GARDEN AND FOREST.

PUBLISHED WEEKLY BY

THE GARDEN AND FOREST PUBLISHING CO.

OFFICE: TRIBUNE BUILDING, NEW YORK.

Conducted by . . . . . Professor C. S. SARGENT.

ENTERED AS SECOND-CLASS MATTER AT THE POST-OFFICE AT NEW YORK, N. Y.

NEW YORK, WEDNESDAY, DECEMBER 29, 1897.

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American Trees for America.

LOOKING at the matter broadly, comparatively little, in northern countries at least, has been accomplished toward beautifying the earth's surface by transferring trees from one region to another, although a great deal of time, energy and money has been expended during the last two hundred years in the attempt to do it. It has given to Europe from America the Locust, the great southern Magnolia, the Negundo, the White Pine, several California conifers, the Arbor Vitæ, one or two Thorns, and the Staghorn Sumach, as truly permanent and valuable additions to the native silva; China has really enriched Europe, as it has eastern North America, with the Ginkgo, the Ailanthus, the Paulownia, the Yulan Magnolias, the Weeping Willow and the flowering Apples; western Asia has sent to Europe the Cedar of Lebanon, the Oriental Plane, the Oriental Spruce and the Cypress, while experiment has shown that of the trees of Europe and western Asia only the White Willows, the Beech, the Elm, the Norway Maple, the Oriental Plane, the Larch, the Box, the Hawthorn and the Mountain Ash can really be depended on in the eastern states to live out their lives in health and beauty. These results may appear small to economists, but certainly all the effort that has been expended in testing exotic trees in Europe and America has been well repaid in the stimulus it has given to the study of botany, in the increase of knowledge and in its few really important practical results. Still, the lesson to be drawn from these two centuries of effort is clearly that the best trees to plant in any particular region are those that grow and thrive naturally in that region. No teacher in such matters is so wise, experienced and unprejudiced as Nature herself, and when her teachings have been followed the best results from tree-planting have always been obtained. The Elms and Maples taken from adjacent swamps and hillsides, which grace the streets of many New England country towns and adorn many New England homesteads, and the Magnolias, Live Oaks and Water Oaks in the streets and gardens of the south testify to the value of native trees; and in England, too, it is the native Oaks, Elms and Beeches which give its distinctive aspect to the land and make its parks the most dignified in the world. Fortunately, in this country it is not difficult to apply this rule, for no other land is blessed with such a rich, varied and splendid silva. In the southern United States the great evergreen Magnolia, the most beautiful of the broad-leaved evergreen trees of the northern hemisphere, the Live Oak, the Water Oak, the Laurel Oak, the Pecan and noble Bay trees, are available for the planter. In the Pacific coast states the conditions are somewhat different; the number of native trees is smaller than it is in the east, and many of the finest of these are found naturally only at high elevations and cannot be successfully cultivated in the warm, dry valleys in which the people of these states have principally established their homes. Some of the trees which grow in the valleys spontaneously are not ornamental, and are often difficult to cultivate, but some of the noble California Valley Oaks surpass in stately beauty any exotic trees which are likely to flourish in that peculiar climate, and two California conifers, the Monterey Cypress and the Monterey Pine, are generally and successfully grown from Vancouver Island to San Diego. These are both beautiful trees, but California will doubtless always be obliged to depend on other parts of the world for many of her ornamental plants. The trees of the eastern states do not flourish west of the Rocky Mountains; it is not probable that those of Europe or Asia will ever gain much foothold in the soil of California, and it is to Australia, Mexico and other dry countries that California planters will continue probably to derive much of the material needed for the decoration of their parks and gardens.

