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THE PENNSYLVANIA STATE COLLEGE

The Graduate School

Department of Horticulture

Division of Landscape Architecture

THE DESIGN OF HORTICULTURAL GARDENS FOR THE PENNSYLVANIA STATE COLLEGE

A Thesis
by
CARL WILLIAM WILD

Submitted in partial fulfillment

for the degree of

MASTER OF SCIENCE

February 1938

Approved:

January 14, 1938 John R. Bracken
Head, Division of Landscape Architecture

January 14, 1938 Warren B. Mack
Head, Department of Horticulture

FRONTISPIECE

View of Mt. Nittany from gardens

FOREWORD

In the development of an investigation involving design, the procedure falls into three categories: first, an analysis of the requirements; second, the making of plans and interpretative sketches; and, third, the compiling of a written text to explain matters which cannot be brought out by the plans and sketches. The greatest attention, however, should be given to the plans, and these should be as comprehensive and complete as possible. The written word can never adequately explain matters of planning.

I have therefore purposely avoided a lengthy discussion wherever the graphic medium can be utilized to better advantage, and have sought to direct the attention principally toward plan compositions and an interpretation of the third dimension in space. While certain administrative and scientific factors cannot be thus portrayed, I feel sure that, if the analyses have been correctly made, a well studied plan, sound in its engineering, in good proportion, with a proper distribution of the elements, logically distributed, and with good circulations, will be convincing. To this end, the written portion of the thesis has been kept free from excessive explanation of the plans and sketches. The reader is asked to study these quite thoroughly for himself. Only in this way can an understanding of the various interrelations of

the problem be gained.

It has been very gratifying to the writer to have had these studies accepted so wholeheartedly by the college administration and to have seen a start being made toward their consummation. The plot of ground under consideration had not even been surveyed previous to the beginning of this study. It was at the instigation of the writer that the Department of Grounds and Buildings made a topographical survey of the area. Upon completion of the plans, nearly six months were devoted to the making of a large model at a scale of one quarter inch to the foot. This model covered an area approximately ten feet by fifteen feet. It was viewed by the College Landscape Architect, by administrative officials and various members of the Board of Trustees. On the basis of this graphic presentation the plans and proposals have been officially approved by the College Architect and Landscape Architect and the Board of Trustees. (See Plates 34 and 35.)

The plans for this study have determined the location of the recently completed Federal building and greenhouses for pasture grass experiments; they have established the location of the first greenhouse range which is now complete and in use. A considerable number of trial plots for roses, perennials and annuals have been laid out in conformity with the future development of the gardens. The head house as shown on the plan is now being submitted for approval as a part of the present building program.

The writer wishes to acknowledge his indebtedness to Professor John R. Bracken, Head of the Division of Landscape Architecture, for his advice and assistance in the design of these

gardens; to Mr. George Ebert, Superintendent of Grounds and Buildings; and to Professor Walter Trainer, Superintendent of Grounds, for their assistance in obtaining campus data, surveys, plans, etc., and their enthusiastic support for the project; and to the members of the staff in the Department of Horticulture for their assistance in obtaining data concerning their present and future needs, desired conveniences and methods of procedure for research and classroom work.

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PART I

CHAPTER I

CHAPTER I

PURPOSES OF THE PROPOSED HORTICULTURAL GARDENS

The varied requirements of a horticultural garden place large demands upon the designer. He must, of course, solve the usual problems of site and situation, but he must likewise satisfy definite scientific objectives. He must recognize in his planning that the area is at once intended for the growing of carefully labelled and partially protected plants and at the same time is intended for public use and exhibition of materials. In its function as a public and exhibition area a garden of this type serves the purpose of an outdoor museum. The designer must reflect this function rather than that of portraying a series of gardens such as might be found on a large estate. A careful balance, therefore, of the various requirements, interpreted and integrated in plan, becomes the major problem of the designer.

This balance is not found in many of the existing arboretums, horticultural gardens and botanical gardens. Most of the earlier ones have been laid out with too great stress upon one objective or the other, leaving the inevitable impression of their one-sided emphasis. (See Plates 2, 3, 4, 5, and 6.) Many,

however, are quite successful and may contribute important lessons to the present undertaking if they are studied critically and intelligently. The writer has attempted to do this and has visited, both in America and in Europe, as many gardens and arboretums of this character as possible. He has been particularly impressed with the artistic significance of the Kew Gardens in London, where the interweaving of the scientific with qualities of landscape excellence are particularly noteworthy. Based, thus, upon a study of other gardens and a rather complete analysis of local requirements, the proposals have greater assurance of being consistent in their planning and of being adaptable to Penn State present and future conditions.

The gardens are planned to provide efficient areas for research and to do this in a manner in which the results may be made available to students and the public with as little interference between research and display as possible. While the increasing demand for new knowledge must be met, the actual needs for student instruction and public inspiration are equally imperative. Conceived with these purposes closely interrelated, the gardens may serve to create an additional college function, which aims to stimulate personal action on the part of the people of the State, in addition to fulfilling the function of undergraduate instruction.

Already, one of the greatest contributions of the College is its service to the large body of adult citizens who make little use of its undergraduate facilities. Not the least of its opportunities is that of out and out inspiration. It is perhaps known, although little considered, that one of the greatest contributions to

the student, to the personnel and faculty, to its many visitors, and indirectly to the State at large is the influence of the campus setting itself. The administration has realized the importance of this rich heritage and has gone far toward creating a higher standard of landscape design, which subconsciously, at least, does stimulate the taste of students, faculty and visitors.

This stimulation is reflected in a demand for further developments and demonstrations which will enable the college to contribute more largely to the individual living conditions in the homes of its constituents. The proposed gardens and the arboretum will not only assist these purposes, but will, through the relatively simple use of plant materials, all related and integrated with the campus and to the dominating setting overlooking Mt. Nittany and the Tussey Mountain, and the intervening valley, attract and stimulate thousands of visitors who would otherwise seldom visit the campus.

The plan, through the use of fundamental principles of landscape design, is intended to achieve a correlation between the campus plan, the dominant quality of its setting overlooking the mountains, and the practical requirements of a laboratory and a museum.

SCOPE OF THE PRESENT PROPOSALS

There are various subject-matter groups that are interested in having land areas set aside on the campus in which trees and flowers may be grown. Among these interests are those of Botany, Forestry, Horticulture, and Landscape Architecture. All

of these must be provided with every reasonable facility for outdoor research, instruction and museum dissemination. In addition, these fields, except Landscape Architecture, require greenhouse and frame space, as well as service and storage areas. Agronomy and Biology are also in need of the latter facilities.

The problem of satisfying these needs is often complex and at times overlapping. It is not within the scope of the present study to solve this problem in the matter of the outdoor areas, although the investigation has revealed that there seems to be adequate opportunity to supply all requirements and with no serious difficulties of integration. It was necessary, however, to make a very complete study of future greenhouse requirements in all fields in order to allot sufficient space and to design their arrangement and service as part of the matter of site planning. The relation of these greenhouses to each other, to the slope, to service, to the laboratories and head house access of the various departments, as well as to the gardens, had to be very thoroughly considered as a first step in designing the area. This will be evident by a study of the general plan (Plate 23).

It may be of interest to mention the various fields and explain briefly in the following paragraphs how these are related to the present study. These are (1) the proposed arboretum, (2) botanical greenhouses and ecological gardens, and (3) the horticultural display and research gardens.

1. The arboretum project has recently received impetus through the interest initiated by Dr. J. Horace McFarland of Harrisburg, Pennsylvania, and Dr. Warren B. Mack, Head of the Department

of Horticulture. A faculty committee has been appointed recently to study and make recommendations upon this proposed arboretum. A tentative although unofficial and unadopted plan, showing possible location for an arboretum is included in the present thesis (Plate 14).

2. The possible development of botanical greenhouses, including a ground area to be set aside for botanical research and ecologically arranged material, was made in 1936 by Dr. Frank D. Kern, Head of the Department of Botany. Two plans embodying Dr. Kern's proposals--which the Division of Landscape Architecture assisted in preparing--were presented to the administration with a request for approval and the allotment of funds for their completion. The plans for this development are of general interest to the subject of this thesis and are included herewith (Plates 12 and 13).

3. The two foregoing projects are in a measure related to the main gardens and greenhouse area with which the present thesis is concerned. Quantitative factors, the avoidance of duplication, and especially the matter of integration with the campus and each other, require that their relationships be considered in planning the present work. It is encouraging to observe how satisfactorily they relate to each other, to administration and to the availability to campus visitors. Matters of detail, design, cost and administration are not recommended, however, for either of the former two projects.

CHAPTER II

CHAPTER II

REGIONAL FACTORS IN RELATION TO LOCATION

In developing plans which will fulfill the functions demanded of an arboretum, a botanical garden, or a horticultural garden on the campus of The Pennsylvania State College, certain local conditions must be considered.

The College, it will be remembered, is situated almost in the exact geographical center of the commonwealth. It occupies a plateau nearly twelve hundred feet above sea level, in a broad rolling valley whence an outlook is commanded of Nittany Mountain toward the east, Tussey Mountain toward the south, and the Bald Eagle Mountain toward the north.

The soil is characteristically a Hagerstown silty clay loam and varies only slightly toward the valley. The Hagerstown series is formed mainly from the decomposition of a great limestone strata. Quite often the soil layer is quite shallow and rock outcropping occurs on the surface. Both because of the ground slope and soil character, the campus drainage is very good. Due to the alkaline character of the soil, ericaceous broad leaved plants cannot be grown without provision for special culture.

In the matter of climatic conditions, the winters are quite severe, the temperature falling as low as 20° below zero. The summers are cool, the summer mean temperature being about 69° F. The absolute maximum is 103°, the extreme range in temperature being, thus, 123°. The rainfall is abundant, usually 35 to 50 inches. Although this is fairly well distributed throughout the year, droughts are to be expected in late summer and early fall. In the vicinity of the College the snowfall is sufficient to give a certain amount of protection to herbaceous plants.

The Bureau of Plant Industry of the United States Department of Agriculture in 1924 prepared a map in which the areas with approximately similar growing conditions are shown enclosed within heavy border lines. Accompanying this, they prepared a description of the different growing regions. (These regional divisions are shown on Plate 1.)

The college location falls within Region 27, which includes much of New England, New York, Pennsylvania and the mountainous portions of the Appalachian States to the south. It is interesting to observe that but three existing arboretums or botanical gardens fall within these similar growing conditions in New York State (at Ithaca, Fishkill Landing and Poughkeepsie), one in Connecticut (Yale University) and seven in Massachusetts (Harvard Botanical Gardens, Arnold Arboretum, Lexington Gardens, Smith College Gardens, Mt. Holyoke College Gardens, Proctor Arboretum at Topsfield, and Wellesley College).

Except for the Breeze Hill Gardens of J. Horace McFarland at Harrisburg, no other public arboretums or gardens lie

within this region in Pennsylvania. It is interesting to observe that northwestern Pennsylvania lies within Region 24, southwestern Pennsylvania within Region 25, and southeastern Pennsylvania within Region 28. In comparison with the college location within Region 27, Region 24 has a more average rainfall of 30 to 40 inches, and the atmosphere is charged with more moisture from the Great Lakes which sets up growing conditions materially different from the center portion of the State. Region 25, which includes Pittsburgh, the Ohio River valley, and southward is characterized by much alternate freezing and thawing, rainfall 40 to 50 inches, the summer warm, with a 30-day drought often occurring near its close. Region 28, lying just east of Region 27, includes Philadelphia and the Piedmont slope. It is warmer than Region 27, with abundant rainfall except in late summer, when 30-day droughts often occur. The winters are open, with much freezing and thawing, and there is little snow protection to be relied upon.

Lying as it does in relation to the rest of the state, both climatically and geographically, the College may be said to be duty bound to develop its arboretum, horticultural and botanical facilities to a far greater extent if it is to take advantage of its opportunities. Few such arboretum and garden facilities are available to which interested people can turn for correct information regarding varietal accuracy, nomenclature, hardiness and growth. Isolated plantings do not fulfill the need, for it is in the collecting and compiling of information, and through definite research projects involving seasonal growth, soil requirements and hardiness, that such gardens become most serviceable.

Pennsylvania is the home of the first arboretum in the United States (1728). There are now twelve arboretums, pinetums or botanical gardens in the State (Plate 2). It will be observed that New York State has fourteen; Connecticut,one; the District of Columbia, two; Maryland, two; Massachusetts, seven; Michigan, four; Ohio, eight; Virginia, one; and West Virginia, one. For the purposes of this study no distinction has been made between arboretums, horticultural or botanical gardens, for these all have the common purpose of serving as museums, libraries and laboratories for plant materials, and serving as a Bureau of Standards for identification and nomenclature of plants, not to speak of the inspirational qualities already suggested.

All of the gardens and arboretums throughout the various states are not completed. Some have for years represented fine achievements, based upon substantial foundations. Of course, the leading ones are the Arnold Arboretum, the Missouri Botanical Gardens and the New York Botanical Gardens at Brooklyn, New York, which are on an excellent basis and have been of great service for many years. Many of them have been planned on a complete scale but are only partially developed or in process of development. Others are too small, too unorganized in their objectives, or too inexpertly administered to ever prove of value from a scientific or educational point of view.

