illustrating the botanical features of regions other than those of the locality of a botanical garden may be installed and this feature is given more or less prominence in the collections of many gardens. As mentioned under biological relationships, the information thus furnished is of immediate interest to the public and in some gardens geographical grouping has been adopted as a primary classification. Like the biological grouping, it has its lim-

itations, and conditions of soil and climate make it necessarily imperfect and incomplete. Any attempt at growing trees, shrubs and herbaceous plants of a region close together in limited areas, while at first very interesting, ultimately fails because of the growth of the trees and the consequent shading out of the lower plants, unless the trees are cut out and their value in the grouping lost. Climatic conditions may be overcome by temporary geographical groupings, and in greenhouses some such groups may be installed quite satisfactorily. As to the relative value of the biological over the geographical as a primary classification in large public gardens, there is room for difference of opinion. An ideal method, if space and funds are available, would be to install both systems.

5. *Esthetic and Landscape Features.*—The public is more immediately interested in landscape effects and in plants from the standpoint of beauty than in most other features of botanical gardens. Well-built and well-kept grounds appeal to people as attractive places to visit. Natural woodlands, thickets and meadows also interest visitors, perhaps more keenly the residents of cities, and in some respects, especially from the standpoint of ecology, are as useful educationally as the artificial plantations. Landscape considerations applicable to parks and private grounds are not wholly adaptable to botanical gardens and this is often notably true in the unharmonious floral color contrasts necessitated by the grouping, although these may be minimized by careful selections. In most botanical-garden planting it is sought to display the plant in its natural form, so that extensive massing of individuals is avoided, although in large gardens space is often available for both massed and open planting. In the grouped plantations incongruous elements should be avoided, such

as establishing herbaceous flowering plants in plots among collections of trees and shrubs, which would divert attention from the main installation, or the introducing of exotic species into natural woodlands and thickets, which would give the public erratic ecological conceptions. Flower gardens, as such, are generally located separately from the botanically grouped plantations, for in them esthetic considerations are predominant.

The popularity of botanical gardens causes them at times to be over-crowded and problems relative to the control and circulation of large numbers of people arise which have to be met as well as possible. A comprehensive system of paths is essential; the majority of visitors instinctively keep to the paths, but it is undesirable in large gardens, at least, to actually restrict visitors to paths, for they could then come close to only a relatively small number of the plants installed, unless the path system was unduly elaborated and landscape considerations wholly neglected. A very small proportion of the public is intuitively destructive, and it is this small number of people that entail high expense for guards and keepers; legal punishment of offenders as a warning to others of mischievous proclivities is the only treatment available. In large gardens a driveway system and provision for conveyances for hire are also desirable, for many visitors are unable or unwilling to walk considerable distances.

The indirect relation of botanical gardens to the public lies in their function of adding to the knowledge of plants and plant products and the diffusion of this knowledge by publication and otherwise. Laboratories, herbaria and a library are essential adjuncts to the garden itself, and through investigations carried on in them and in the garden, additions to knowledge are constantly made. Of these additions

to botanical information those of an economic character are the most immediately available for the public good, but the more theoretical additions to information improve the more important in the long run.

From what I have said it will be clear that the function of botanical gardens in their relation to the public is somewhat different from their relations to college and university students, although, after a moment's reflection, this difference is one of degree rather than of kind.

N. L. BRITTON

THE PLACE OF BOTANICAL GARDENS IN
COLLEGIATE INSTRUCTION

THE splendid gardens under the direction of my predecessors in this discussion are well known to everybody, but this cannot be true of the modest one of which I have charge. It will therefore be fairer to my comments on the subject if I say that it has been my duty, during the past fifteen years, to develop at Smith College, with due regard to reasonable financial restrictions, a garden which should be as well adapted as possible to collegiate instruction. It now includes these parts. First, there is an arboretum and fruticetum, of some 500 species, distributed, with regard partly to scientific arrangement and partly to pleasing landscape effects, over a campus of some thirty acres. Second, there is an herbaceous garden of some 700 species, arranged on the Engler and Prantl system. Third, there are three natural gardens, a rock garden, water garden and wild garden, the last as yet too young to be effective. Fourth, there is a range of well-built and suitably stocked greenhouses, nine in number with two attached laboratories. Upon the development of this garden rests my qualification for the part I have in this discussion. Naturally, it approximates to my idea of what a college botanical garden