It is in the eastern and middle states, however, where there is a greater interest in ornamental planting than in other parts of the country, that most is to be obtained from the native silva. That of no other part of the world is richer in handsome trees. From its Magnolias, Oaks, Hickories, Walnuts, Elms and Ashes, its Tupelo and stately Tulip-tree, its Rhododendrons and Mountain Laurels, its Birches and Lindens, its Coffee-tree and Honey Locust, its Sourwood and Sassafras, its Beech, Chestnut, Yellow-wood and Wild Cherry, its Catalpas, its Persimmon and Silver-bell tree, its Flowering Dogwood and Fringe-tree, its Liquid-ambar and Hackberry, its Sumachs, its Wild Crab and its Hawthorns, planters of deciduous-leaved trees can choose material enough to satisfy every taste and fill every requirement. And among coniferous trees none is more picturesque in youth or more stately at maturity than the northern White Pine, more graceful than the Hemlock, or more symmetrical and enduring than the Red Cedar.

In the past our gardens have suffered from the general ignorance with regard to the true beauty and value of native trees, which appears to have been peculiar to us as a nation. Too often the planter, unable to obtain American trees, has had to rely on the Spruces, Oaks, Ashes, Maples, Pines and other trees of Europe, and these are still too largely used in this country, although it is now known that they are entirely unsuited to our climate and that where they have been used in public parks they must soon be replaced by native species. The lesson has been a costly one, but the experience has not been dearly purchased if we have finally come to realize that Nature has placed for us in America a greater number of beautiful trees, large and small, than is found in any other part of the world, and that American trees are the best for America.

Notes on Cultivated Conifers.—XIII.

ABIES, the name now given to the Silver Firs, is one of the widely distributed coniferous genera with a larger number of species than any other except Pinus. It is well characterized by its flat or more or less quadrangular leaves, without persistent woody bases, spreading on lateral branches in two ranks and leaving in falling nearly circular scars, scattered axillary male flowers, erect cones usually produced only on the upper branches and maturing in one season, their thin entire, rounded scales being often shorter than the bracts, and separating at maturity from the

to succeed here, shows that the number of species of these great families which can be really depended on to grow permanently in this part of the world is a small one. Pinus Strobus, Pinus resinosa, Pinus rigida, Picea alba, Picea rubra, Juniperus Virginiana, Juniperus communis, Thuya occidentalis, Tsuga Canadensis, Ginkgo biloba, Larix Americana and Larix Europea are the only handsome trees of these families which have shown themselves able to grow in this climate to a large size and preserve in cultivation here their mature beauty. All of these, with the exception of the Ginkgo and the European Larch, belong to our northern silva. In a second list may be placed Abies concolor, Pseudotsuga taxifolia and Picea Engelmanni of the Rocky Mountains, Taxus cuspidata, Abies homolepis, Abies Veitchii, Picea Ajanensis, Pinus parviflora, Thuya Standishii and Sciadopitys verticillata of Japan, Pinus Koraiensis of Corea, Pseudolarix Kæmpferi and Pinus Bungeana of northern China, Abies Nordmanniana, Abies Cilicica and Picea orientalis of Anatolia. The trees in this second list all do well in the northern states, where they have been grown from twenty-five to fifty years, although none of them have been tried long enough yet to show their ability to thrive permanently here. In a third list of species promising in this climate, but still less tried than those of the second list, may be placed Abies Sachalinensis, Pinus densiflora, Abies lasiocarpa, the two Japanese Hemlocks, Thuya plicata, Tsuga Caroliniana, Tsuga Pattoni, Picea Omorika, Larix Dahurica and Tumion nuciferum. If these all succeed here the number of plants of these families which we can really depend on is still very small, and the permanent decoration of the parks and gardens of the north-eastern states will have to be largely made of broad-leaved trees, which flourish here almost as well as in any other part of the world, and of a comparatively small number of species of Taxids and Conifers.

C. S. S.

The Botanic Garden of Smith College.

A STUDY OF AN EDUCATIONAL ADAPTATION.

IT is plain to all who read the signs of the times that the present trend of botanical activity is toward the study of the phenomena of the life of plants. The facts of plant-structure, and of plant-relationships as suggested by resemblances of structure, have been relatively so well studied that for the present and near future the most attractive problems must lie in the investigation of the causes of structure. The plant static needs to be, and is being, explained by the study of the plant dynamic. But as investigation leads, so must education follow. For the systematic pursuit of physiology and ecology, however, a botanic garden with a well-proportioned greenhouse system is essential; and it is rapidly coming to pass that a college must provide these if it is ambitious to keep abreast of the general advance.