There appear to be arboretums or gardens connected with various colleges and universities. From an investigation made several years ago by the American Association of Nurserymen, with Robert Pyle as Chairman (see "Parks and Recreation", October 1931,

pages 56-60), there are such projects at the University of California, Yale University, University of Illinois, Butler University, University of Kentucky, Transylvania University, Johns Hopkins University, University of Maryland, Smith College, Mt. Holyoke College, University of Michigan, Michigan State College, University of Minnesota, Cornell University, Vassar College, University of North Carolina, Ohio State University, Ohio Agricultural Experiment Station at Wooster, Ohio, Oregon State College, University of Pennsylvania, Swarthmore College, University of Texas, College Station Agricultural Experiment Station, Texas, Washington State Forest Experiment Station.

On the basis of its unique location, its present and possible relation to the horticultural and similar industries, its opportunity for service to other interested citizens of the State, the progress which has been made at other similar institutions, its administrative and technical personnel, the opportunity for further contribution to the present high order of the college campus, and equally because of the extremely unusual possibilities of its practical and inspiring site, it would seem logical to propose the development of more complete arboretum, botanical and horticultural garden facilities at The Pennsylvania State College.

A list of the gardens and arboretums shown by number on Plate 1 is subtended herewith, with name and location by states.

(See page 57 + "Parks and Recreation".)

ARBORETUMS, HORTICULTURAL AND BOTANICAL GARDENS IN EASTERN UNITED STATES
(See Plate 1)

CONNECTICUT

12. New Haven: Yale University - Marsh Botanic Garden.

DISTRICT OF COLUMBIA

13. Washington: National Arboretum, Mt. Hamilton.

14. Washington: National Botanical Garden.

ILLINOIS

17. Lisle, DuPage County: Morton Arboretum.

18. Urbana: University of Illinois Arboretum.

KENTUCKY

20. Lexington: University of Kentucky.

21. Lexington: Transylvania University Botanical Garden.

MARYLAND

22. Baltimore: Johns Hopkins University.

23. College Park: University of Maryland.

MASSACHUSETTS

24. Cambridge: Harvard University Botanical Garden.

25. Jamaica Plain: Arnold Arboretum.

26. Lexington: Lexington Gardens, Inc.

27. Northampton: Smith College.

28. South Hadley: Mt. Holyoke, College.

29. Topsfield (15 miles south of Newburyport): Procter Arboretum.

30. Wellesly (12 miles west of Boston): Hunnewell Arboretum.

MICHIGAN

31. Ann Arbor: University of Michigan - Nichols Arboretum.

32. Battle Creek: Park Department - Leila Arboretum.

33. Charlevoix: Hemingway Evergreen Arboretum.

34. Lansing: Michigan Agricultural College - Beal Botanical Garden.

NEW YORK

38. The Bronx, New York City: New York Botanical Garden.

39. Brooklyn: Brooklyn Botanic Garden.

40. Brookville, Glenhead, L. I.: Arboretum of Theodore A. Havenmeyer.

41. Buffalo: South Park.

42. Fishkill Landing: Wodenethe Estate of Henry W. Sargent.

43. Glen Cove: Dosoris 1874. Private arboretum of Charles A. Dana.

44. Ithaca: Cornell University Campus.

45. Locust Valley, L. I.: Private arboretum of Anton G. Hapendyl.

46. New York City: Elgin Botanic Garden.

47. Oakdale: Arboretum of Mrs. W. Bayard Cutting.

48. Poughkeepsie: Vassar College.

49. Rochester: Highland Park.

50. Roslyn, L. I.: Private arboretum of Childs Frick.

51. Yonkers: Boyce Thompson Institute of Plant Research.

OHIO

53. Cincinnati: Mount Airy Forest Arboretum.

54. Cleveland: The Fine Arts Garden (in Wade Park).

55. Cleveland: Holden Arboretum - Kirtland Hills District.

56. Columbus: Ohio State University.

OHIO (Continued)

57. Kent: John Davey Memorial Arboretum.

58. Newark: Gift of Mr. and Mrs. Beman G. Dawes.

59. Wooster: Ohio Agricultural Experiment Station Arboretum.

60. Yellow Springs: Bryan Park.

ONTARIO, CANADA

61. Ottawa: Central Experimental Farm Arboretum.

PENNSYLVANIA

64. Chestnut Hill: Morris Arboretum.

65. Kennett Square: Pierce Arboretum.

66. Lima, Delaware County: Arboretum on Painter Estate.

67. Marshalltown, near West Chester: Tree collection of Humphrey Marshall.

68. Merion: Barnes Foundation Arboretum.

69. Philadelphia: Bartram's Garden.

70. Philadelphia: University of Pennsylvania.

71. Radnor: Garden and Arboretum of John Evans.

72. Swarthmore: Swarthmore College Arboretum.

73. West Chester: Josiah Hoopes Pinetum.

74. Westtown, Chester County: Westtown Friends School Arboretum.

VIRGINIA

82. Richmond: Maymont Park.

WEST VIRGINIA

85. Wheeling: Waddington Farm Arboretum.

CHAPTER III

CHAPTER III

ELEMENTS IN THE DESIGN

The first procedure in developing the plans and policies for the gardens was to inaugurate a complete investigation of the requirements. Quantitative inquiries as to acreage, the number of square feet of glass, frames, nursery areas and storage, size, type and number of collections, and other matters of this kind were obvious points of investigation, and of course these were gone into quite thoroughly at the beginning and were later incorporated into the finished plans. But, obvious as these matters are and as essential to the success of the final project, it was soon found that the real possibilities inherent in the planning embraced a number of other factors. These were also quite diversified in character; they were found to be technical, administrative, educational, economic, ecological, engineering, and aesthetic.

It is, at times, difficult to say where investigation leaves off and planning begins. It would seem that both of these were in the present instance parallel and continuous. In some cases the planning had to be arranged to fit the data assembled, whereas under the influence of local factors and exigencies the

plan seemed to develop features which called for readjustments in the original data. Such procedure seemed to lead to consistency. Indications were that it would have been folly to undertake the collecting of interminable data before the local and limiting conditions were known. It is hoped that the results have produced proposals thoroughly adaptable to the present and future garden needs of The Pennsylvania State College, and through it to the State at large.

Before outlining the elements, and at the risk of discussing the fundamental design approach which is discussed in the next chapter, I feel that it would clarify the foregoing statements somewhat if I should explain my primary conception of the whole project. It is primarily scientific and educational and becomes, when reduced to its creative elements, therefore, a laboratory and a museum. Neither of these must predominate, but rather there must be conceived a smooth working arrangement into which both are happily merged. I have already mentioned this in the introductory chapter, but it cannot be too strongly emphasized. The museum phase of the gardens must be so designed that it will be a comparatively easy matter to display the laboratory aspects. The gardens must be pleasant to "be in"; broad, free, open and as expansive as is consistent with space utilization and maintenance. They must somehow or other be designed to express the highest ideals of both art and nature; attractive of themselves, apart from education or scientific research. They must be a busy work area where various types of plant life may be seen, each in its own season, in a changing landscape that will present timely "ex-

hibitions" such as are held in other kinds of museums. In other words, they will be a living museum of useful vegetation arranged as far as possible as nature intended, but readily accessible as exhibits.

Botanical gardens and horticultural gardens may have different requirements. The writer in his investigation has only touched on the fringe of the needs of a truly "botanical" garden, and he is not equipped to make specific recommendations in this respect. However, since the future development of the campus, under the arrangement shown in Plate 14, allows for a definite botanical allotment it would seem that this need is protected in the College program and need not be considered here.

BASIC REQUIREMENTS

The functions of a problem determine to a large extent the disposal of its land areas. These must be incorporated into the design in a logical and convenient manner. As has been indicated, other factors beyond the point of fundamental requirements will be encountered, dependent upon the peculiar physical, financial and other conditions incident to the problem.

In setting up the requirements of the present gardens to fulfill the various laboratory and museum purposes which have been mentioned, the conceptions must also be based upon economic possibilities. It has been the intention to create a project of definite ideals and objectives, but one in which every dollar

spent must be based upon carefully planned proposals in keeping with the financial background of the College.

The requirements must consider not only the present but should look far ahead into the future. There is very little probability that the site will be developed all at once. Usually in matters of this kind a small beginning is made in one or two phases of the program which serves as a nucleus for the later developments. However, no matter how small the beginning, it must be according to a comprehensive plan and every part must be started in such a manner that, without changes of location, it can be developed gradually into its ultimate form to function satisfactorily at all times.

A comprehensive program will need to consider particularly the following points:

A. THE SELECTION OF THE SITE

1. Relation to campus.
    a. Convenience in physical access.
    b. Convenience in administration and service.
    c. Integration with campus plan.
    d. Effective entrance treatment; possibility to serve as a dignified "lobby" in the museum aspect of the gardens.
    e. Existing structures.
2. Natural features.
    a. Soil: depth, existing rock outcropping.
    b. Slope and exposure.
    c. Topography.
    d. Surrounding landscape and aesthetic qualities.

3. Size of site required.

    a. Ultimate acreage for buildings.

    b. Ultimate acreage for service.

    c. Ultimate acreage for collections.

    d. Factors in which the campus at large will assist in reducing the apparent requirements.

    e. Financial and other limiting factors.

    f. Compromises and adjustments to adapt to ideal local objectives.

B. BUILDINGS

1. Greenhouses.

    a. Requirements of Department of Horticulture.

    b. Requirements of other departments.

    c. Orientation.

    d. Adaptation to topography.

    e. Possibility of partial program.

    f. Relation to head houses and laboratories.

    g. Relation to service.

    h. Relation to outdoor areas.

2. Administration building.

    a. Offices and laboratories.

    b. Classroom facilities.

    c. Model floral shop.

    d. Library and reading room.

    e. Public information center.

    f. Relation to all other elements in the plan to be carefully considered.

3. Head houses and laboratories.

    a. Different conditions encountered from usual requirements.

        1. Laboratory, office and head house functions combined.

        2. Needs of different departments to be satisfied; space requirements.

        3. Minimum inter-circulation between various departments desired.

        4. Soil deliveries and storage.

4. Hot beds and cold frames.

    a. Space requirements of Department of Horticulture.

    b. Space requirements of other departments.

    c. Relation to potting areas and greenhouses.

    d. Exposure and orientation.

    e. Service factors.

5. Conservatory.

    a. Indoor exhibitions and collections.

    b. Orchids, palms, etc.

    c. Study as to its value and fitness with possibility of its elimination.

    d. Tentative location and space requirements.

6. Service buildings.

    a. Storage: machinery and implements.

    b. Existing vegetable storage building.

        1. Its first floor present use.

        2. Possibility of utilizing for second floor addition.

        3. Relation to service roads and other outdoor areas.

    c. Shelters and comfort stations.

C. OUTDOOR PRODUCTION AREAS (Space requirements)

1. Experimental and test gardens.

2. Plant breeding experiments.

3. Nursery and propagating.

4. Service and storage factors for these projects.

D. ROADS, PATHS AND SERVICE AREAS

1. Vehicular.

   a. Macadam or hard surfaced roads and courts, creating access and service to the various units.

   b. Parking facilities for visitors, faculty and service vehicles.

2. Pedestrian.

   a. Walks and footpaths of varying width and treatment, depending upon function and location.

   b. Creation of a dominant "mall" or center from which the various units integrate.

   c. Enlarged park-like areas at strategic points to serve as outlooks, points for class instruction, or public lectures.

   d. Paths within garden and collection areas.

   e. Investigation of surface requirements for different walks (grass, stone paved, concrete, etc.).

3. Service.

   a. Study for special heavy duty service roads and courts for trucks, tractors and other machinery.

E. GARDEN AREAS (Space requirements, location and policies.)

1. Perennial flower gardens; herbaceous.

   In the perennial gardens will be displayed attractive combinations of carefully selected perennial flowers and typical sections or borders for spring, summer,

fall and continuous bloom display; also beds will be provided to display those plants which will withstand drought, those which will need moisture, those which will prove satisfactory in shade, and those which will be effective in a hot, dry exposure. A special corner will also be included where newly introduced varieties are displayed. All the materials in the perennial borders will be labelled, of course, although it is always a problem to do this without destroying the beauty of the gardens.

2. Gardens for annuals and biennials. (Flowers for cut-flower gardens.)

   The annual garden is not intended to display large and bewildering collections of as many varieties as can be brought together, but rather will show attractive color combinations of a representative selection of some of the best and most recommendable kinds. The selection of varieties in this garden as well as its color scheme will be planned so that it will vary from year to year, and plans should be made to keep records of the combinations which have proved particularly pleasing and satisfactory.

3. Taxonomic gardens; definitely eliminated as being more pertinent to a strictly botanical garden.

4. Morphological and biological gardens; likewise designated for botanical gardens.

5. Economic gardens; not indicated for present purposes.

6. Water and bog garden; space for aquatics and water lilies to be provided by designing locations for formal and informal pools.