It is in this spirit that Smith College has established its Botanic Garden. As an attempt to realize with fair rapidity and minimum expense, a preformed plan which should express the optimum of adaptation to the present demands and indicated tendencies of botanical education, this venture is, perhaps, without exact precedent, and its results must possess, botanically and educationally, a far more than sectional interest.

The history of this Garden is very brief. In 1891 the trustees of the college, following the recommendation of President Seelye, to whose initiative and constant interest the Garden owes everything, decided to attempt to combine the beautifying of the college grounds with the formation of a scientifically planned botanic garden which should serve as an adjunct to the department of botany. Messrs. Olmsted, Olmsted & Eliot were engaged to draw up the plans, and in 1892 planting was begun. The next year a small greenhouse was built. In 1894 the position of Director of the Botanic Garden and Professor of Botany was established and an appointment made. Since then, though with large changes in the original plans made necessary for practical reasons, development has gone steadily on. Some progress has been made in the school of trees and shrubs; the herbaceous garden is nearing completion; the greenhouses are finished and stocked; the work of administration is systematized.

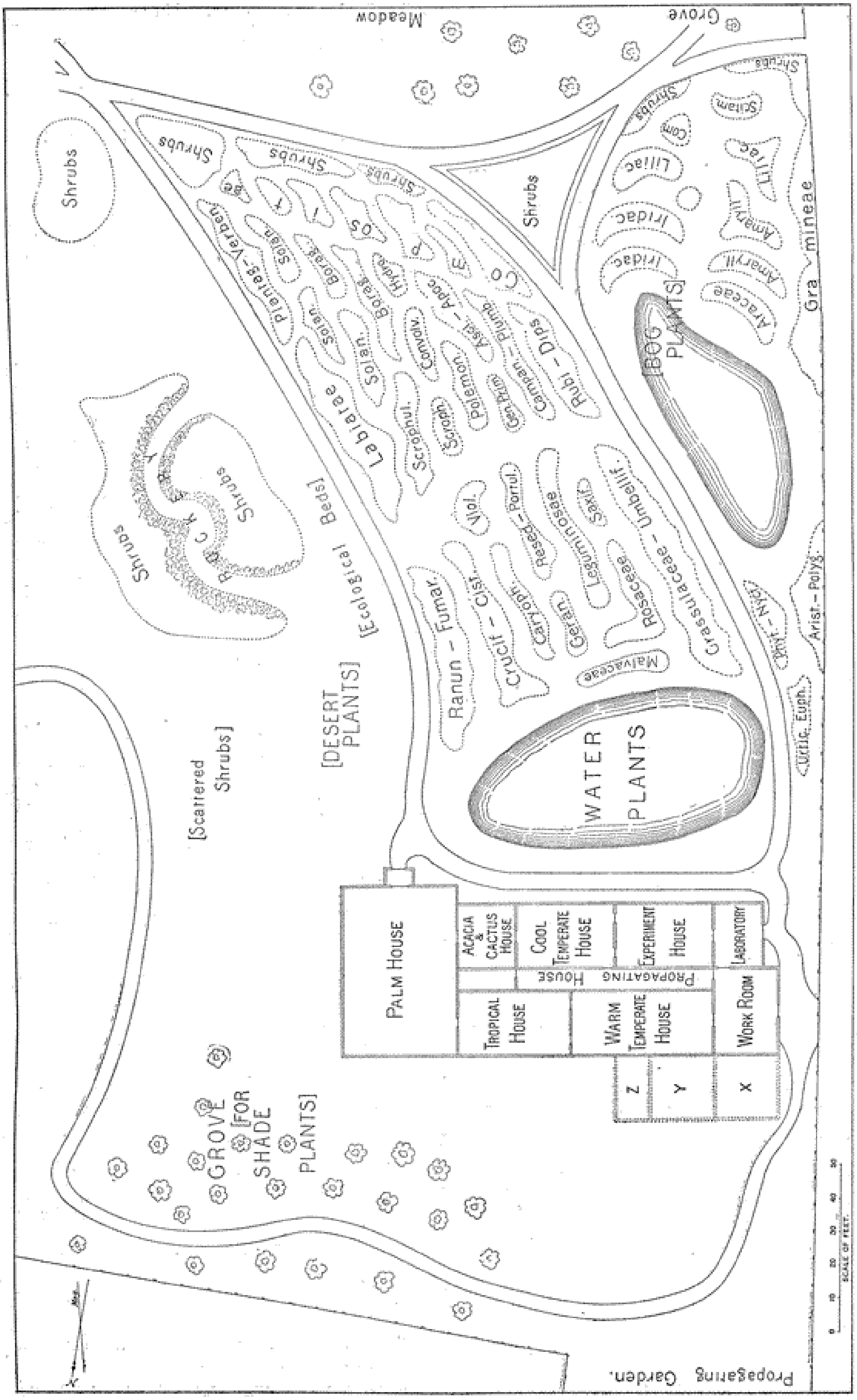
The college campus contains about thirty acres, including the space occupied by the nineteen buildings (see map on p. 513). It is roughly quadrangular in shape, and, as to surface, consists of two nearly equal plains differing fifteen to twenty feet in elevation, the higher on the north-east, with a slope of varying steepness between. The soil is mostly poor. There were originally some fine trees on the grounds, and two or three good vistas and open spaces, and from several points there are beautiful views of the distant hills or over a little lake and the woods beyond. Happily, the campus is not a public thoroughfare. Except for the herbaceous garden and a large open meadow, the entire grounds are divided by imaginary lines into sections, each devoted to a single family of woody plants, and arranged in sequence according to the natural system of Bentham and Hooker. Within the limits of the family it is intended to group the trees and shrubs about the buildings chiefly for artistic landscape-effect. Naturally, development in this part of the Garden must be slow. None of the good trees or shrubs originally on the grounds will be disturbed, but all new planting will be made to accord with the new plans. Of trees and shrubs 276 species, in forty-five families, are now growing on the grounds.

In the north-west angle of the campus, and on the lower level, about two and one-half acres have been devoted to the herbaceous garden. It has four parts: (1) the systematic section, (2) the ecological section, (3) the greenhouses, (4) the propagating garden.

A systematic section must always form the centre of any complete botanic garden, for name and relationships are to botanists practically the most important things about a plant. The accompanying plan sufficiently shows the arrangement of this section, which follows the system of Bentham and Hooker, and aims to illustrate the systematically important families and genera, not of New England alone, but of the world. It now contains, along with the ecological section, more than 1,200 species, in seventy-eight families.

For the many plants which will not grow in open beds because they are fitted to a different situation, and that the principles of their adaptation to their particular habitats may be shown, it is necessary to supply those habitats. For this reason we have the ecological divisions. The pond is well stocked with water-plants selected to show the different ways in which plants overcome the drawbacks of that mode of life. A bog is being prepared for bog and marsh forms. The rockery is completed and well stocked with alpine and other rock-dwelling species. Behind the greenhouses a grove of native trees and shrubs has been started in which the shade-loving plants are to be placed. Desert plants will have a place on the sunny bank near the rockery, and strand plants will ultimately be present also. In addition to the ecological groups, there are important principles, needing illustration, of adaptation to particular modes of nutrition, exposure to light, the climbing habit, protection, movements, locomotion (dissemination and pollen-transfer), etc. For these, and for illustrating principles of form and color, a series of beds will be made along the space reserved for the purpose west of the rockery. An economic section has not yet been arranged for, though in a complete botanic garden it should be present. The shrubs which have a place in the herbaceous section are all of special educational interest.