7. Rock gardens; for presentation of alpines, ferns, heather and ground covers.

   Careful consideration will be given when the construction is undertaken to make this area as instructive to the layman as possible. Instead of too great emphasis being placed on the rocks, the attention will be devoted to the most satisfactory display of the plant materials. Quite often, in the usual type of rock garden, many of the best and most desirable varieties are lost among the multitude of species often having purely botanical interest. Only plants most amenable to cultivation are to be included. These will be displayed in dry walls, raised beds, flagstone paving, with perhaps one well constructed terminal morraine bed.

8. Desert gardens; for exhibition of cactus, sedums, etc.

F. COLLECTIONS

1. Much careful study of the disposition of the areas in planning to determine the numbers, types and arrangement of the collections. Without question the predominance will be given to developing large and fairly complete collections of most of the known varieties of iris, peonias and roses. Other important collection items will be anemone, aquilegia, bedding plants, bulbs, chrysanthemums, dianthus, gladioli, grasses, heather, lilies, phlox, primrose and veronica.

G. WOODY MATERIALS

1. Trees.

   a. Determining their location and relation to other elements considered one of the most vital requirements of the planning.

   b. Definitely establish certain windbreak and shade factors which set them over and apart from purely aesthetic contribution.

   c. Utilizing their location, grouping, color and form to establish fluent rather than static qualities in the design.

2. Dwarf flowering trees.

   a. Only secondary to the large trees in creating "new objectives" in fluent design, which will depart from the usual static and cellular type of most existing similar projects.

   b. Special seasonal and flowering collections.

      1. Flowering Japanese crabs.

      2. Flowering Japanese cherries.

      3. Flowering dogwoods.

      4. Other: mountain ash, redbud, etc.

3. Shrubs.

   a. Use as structural elements to set off and separate various areas.

   b. Policy to be determined regarding creating system-

atic plantations; decision probably to be that of establishing generic groups, but disregarding further family and order limitations.

c. Policy to be established to have all the woody materials in the gardens supplement rather than duplicate campus and arboretum plantings, leaving the present decisions free to create plantings of special interest, such as

(1) spring flowering displays

(2) fall displays; fruit and foliage

(3) colored foliage displays; eleagnus, berberis, ligustrum, etc.

(4) winter color displays

4. Hedges.

a. Special effort to select hedges between various units to present as much variety in form, size, character and use as possible.

b. All hedge experiments cannot be expediently carried out within the main portion of the garden; these to be established in test areas especially set apart.

5. Vines and ground covers.

a. Conditions to be provided where vines may be given an opportunity to

1. Cling to buildings.

2. Climb upward on posts and walls.

3. Hang over walls from above.

4. Grow upon, and serve as ground cover, for slopes.

H. SPECIAL OTHER ELEMENTS

1. Other factors in design;

a. Walls and grading planning.

b. Watering system and irrigation.

c. Drainage.

2. Establishing facilities for seed and cuttings collecting and exchange.

3. Setting up facilities for publishing reports and for publicizing dates for special displays.

4. Policing and protection of material and the establishment of rules and regulations.

5. Establishing financial problems, cost estimates, personnel employment estimates and other fiscal policies.

6. Creating a policy of placing a trained, experienced director in charge of all the gardens and arboretum areas, and determining the relation between the administration of these areas with the general landscape construction and maintenance of the college campus.

It is not to be supposed that the above program can or should be carried out completely on the campus of The Pennsylvania State College. As has been indicated in the beginning of this chapter, matters of landscape planning in relation to topography, cost and expediency will determine the practical aspects of the problem as much as will the collecting of data and the making of a program. No landscape architect in the diversity of the ground forms and other conditions which he encounters can develop a proper plan by following a recipe or an exact standard.

However, it is quite impossible to select the features to which one will limit himself without having first a complete outline of everything that should be considered. Suffice to say that the complete program was carefully developed and as much quantitative information was collected as could be found. It will not be necessary to further list the quantitative data and requirements here. These are demonstrated to a definite scale in the general plan which is

depicted on Plate 23. It is almost reasonable to hope that a certain number of right decisions have been made; that the number and total space allotted for greenhouses will prove adequate for the future program of the college; that the service areas and gardens will function; that the collection and test and experimental areas will prove nearly adequate and convenient. These may be checked for location and number of square feet by scaling the general plan. They become physical elements which a good plan must provide. But, having assured them, a further and deeper spiritual or aesthetic quality must also be made a part of the planning. It is the hope of the writer that the creative qualities of the planning will be as inherent in the plan as the programmatic. It will be the purpose of the succeeding chapter to explain the objectives of this latter phase of the planning.

CHAPTER IV

CHAPTER IV

THE DESIGN OF THE GARDENS

We have, by now, come to an understanding of the unique local factors which apply to the creating of a horticultural center at The Pennsylvania State College. We have discussed fundamental purposes and have arrived at the conclusion that the center must develop a unified group of administrative, laboratory and greenhouse buildings, with a surrounding ground area devoted to various kinds of plant growth, and that these must be properly serviced and made available for both vehicular and pedestrian access. We have discussed the administrative objectives of making the gardens serve the twofold function of a scientifically adequate laboratory and an inspirational outdoor museum. We have presented the geographical and climatic background which would pertain to gardens within the State College region, and have tried to justify the need for such a development in relation to other existing projects, as well as to the State at large. We have outlined a complete program covering a study of the essential elements that must be considered in developing the design for the area, and have indicated that it is as necessary to know what elements to eliminate--and why--as it

is to know what to include.

It is reasonable, also, to assume at this point that our policies or objectives are clearly determined. The gardens must be efficient and must be made the most ideal possible place in which to work if we are scientifically inclined, and at the same time they must be an inspirational and educational medium through which to further or to awaken interest in plant life by the general public. It is understood that the policy will not be simply to try to teach people, but to display material for learning in such a manner that it will make people eager to learn. We shall be dealing with all classes of people. Some will come to the gardens anxious to learn; others will be either indifferent or casual to the details of the materials but will be enticed by the setting. The former, composed of garden club members and home owners, will perhaps have already some background of factual knowledge about the materials on display and will be intent on comparing and in learning new facts; they will even desire to go into the more abstractly laid out areas devoted to proving grounds and testing areas. The latter group, by skilful subtleties of planning and setting, may find it difficult to resist the urge to continue walking throughout the gardens along walks lined with dramatic masses of flowering trees and shrubs of such materials as lilacs, forsythia, flowering cherries, Japanese flowering crabapples, dogwoods and hawthorns. They will encounter in larger gardens along the way concentrated seasonal displays of such collections as iris, peonies, roses, herbaceous borders and bedding plants. If the administrative officers will be certain to see that the most important of these displays are properly publicized at

their season of bloom, it is easily conceivable that The Pennsylvania State College Gardens would become an important exhibition center for many visitors who might not otherwise have occasion to visit the college.

These seasonal displays must be of exceptional brilliancy and skilful planting to satisfy a constant gathering of visitors. Only a few such displays have ever been completely dramatic and effective. Of course, the most striking in America are the Rhodendron and Azalea Display at the Magnolia Gardens in South Carolina, the Flowering Cherries in the Tidal Basin at Washington, the Lilacs and Rhodendrons in Highland Park at Rochester, New York, and the Crabapples and Flowering Cherries in the Arnold Arboretum at Boston.

As noteworthy as some of these are, none have the unparalleled "setting" which may be achieved in the gardens we are considering. From the overlook near the entrance or "lobby" which has been designed at the eastern approach to the gardens, the displays will themselves frame, and be a part of, the inspiring view toward the valley with its mountains on either side. After he is satisfied with this view, the visitor may behold further displays of plant materials radiating either eastward along the mall, or on the sloping hillside leading northward to the conservatory. This entrance area is so conveniently and centrally located in relation to the campus that even the most hurried visitor will be brought at least to this entrance to the gardens on "trips about the campus". Eventually, as more college buildings are erected in the future and are brought into closer quadrangles, this park-like area will offer a relief from such crowding and will preserve a scenic attraction

which probably could not be duplicated on any other college campus in the country. This center alone, if satisfactorily planted with material intentionally selected for effective display, has possibilities of becoming one of the most inspiring remembrances for students and alumni, and may assure the worth of distant or repeated pilgrimages to the campus.

THE SITE

In developing the plans, the writer did not have great difficulty in determining the site. In January 1928 and in December 1928 Professor John R. Bracken, Head of the Division of Landscape Architecture, had made a preliminary set of investigations at the request of Mr. E. S. Bayard, of Pittsburgh, Pennsylvania, a member of the Board of Trustees, who has always been intensely interested in the more sociological services of the College as expressed in such matters as better living conditions and more aesthetic environment. The first study, made in January 1928, is indicated in Plate 15. While this site has certain advantages, provided no other area could be obtained, it becomes very evident that the area proposed in December 1928 and indicated on Plates 16 and 17 is more adequate for planned development and expansion, for closer integration with greenhouse and laboratory units, has a more desirable southern slope, and of course is unparallleled in inspirational opportunity as regards its outlook over the surrounding landscape. Few permanent buildings are at present within the area, and these may be utilized--as in the case of the storage cellar--or removed, as expediency requires over

a period of years of development. The plans developed by Professor Bracken in 1927 for the arboretum (Plates 10 and 11) show the possibility of integration of gardens and tree and shrub experimental areas, and this is more adequately revealed in the most recent arboretum study by Professor Bracken and the writer indicated on Plate 14. Furthermore, the recent study for botanical areas (Plate 13), as mentioned previously, also indicates further justification in this relationship.

The proposals made by Professor Bracken received universal acceptance and have been instrumental in preserving the area for the purposes set forth in this later and more comprehensive study. The Campus Master Plan, developed by Charles Z. Klauder, the College Architect, and Thomas W. Sears, the College Landscape Architect, allot a diagrammatic arrangement of greenhouses to the northeast portion of the site. During the intervening years the proposals were also made the basis for locating the Department of Horticulture nursery, for requests for the removal of Department of Poultry buildings, and other minor developments.

The studies made by Professor Bracken, however, were undertaken simply to demonstrate the possibilities of the various areas under consideration and were not intended to serve as working or development drawings. When the writer began his studies for the project Professor Bracken requested that the former proposals be thus considered and that no limitation be made as to policies, plan decisions, space relation or any other matter which the investigations would reveal. It has, therefore, been from an entirely clean slate that the present work has developed, except in regard to conferences

and helpful suggestions from time to time, acknowledgment for which was made in the preface.

PLAN DECISIONS IN RELATION TO BASIC ELEMENTS

The site selected is a rectangular area of 14.6 acres along the east side of East Drive and the southern side of Three Mile Road. Its southern limits are bounded by the Jordan Fertilizer Plots, and its eastern boundary is an existing road lying at the eastern extent of the student orchard, the orchard being considered part of the present proposals.

In fulfilling the analysis of essential features listed in the preceding chapter the plan allots approximately five acres to buildings, the balance being given over to outdoor growing areas, gardens, trees and shrubs, collections, and the circulation needs supplied by roads, courts, walks and paths. Space allotted to these elements is as follows:

Buildings	
Greenhouses (area under glass)	42,000 sq.ft.
Administration building	5,000 " "
Head houses and laboratories	12,000 " "
Hot beds and cold frames	8,500 " "
Conservatory	3,500 " "
Service buildings (various, as required)	
Outdoor testing and experimental areas	150,000 " "
Roads, paths and service areas	120,000 " "

Gardens and Collections

Perennial collection	5,000 sq. ft.
Perennial gardens (herbaceous)	12,500 " "
Annuals (bedding plants and including bulbs)	10,000 " "
Aquatics (lilies, etc.)	5,000 " "
Rock garden space	3,500 " "
Desert garden (sedums, etc.)	1,500 " "

Special collection gardens

Iris	18,500 sq.ft.	(garden 260' long by 75' wide)
Peony	25,000 " "	
Roses	15,000 " "	
Climbing roses	6,500 " "	(500 lineal feet)

Woody Materials

Trees - No special area set aside. Trees have been very carefully considered from every possible standpoint. Their location for group effects and enframement is essentially a quality of planning. However, certain practical contributory aspects have been sought for, which may influence the ecological factors. In no instance have trees been introduced where they will create shade in places where sunlight is required.

Dwarf flowering trees - Carefully studied for enframement and strategic exhibition.

Shrubs - Used (1) as divisions between gardens, and (2) 15,000 square feet devoted to a special shrub and wild garden near the main entrance.

The "Entrance Lobby" 16,000 sq. ft.

The "Mall" (main portion) 360 ft. long; 20 ft. wide.

In comparing the proposed area of 14.6 acres with similar work elsewhere, it may be interesting to know that the Harvard Botanical Gardens comprise 7 acres and those at Ohio State 24 acres. It is also interesting to realize that almost unbelievably large acreages are to be met with in certain places, the Missouri Botanical Gardens having an allottment of 1,300 acres and the New York Botanical Gardens 400 acres. In the latter instances, of course, these are not completely developed.