The greenhouses stand in a sheltered corner with a high terraced bank on the north and east. They are a gift to the garden from Mr. E. H. R. Lyman in memory of his mother. They are built and equipped in the most thorough and modern manner. Their divisions are, of course, primarily climatic, but within each there is an attempt at an ecological arrangement. The Warm Temperate House (18 by 42 feet, inside measurement) contains, in addition to plants proper to that climate, a raised tank, eight feet square, in which principal types of water-plants are constantly growing, and a grotto or rock-work, over which water is always trickling, for Liverworts and similar amphibious forms. The Tropical House (18 by 35 feet) contains special collections of Orchids, Begonias and Ferns, with other smaller tropical types. The Palm House (50 by 35 by 25 feet high) is the best furnished and most attractive of the range. Its chief feature is the great central bed in which selected types of larger tropical vegetation—Palms, Bamboos, Figs, Dracænas, Musas, Crotons, Aroids, Ferns—are growing directly in the earth, and form a jungle instructive of many principles of adaptation. The great success of this bed illustrates the value of planting out large plants wherever possible. Other collections in this house are the climbers, Nepenthes, Bromeliads, all chosen for principles which they illustrate. The Acacia and Cactus House (17 by 18½ feet) is filled with forms to show relations to the desert habit. The Cool Temperate House (18½ by 33 feet) contains forms of our own latitudes, and in it large quantities of materials are raised for elementary instruction. In it also is another tank, a group-



THE BOTANIC GARDEN OF SMITH COLLEGE
1897

of Sarracenias, and later are to be added halophytes and alpines. The Experiment House (18¼ by 33 feet) is chiefly devoted to the practical study of plant physiology by the advanced students. Here a practicum is carried on in which each student works through a series of experiments upon the nutrition, growth, irritability and other vital operations of plants. The laboratory is used by them in this work. A Propagating House (5 by 66 feet) and the workroom, with the boilers beneath, complete the series. This brief sketch does but scant justice to the botanically and educationally interesting contents of the houses. It is difficult to estimate the number of species in them, but it will give some idea to state that they contain 28 species of Palms, 15 of Aroids, 16 of climbers, 15 of economic plants, 56 of Ferns, 8 of Sensitive plants, 78 of Cactaceæ, 37 of Acacias, etc., 20 of Aquatics, 15 of Insectivora, etc. It is not, however, accumulation, but selection, which is the guiding principle here as throughout the Garden.

In practice this arrangement of the houses in parallel series has proved both economical in heat and labor, and convenient for study, and can be strongly commended. There is but one change needed, a larger cool greenhouse, for the present one is too small. In time the Experiment House will be taken for this purpose and a new house and laboratory built on a space reserved along the north of the present range.

The Propagating Garden contains the usual equipment of frames, bulb houses, etc.; in it plants are grown on for winter-flowering, and woody plants for the School of Trees and Shrubs.

A great element in all adaptation is size. This Garden is not for the public, nor even for University work (which Smith College only permits and does not encourage), but is intended for the botanical education of a growing college of about a thousand undergraduate students. This, and economy, have made the Garden the size it is, and it is believed to be ample for a long time to come. The relatively large size of the greenhouses is made necessary by the nature of the American college year, with a winter session and no summer session. Such houses as these, since they allow the study of living plants to be carried on practically regardless of season, both permit the arrangement of the botanical courses upon the best educational principles, unhampered by the usual practical difficulties, and also allow of constant improvement, through experiment, in the providing of the most illustrative materials, in the best condition, for the most thorough, vivid and economical instruction of the different grades of students. It is plain that efficiency in these respects presupposes a gardener of special and unusual qualifications; such is our head-gardener, Mr. E. J. Canning, to whom most of the success of the Garden is due.

Of great importance to any American college contemplating such an equipment is the question of cost, which in this case also has had to be considered with great care. Since the grounds of a college must be kept in good order in any case, and their improvement ought to go steadily on, the additional cost of developing them on a botanical system is not great, and the chief expense is in the care of the herbaceous garden and greenhouses. The winter force in this Garden consists of a head and second gardener, aided by about half of the time of one laborer; the summer force consists of the two gardeners, with from three to four laborers. Materials for stocking garden and greenhouse are, thanks to the generosity of the older gardens of Harvard, Washington and St. Louis, readily obtainable as gifts, or else may be chosen from the exchange seed-lists of the gardens of Europe. Following their example, this Garden issues an annual exchange list, which is sent to all of the great gardens of the world, for which theirs are received in return. During the past year we received from other gardens 744 packets of seeds, all we could use, selected from 23 seed-lists, and in return sent out 1,368 packets selected from our own by thirty gardens, nearly all European. Another question of cost often raised is as to the profit of maintaining a garden when college is not in session at its best time. The answer is, first, if a garden is wanted at all, its maintenance through the summer must be reckoned as a part of its cost, and, second, it is more useful in summer than it seems. The blossom is not always the important part of the plant, nor is the study of flowers all of botany; it is possible within certain limits to select forms which blossom early and late; summer-blooming materials may now be cheaply and well preserved in formaline for winter use; and finally, summer schools may fully utilize the summer condition of a garden.