While there has been very little exact reference material in which I could find analogous conditions, I believe it is possible to have an extremely practical and satisfactory group of buildings and gardens within the limits I have devised. One might compare this phase of the planning with that of an architect planning a hospital. There are large hospitals and small hospitals, just as there may be botanical gardens of one hundred acres or ten acres. The architect will make a technical study of all hospitals--five thousand beds and fifty beds--in order to bring the soundest workable conditions to the one he must design. Within its limits, the small hospital must suit its local population as satisfactorily as the great one. If in an industrial center the accident treating equipment will probably be stressed over other facilities which might be encountered in a college community. In any case, there are functions common to both, as well as physical and financial factors as vital to the one as to the other. These proposed gardens are set up fully by technical requirements and one can only avoid mistakes by making as careful a determination as he can, in the beginning, of their physical, financial and economic functions and

limitations. If, within the spaces allotted, constant rearrangement and elimination of obsolete, useless and obnoxious things is adhered to as an administration policy, the gardens can exhibit adequate and sufficiently complete displays to present its educational material in a manner that will please and will be subconsciously absorbed by the visitor.

PURELY DESIGN FACTORS

The area designated is particularly fortunate in that it permits an excellent tie to the campus open areas and permits this tie to be of sufficient scale to make it appear a part of the campus. The site is additionally fortunate in that it overlooks a majestic view which permits the designer to adopt a solution whereby this view can be made part of the unrivalled setting of the College.

In addition to the various uses of the gardens which have been previously stated, these two natural features have a definite relation to a very interesting sloping topography with several variations in slope which the design may use to advantage.

The design which has been adopted (Plate 33) differs from the plan of other similar gardens which the writer has studied in its attitude toward <u>space</u>. The usual botanical gardens make use of a cellular design not unlike the space enclosed by the walls of a room. This is generally spoken of as "formal" design, and many gardens which seem to have some curved lines in them are so balanced or axially related that they cannot escape this classification.

The other type of design used in outdoor planning makes

use of curved lines in apparent imitation of nature and is often termed "informal" design.

In the attempt to solve this particular area it became evident that neither type alone would give a satisfactory solution. In studying other areas devoted to similar uses, it also became evident that many of the weaknesses in the designing were caused by an uncompromising adherence either to forms of design that originally were derived from gardens that had no educational objectives, or from park-like treatments inspired by nature, but likewise with no original educational intent (See Plates 21 and 22).

Consideration of the problem developed a conception that we have here what is essentially an outdoor museum which must be designed for its visitors as much as for its plants. From an abstract point of view the writer considered that he should make a thorough study of museum planning and function in order to more soundly approach his present problem. Here, however, he encountered conceptions of cellular enclosure in most of the existing examples based on adaptations of styles originally intended to serve either as temples or palaces, and likewise had no museum educational objective. The usual plan simply consisted of square or rectangular rooms with small doors at the ends leading from and to other similar rooms. Seeing the whole room at a glance, the visitor is asked to go along one side of the room and then the other, examining in detail that which he had already seen as a whole. The entire process soon becomes one of terrific monotony, with no feeling of contrast, emphasis or climax, and leads to the condition known as "museum fatigue" felt by all visitors to art galleries and museums. Many

more socalled amateurs could be made into devoted museum visitors if more attention were given to their physical and mental reactions rather than entirely to the material to be displayed (Plate 21).

Exceptions to the cellular type of planning were discovered, however, which have a very fine conception of the desired objectives. Two excellent types of such planning are the German Pavilion at the Barcelona Exposition by Mies Van Der Rohe, and the more recent designs for the New York 1939 World's Fair buildings (Plate 21). In these buildings the circulation of the public line of travel "leads through" the space without the finality of enclosure encountered in the room or cell motive. The visitor is lead from one exhibit to another in settings of ever changing vistas and proportions, and with the ever present desire to see that which lies around the corner. This use of space permits a much more interesting and varied series of vistas of space than is possible in room-like enclosures.

The room or cell-like treatment of space creates a <u>static</u> quality. However, where conditions are set up in which the space is not confined, and rather portrays an effect of limitless extent, there is created a <u>fluent</u> relation between the parts.

In a conscious endeavor to interpret the spatial quality of the "informal" it is found that the geometrical line can be justified and can become perfectly expedient. This fulfills the scientific requirement that the beds be rectangular or radial, so that beds and plants may be more efficiently maintained and studied. However, the balanced symmetry of geometrical line found in the "formal" was rejected for the reason that it only encouraged an unnecessary repetition of the same plants. Orientation in relation to sunlight

and air is usually unequal in the design having balanced symmetry, with the result that certain inequalities are set up between flower beds; one bed is usually in complete sunshine and the other is often in the shade of the enclosing planting. This, too, may be overcome if the fluent use of space takes precedence over the "room-like" requirements.

Free from the restrictions which I have named, it has been possible to adopt a design which I believe achieves a form unlike any previous gardens of this kind, but inherently sound and appropriate for their scientific and educational purposes.

PART II

I. PLANS OF NOTEWORTHY GARDENS

Plate 1

MAP showing location of arboretums, horticultural and botanical gardens in eastern United States

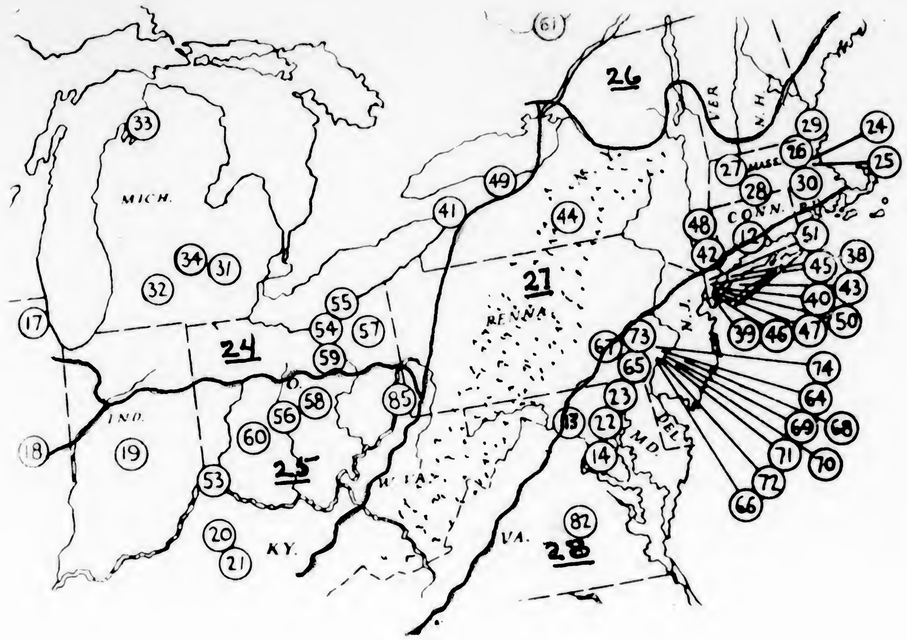


Plate 2

Harvard Botanical Gardens; Cambridge, Massachusetts
(A Manual of Parks - L. H. Weir - Page 954)

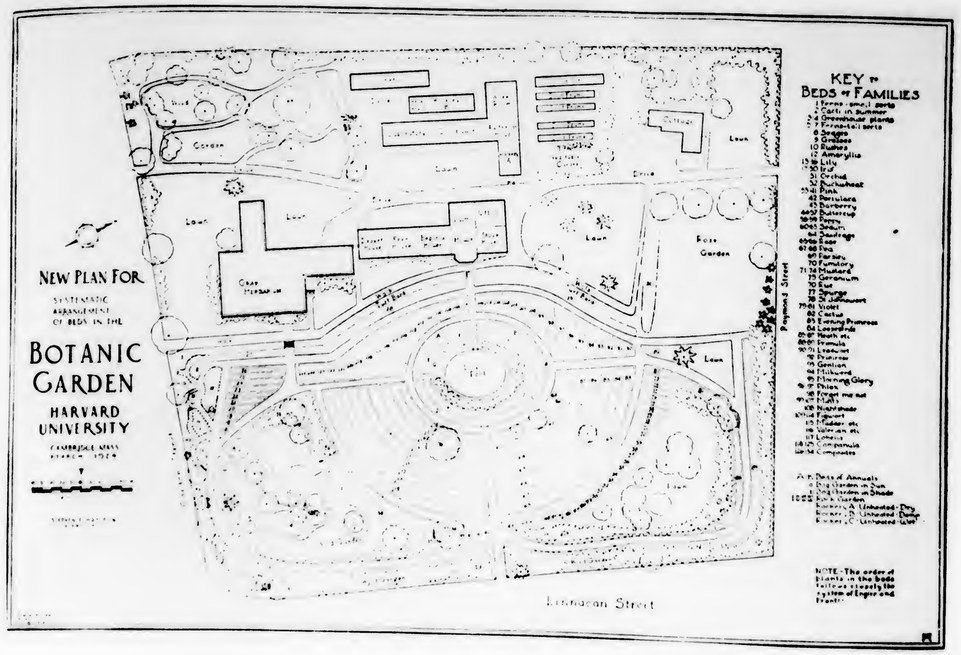


Plate 3

Missouri Botanical Gardens; St. Louis, Missouri
(A Manual of Parks - L. H. Weir - Page 958)

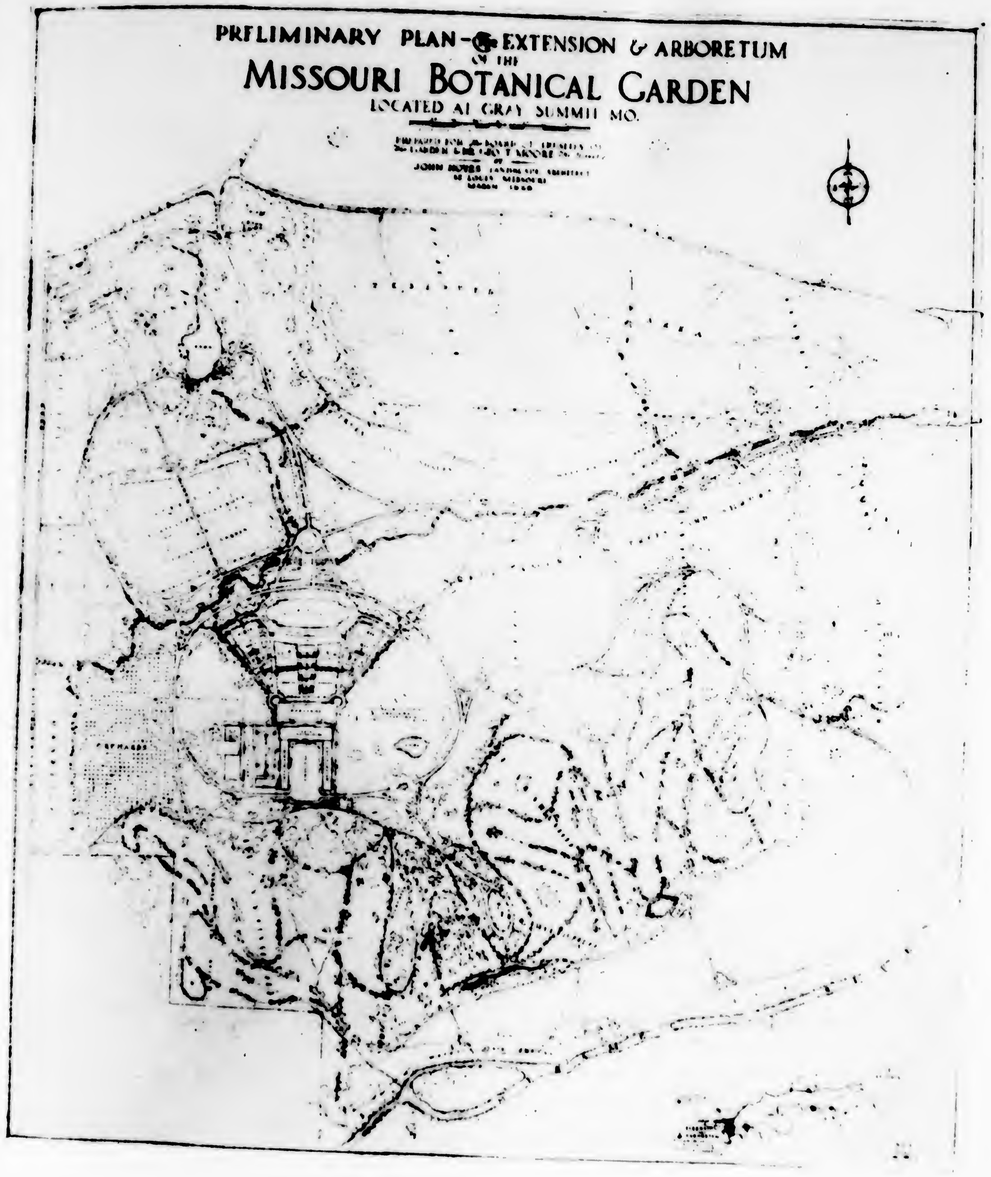


Plate 4

New York Botanical Gardens; Brooklyn, New York
(A Manual of Parks - L. H. Weir - Page 963)

Plate 5

Proposed Horticultural Gardens; Fairmount Park, Philadelphia, Pa.
(By Thomas W. Sears, Landscape Architect)

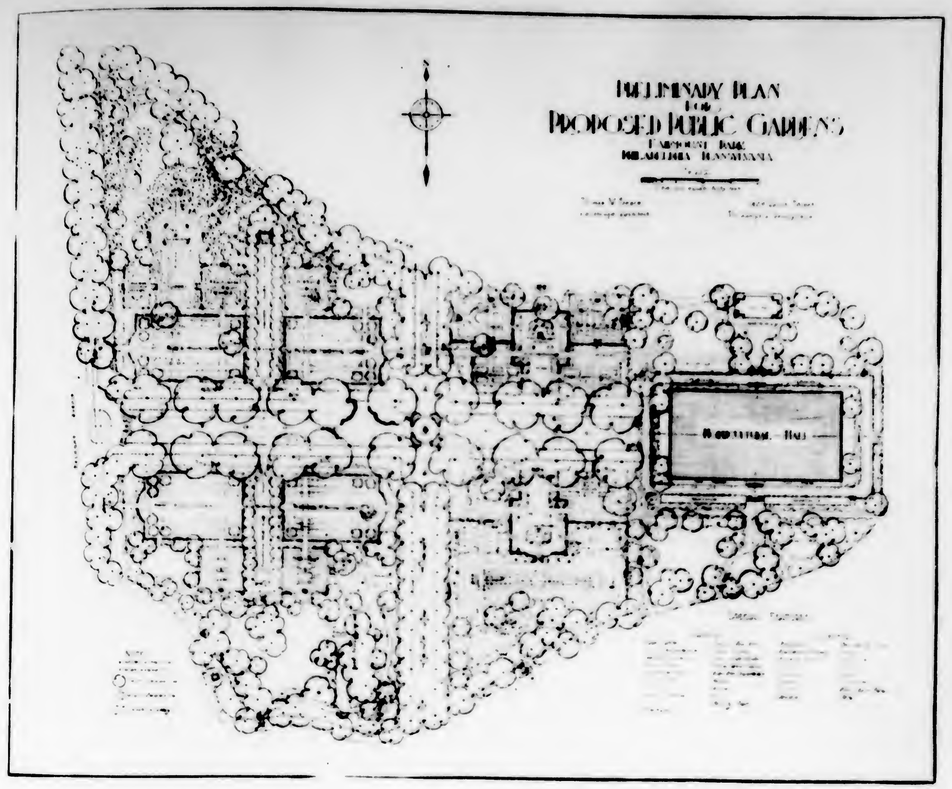


Plate 5

Proposed Horticultural Gardens; Fairmount Park, Philadelphia, Pa.
(By Thomas W. Sears, Landscape Architect)

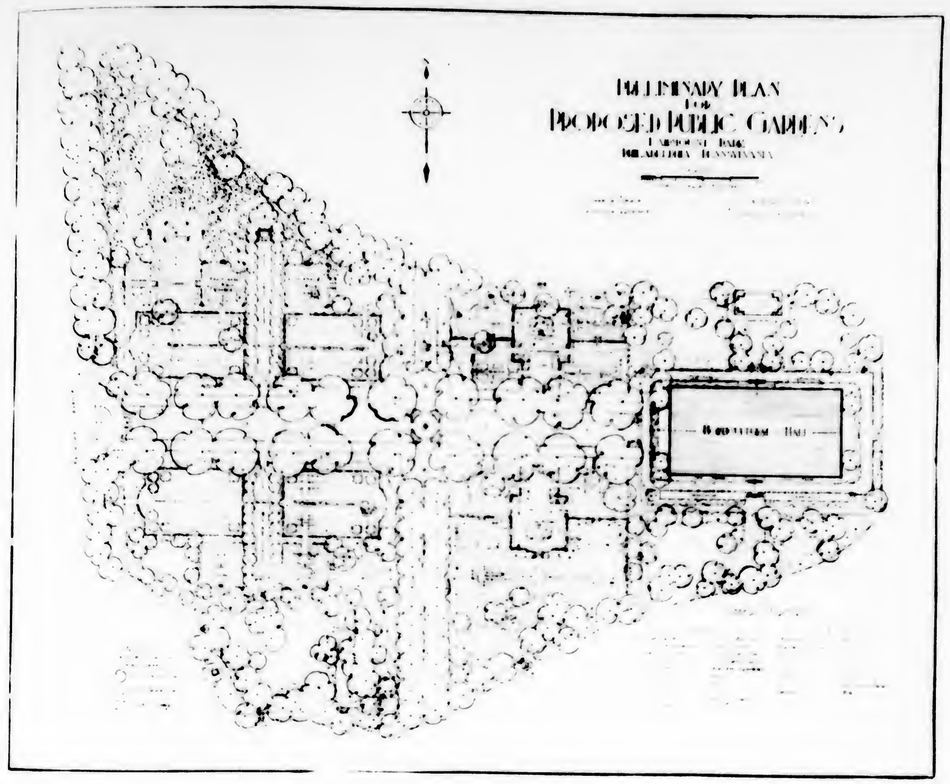
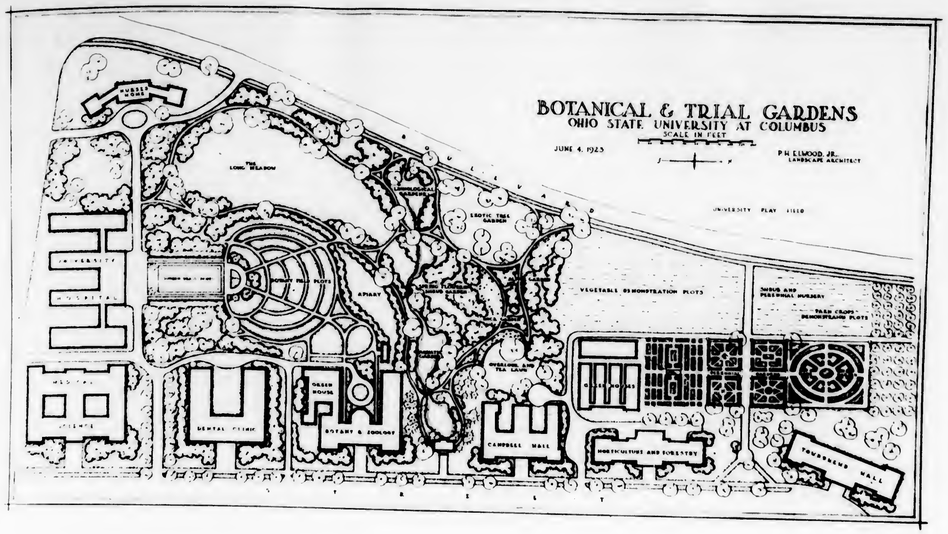


Plate 6

Ohio State University Gardens; Columbus, Ohio
(By P. H. Elwood, Landscape Architect)