Although in this sketch the botanical or educational aspect of the Garden has had first place, it is not to be inferred that its æsthetic side is neglected. Plants for beauty as well as plants for use stand in our beds and houses and are open to all. The Garden is yet too new, and in some respects too incomplete to have ripened to full beauty. But in time and with constant growth, it may yet come to pass that there will gather about the gardens of Smith College something of that charm which makes the gardens of Oxford almost sacred ground, where all that is dearest to vigorous and scholarly youth is associated with all that is most beautiful in man's friendship with Nature.

Northampton, Mass. *William F. Ganong.*

Plant Notes.

The Fruit of Sequoia.

IN *The Silva of North America* the fruit of Sequoia is described as maturing during the first season, although both Engelmann, in *The Botany of California*, published in 1880, and Masters, in *The Journal of the Linnæan Society* (xxx., 22), published in 1895, stated that it did not mature until the second season. It is now evident, however, that the statement in *The Silva* was based on the study of insufficient material, and that so far, at least, as Sequoia Wellingtonia is concerned, the fruit does not ripen until the second season. This fact has been pointed out to me by Miss Alice Eastwood, the curator of the herbarium of the Academy of Sciences of California, who has made a careful investigation of the subject, and in a recent letter says: "I think that this is what happens. The trees bloom early, probably in February or March, and the cones grow during the following summer and, perhaps, also during the winter. The next spring they are of mature size and the seeds are ready to germinate. The cones open during the following summer, in August or September, after the hot, dry season." To Miss Eastwood, too, I am indebted for the specimens which show the accuracy of her observations, and which are reproduced in Mr. Faxon's drawing on page 515 of the present issue.

So far as I have seen there is no reason to believe that the second species, the type of the genus, Sequoia sempervirens, does not mature its cones in one season.

C. S. S.

Notes on the Botany of some Southern Swamps.

THE following notes were gathered the past summer during a journey especially devoted to collecting and studying the plants of swampy regions in the states of Missouri, Arkansas, Louisiana, Mississippi, Alabama and Florida.

Leaving St. Louis on the night of July 27th, I arrived at Little Rock, Arkansas, early the next morning, and at sunrise heard the shrill cries of mocking-birds as they left the trees where they had passed the night, announcing, as well as the appearance of Cotton in the fields, the Crape Myrtle and Pride of India trees in the yards, and the Paper Mulberries in the streets, that I was entering the sunny south. The principal indigenous plants observed near the banks of the Arkansas River at this place were the Willow Oak, Spanish Oak, Cow Oak, Catalpa, Sweet Gum, Cassia occidentalis, C. Tora, Jussiæa decurrens, Rhexia Mariana and Hibiscus lasiocarpus. As my object was to study the swamp flora, I did not attempt to make a collection here, but proceeded to Alexandria, Louisiana, noting as good collecting points Varner, Arkansas, and Mer Rouge, Louisiana, for the return trip.

On reaching Pine Bluff, Arkansas, I found that Albizzia Julibrissin was common in cultivation, and that Sabal Adansoni was abundant in low woods along the Arkansas River. Big trees became common from Walnut Lake, Arkansas, southward. Hicoria aquatica, Aralia spinosa, Populus heterophylla and Sesbania macrocarpa are very common beyond Pine Bluff, Arkansas, while the Long Moss (Tillandsia) became conspicuous at Parkdale, Louisiana. Passing through Alexandria and reaching Melville, Louisiana, I found Fraxinus pubescens, var. lanceolata, Brunnichia cirrhosa and Quercus lyrata common in the swamps. Here I paid little attention to the upland flora,