CHARTS

Plate 7

Pennsylvania horticultural products and research

PENNSYLVANIA
HORTICULTURAL PRODUCTS & RESEARCH

GREENHOUSE PRODUCTS ○○○○○○○
●●●

FRUIT ○○○○○○○C
●●●●●●●●●●●●●●●

VEGETABLES ○○○○○○
●●●●●

○ $1,000,000 INCOME
● $1,000.00 FOR RESEARCH

Plate 7

Pennsylvania horticultural products and research

PENNSYLVANIA

HORTICULTURAL PRODUCTS & RESEARCH

GREENHOUSE PRODUCTS ○○○○○○○ ●●●

FRUIT ○○○○○○○C ●●●●●●●●●●●●●●●

VEGETABLES ○○○○○○ ●●●●●

○ $1,000,000 INCOME

● $1,000.00 FOR RESEARCH

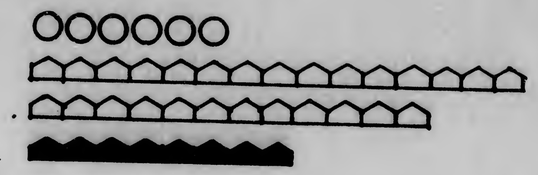
INTENTIONAL 2ND EXPOSURE

Plate 8

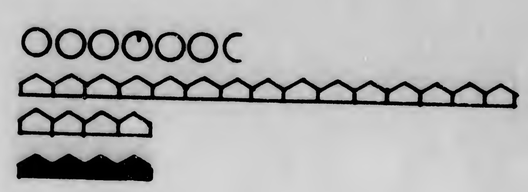
The greenhouse industry

THE GREENHOUSE INDUSTRY

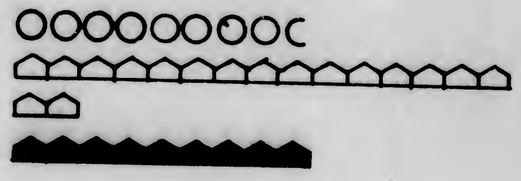
OHIO



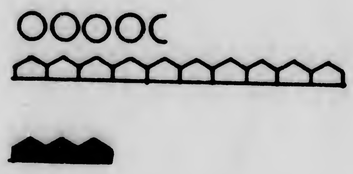
PENNSYLVANIA



NEW YORK



NEW JERSEY



○ $5,000,000.00 INVESTED

⌂ 100,000 FEET COMMERCIAL GLASS

⌂ 10,000 FEET EXPERIMENTAL GLASS

Plate 8

The greenhouse industry

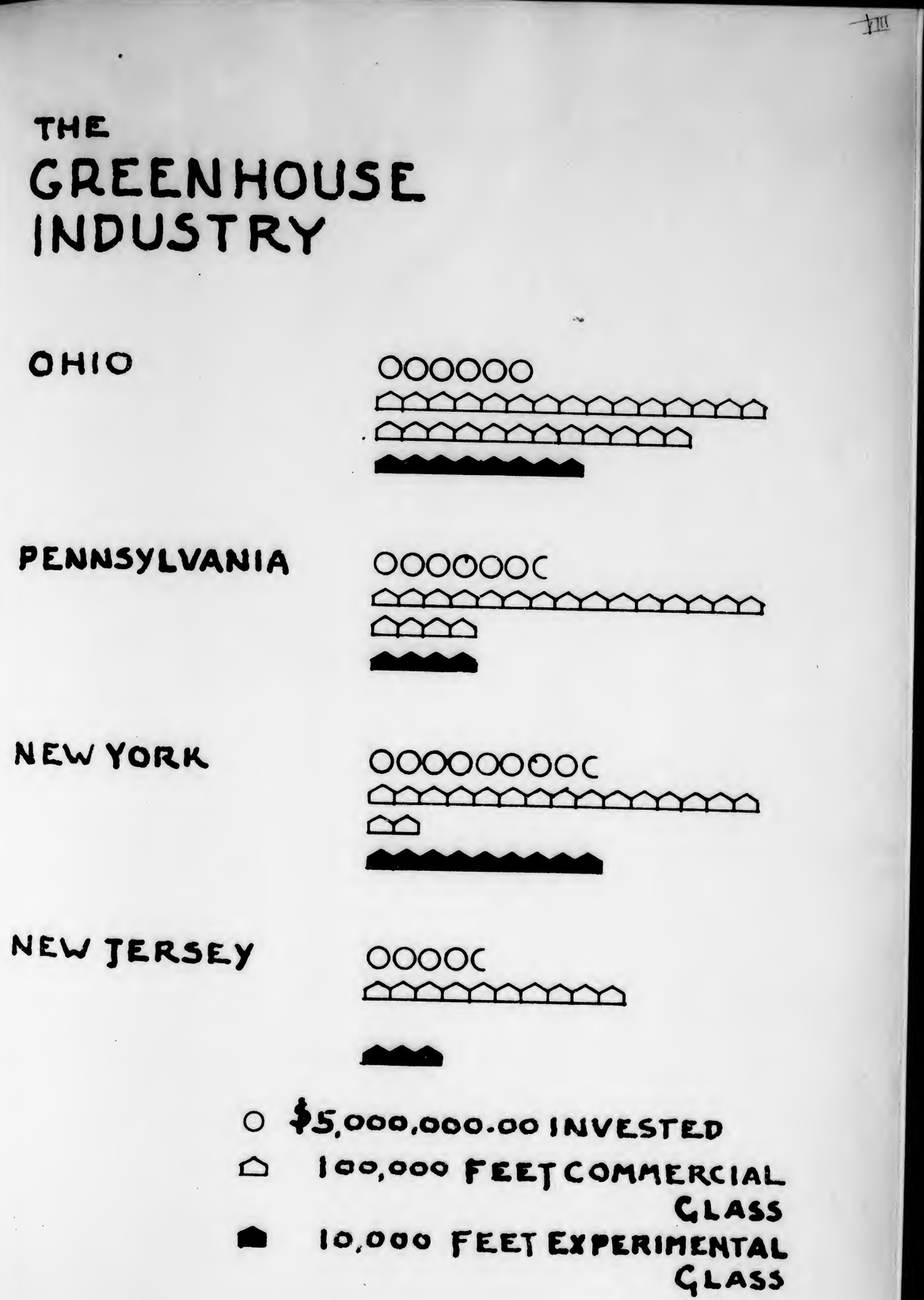


Plate 9

Ratio between commercial greenhouses and experimental greenhouses

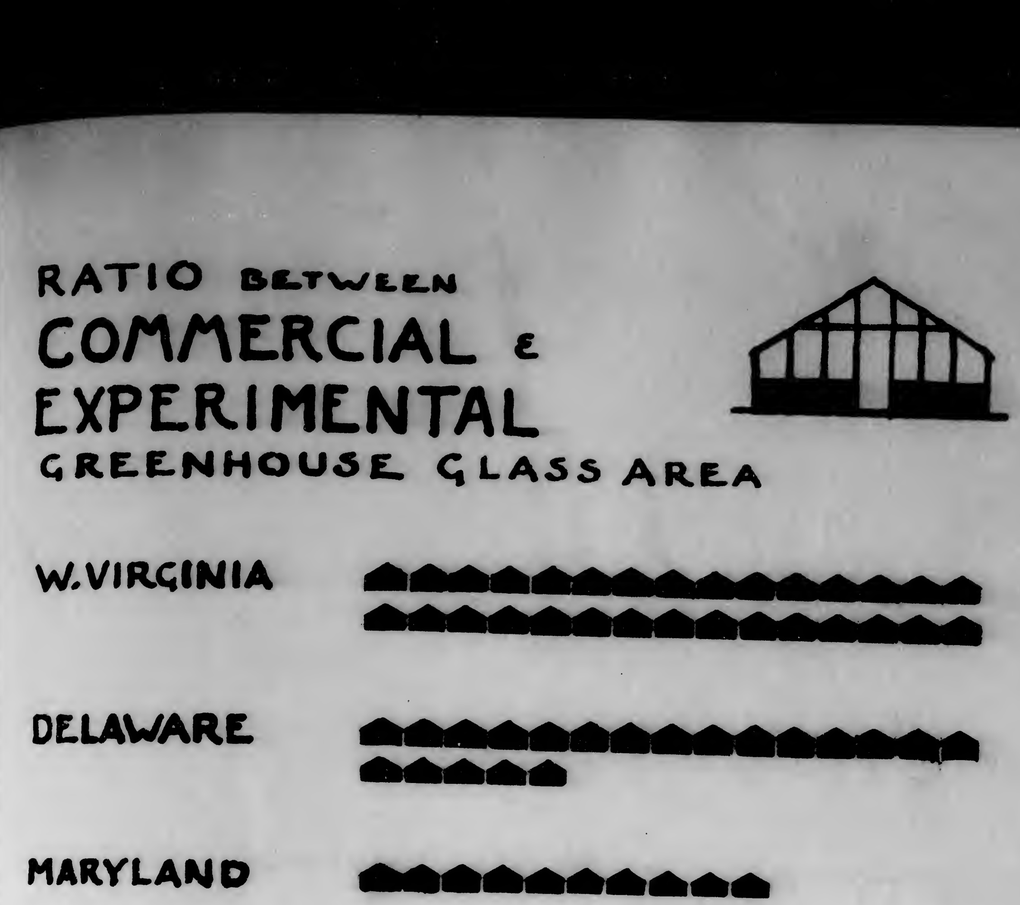
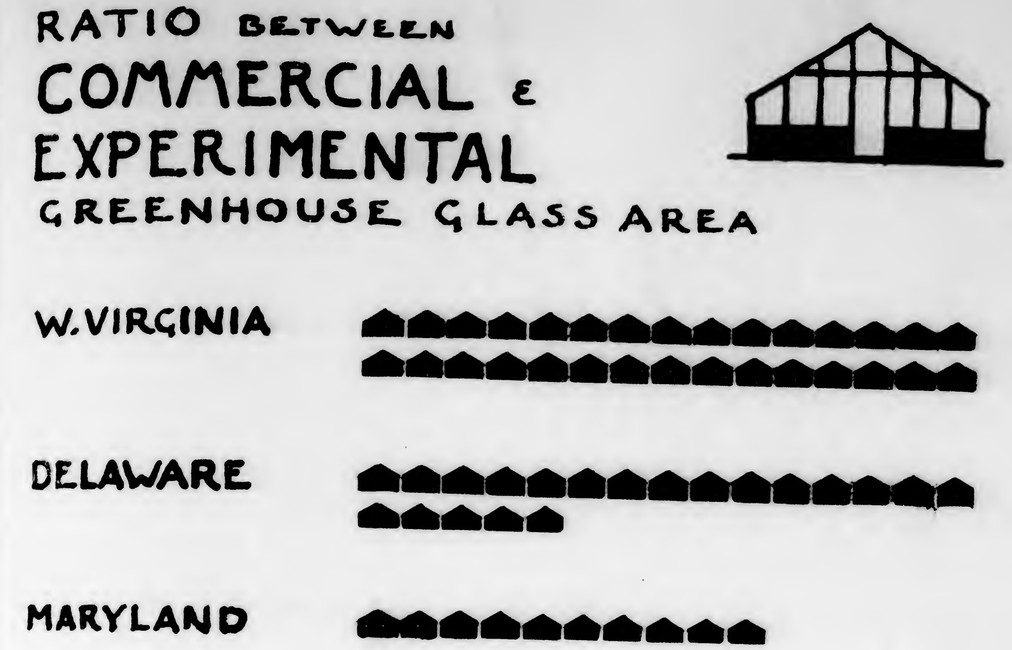


Plate 9

Ratio between commercial greenhouses and experimental greenhouses



EARLY ARBORETUM STUDIES FOR THE PENNSYLVANIA STATE COLLEGE

Plate 10

Proposed arboretum plan, 1927
(By Professor John R. Bracken, Landscape Architect)

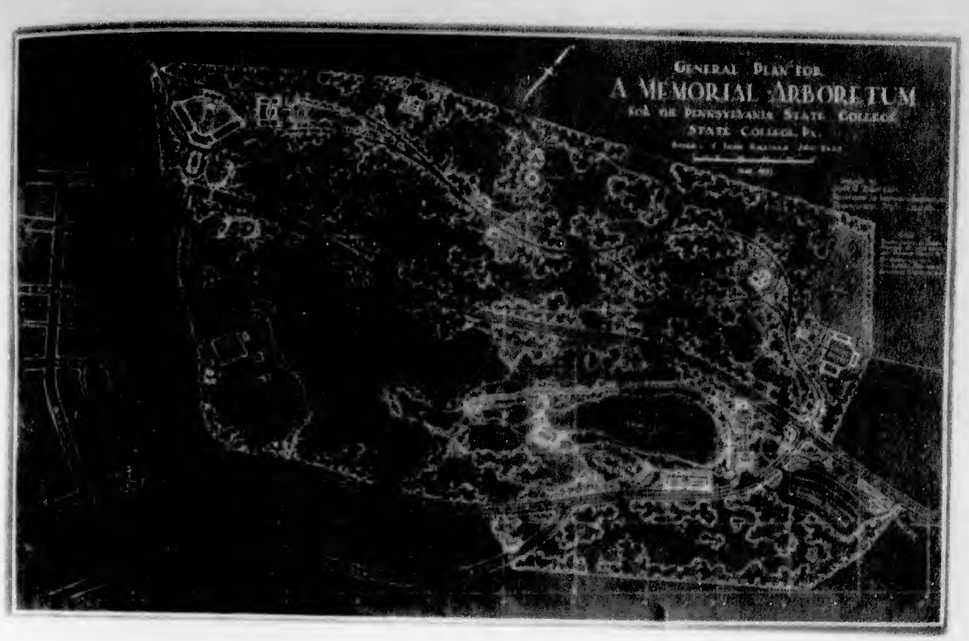
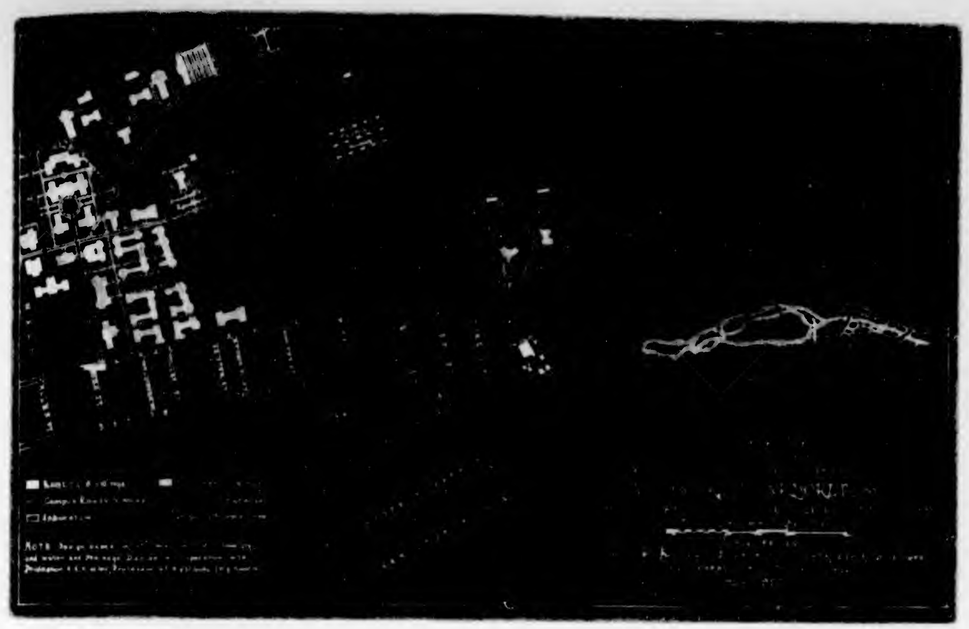


Plate 11

Arboretum key plan showing relation to borough and campus, 1927
(By Professor John R. Bracken)



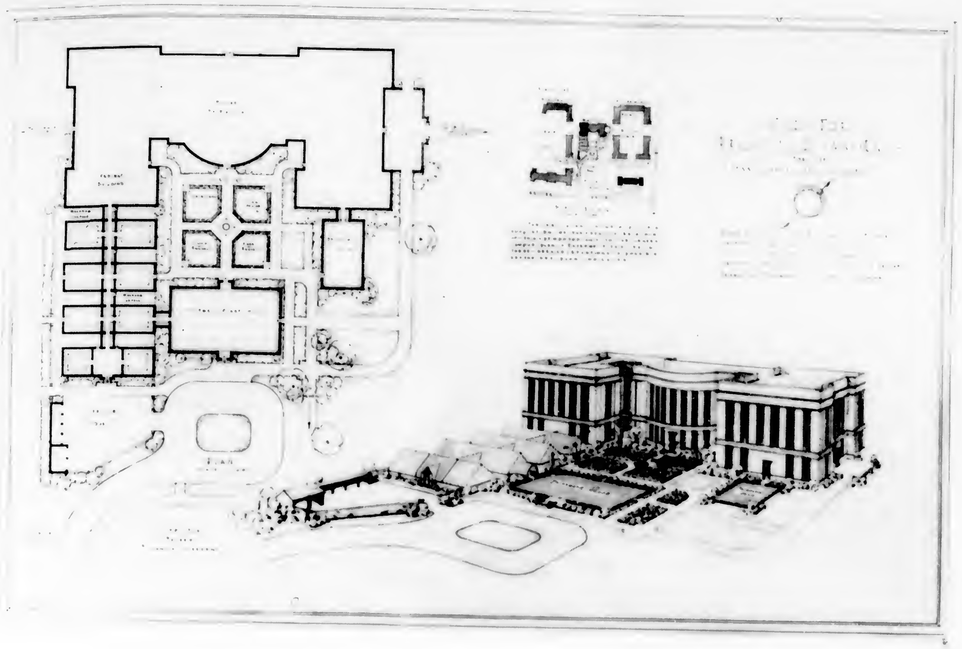


Plate 12

Plan for greenhouses adjacent to Botany Building, 1936
(By Dean F. D. Kern. Drawn by H. F. Graham)

Plate 13

Plan for greenhouses and garden sites at Botany Building, 1936
(By Dean F. D. Kern. Drawn by H. F. Graham)

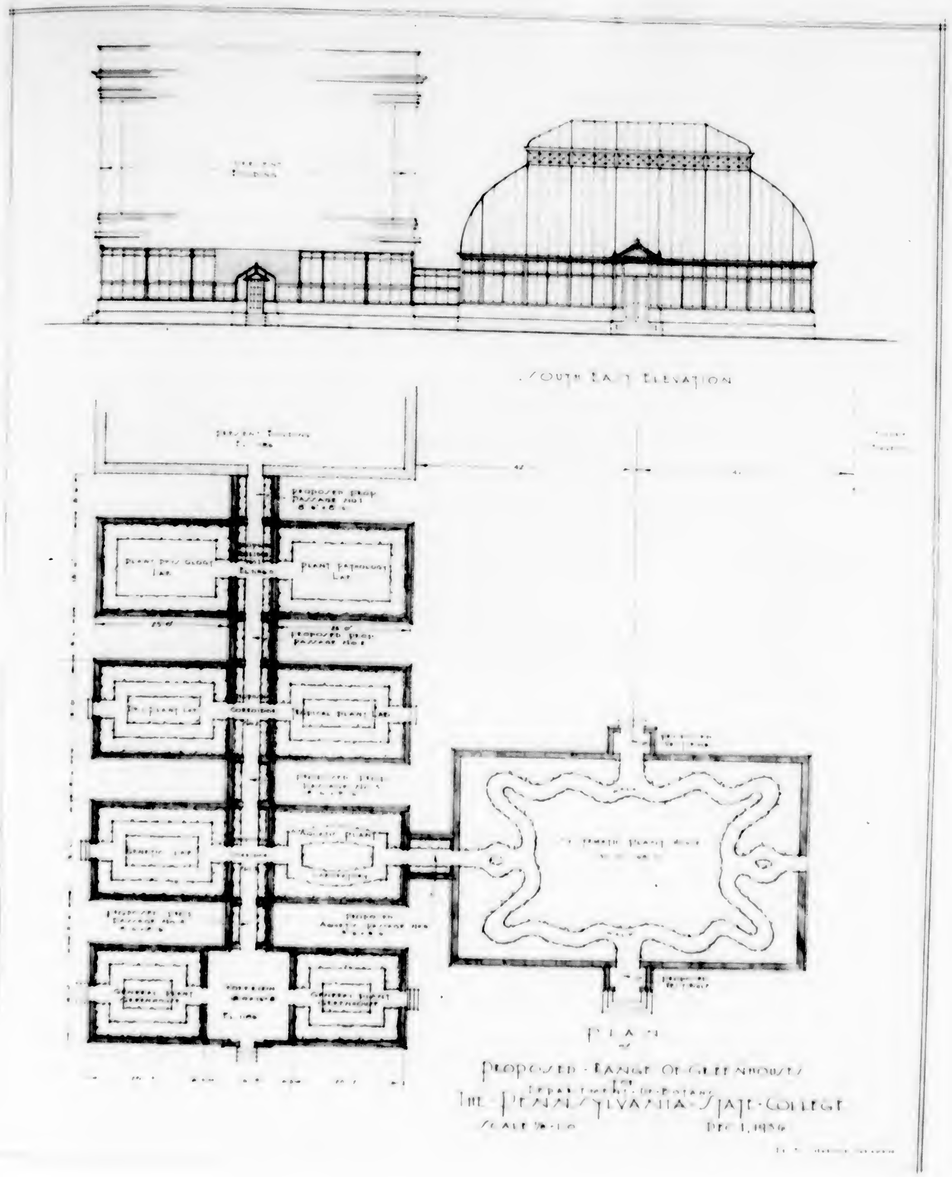
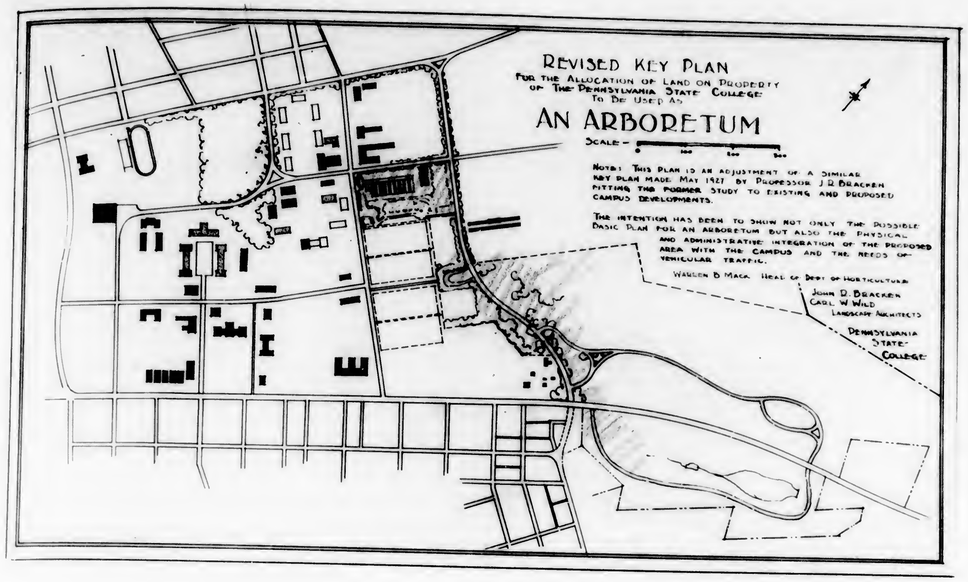


Plate 14

Key plan for proposed arboretum, 1938
(Drawn by John R. Bracken and Carl W. Wild for basis of study by recently appointed faculty committee.)



EARLY PLANS FOR HORTICULTURAL GARDENS AT THE PENNSYLVANIA STATE COLLEGE

Plate 15

January 1928 location west of dairy barn
(By Professor John R. Bracken)

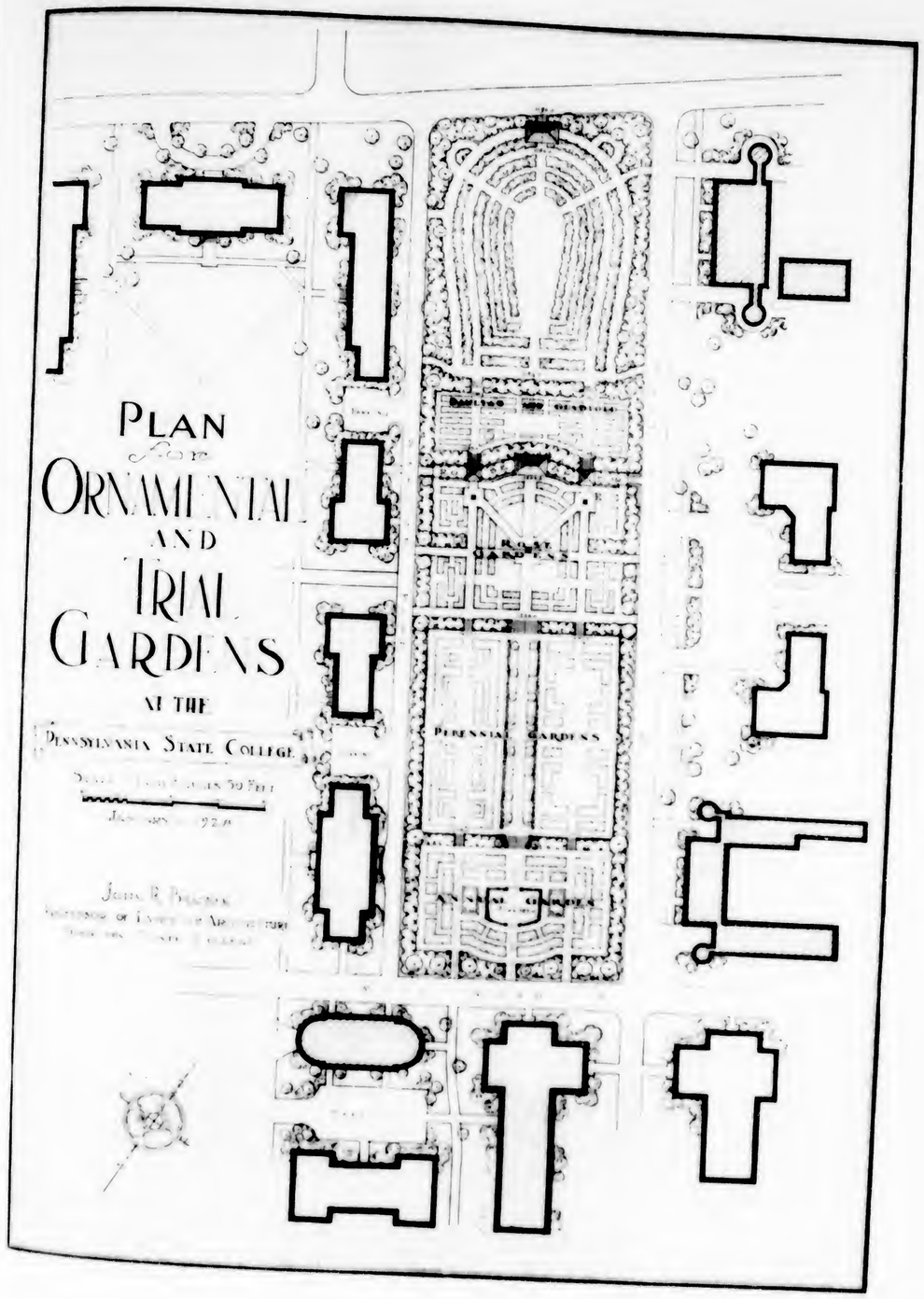
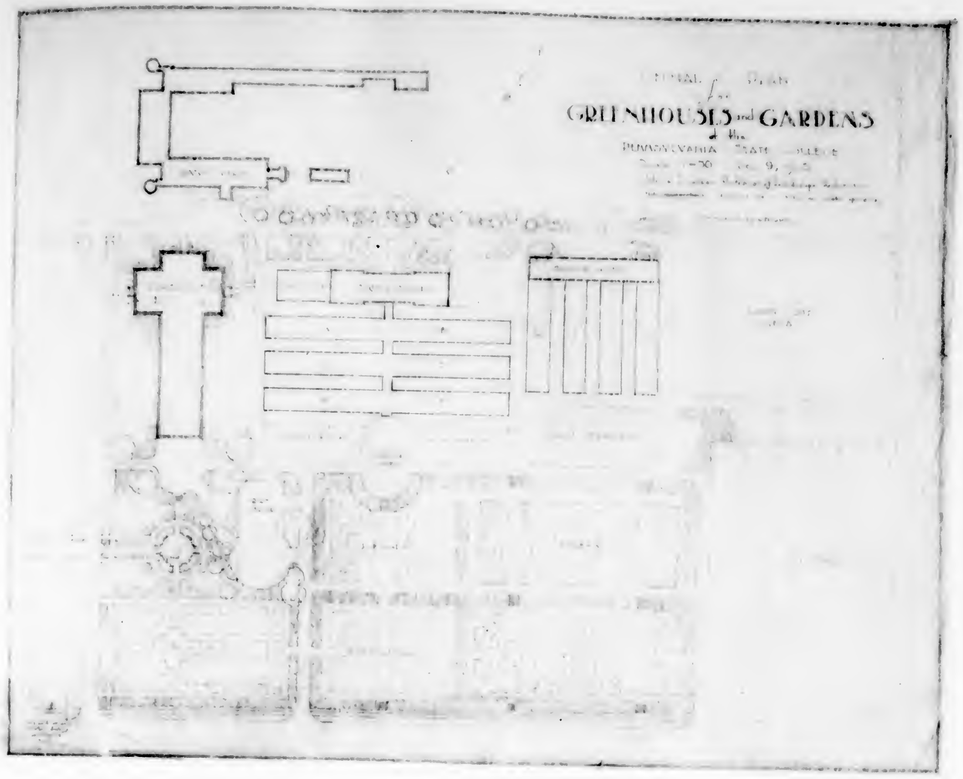


Plate 16

December 1928 general plan study showing greenhouses
and gardens proposed southeast of dairy barn
(By Professor John R. Bracken)



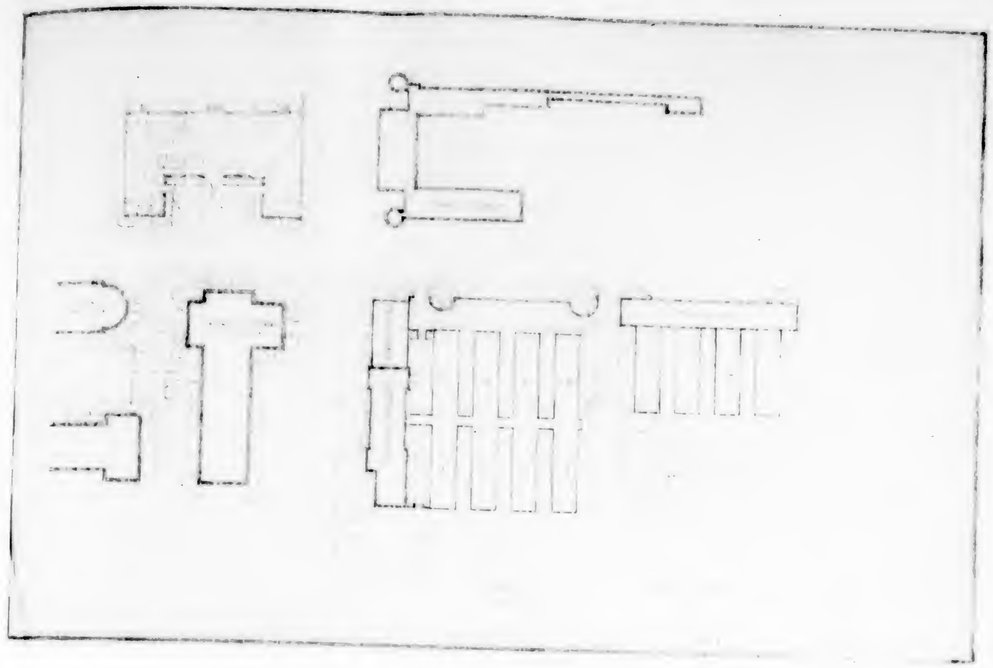


Plate 17

December 1928 general plan and further detail
for gardens at same location
(By Professor John R. Bracken)

DESIGN AND POLICY RECOMMENDATIONS
BY WRITER AS RESULT OF THIS INVESTIGATION

Plate 18

Topographical survey of proposed site for gardens

Plate 19

January 1936 preliminary study for gardens
(By C. W. Wild)

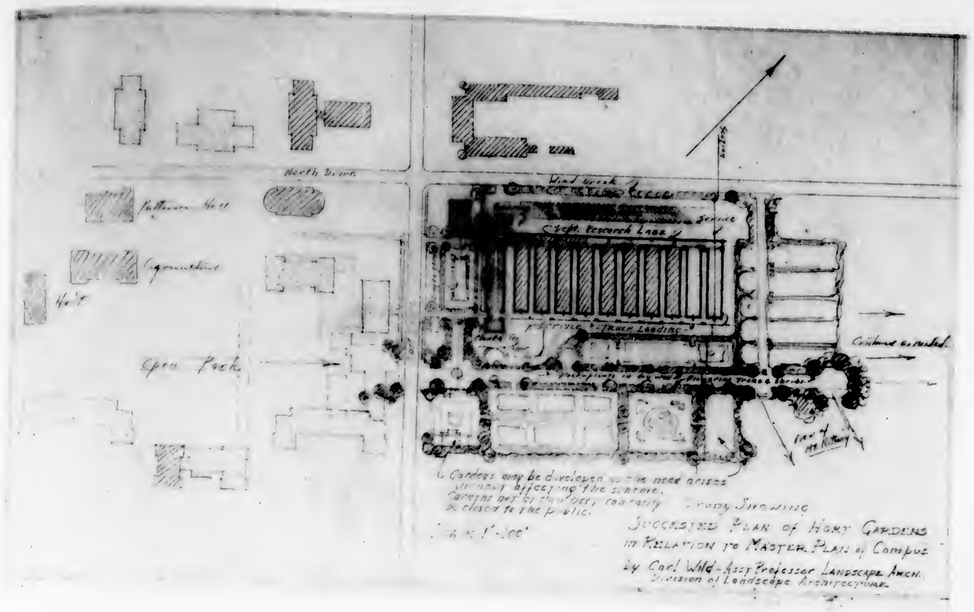


Plate 20

Key plan showing relation of proposed gardens with campus
(By C. W. Wild)

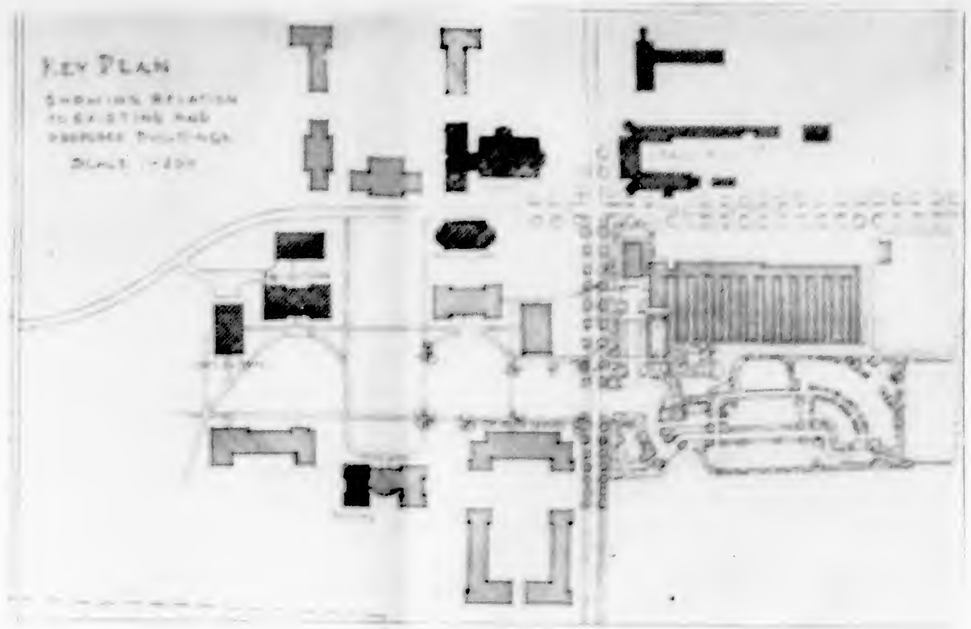
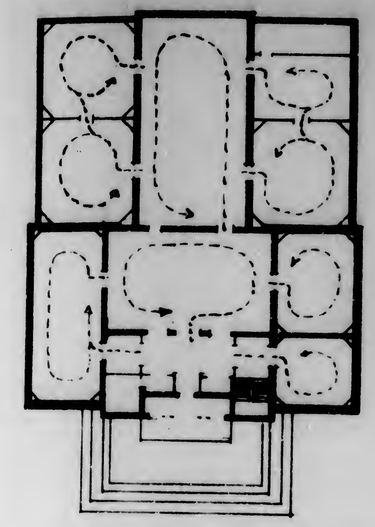


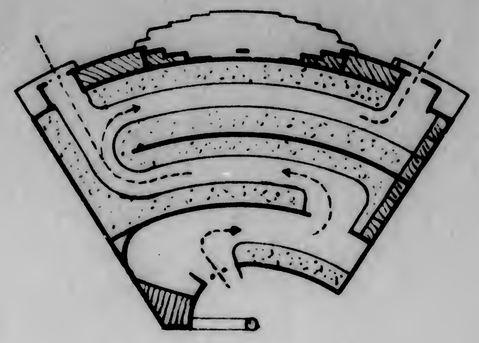
Plate 21

Comparison of static and fluent design in museum buildings

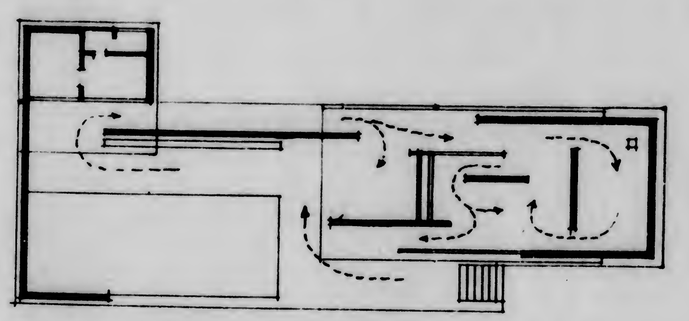
STATIC & FLUENT PLANS FOR EXHIBITION BUILDINGS



ART MUSEUM
ROCHESTER, N.Y.
STATIC



PROPOSED
EXHIBITION BUILDING
NEW YORK WORLD FAIR 1939
G. L. PAINE JR. - DESIGNER
FLUENT



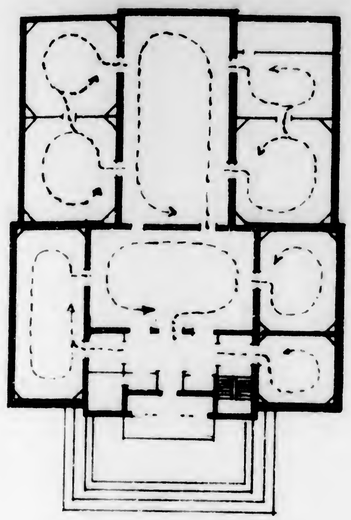
GERMAN PAVILION - BARCELONA EXPOSITION
by MIES VAN DER ROHE 1929
- FLUENT

PLATE-21

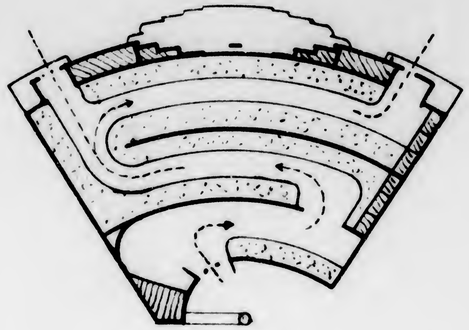
Plate 21

Comparison of static and fluent design in museum buildings

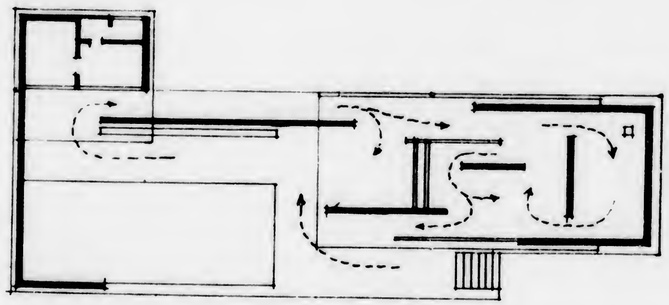
STATIC & FLUENT PLANS FOR EXHIBITION BUILDINGS



ART MUSEUM
ROCHESTER, N.Y.
STATIC



PROPOSED
EXHIBITION BUILDING
NEW YORK WORLD FAIR 1939
G. L. PAINE JR. - DESIGNER
FLUENT



GERMAN PAVILION - BARCELONA EXPOSITION
by MIES VAN DER ROHE 1929
- FLUENT

PLATE-21

Plate 22

Comparison of static and fluent design in outdoor areas

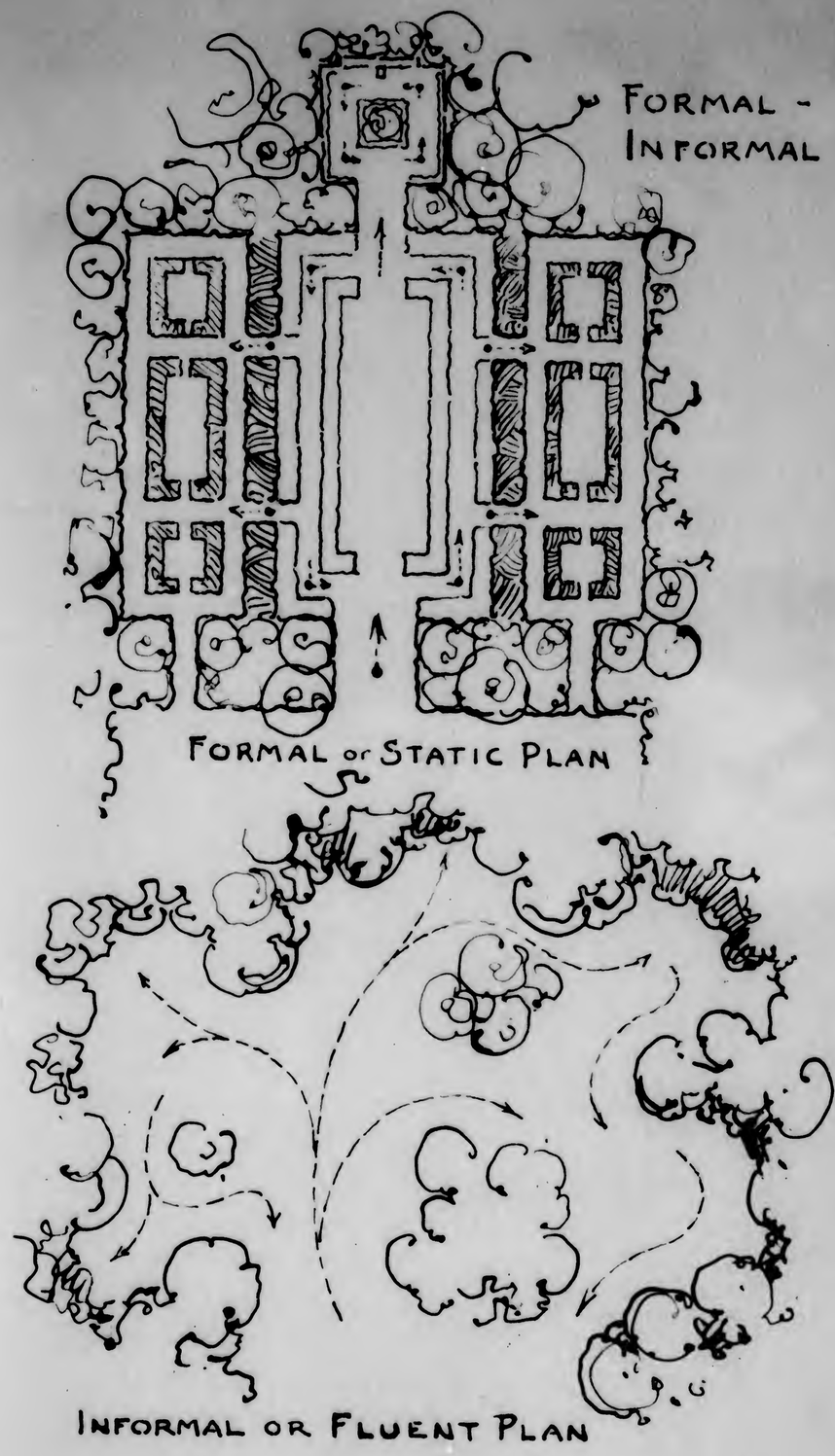


Plate 22

Comparison of static and fluent design in outdoor areas

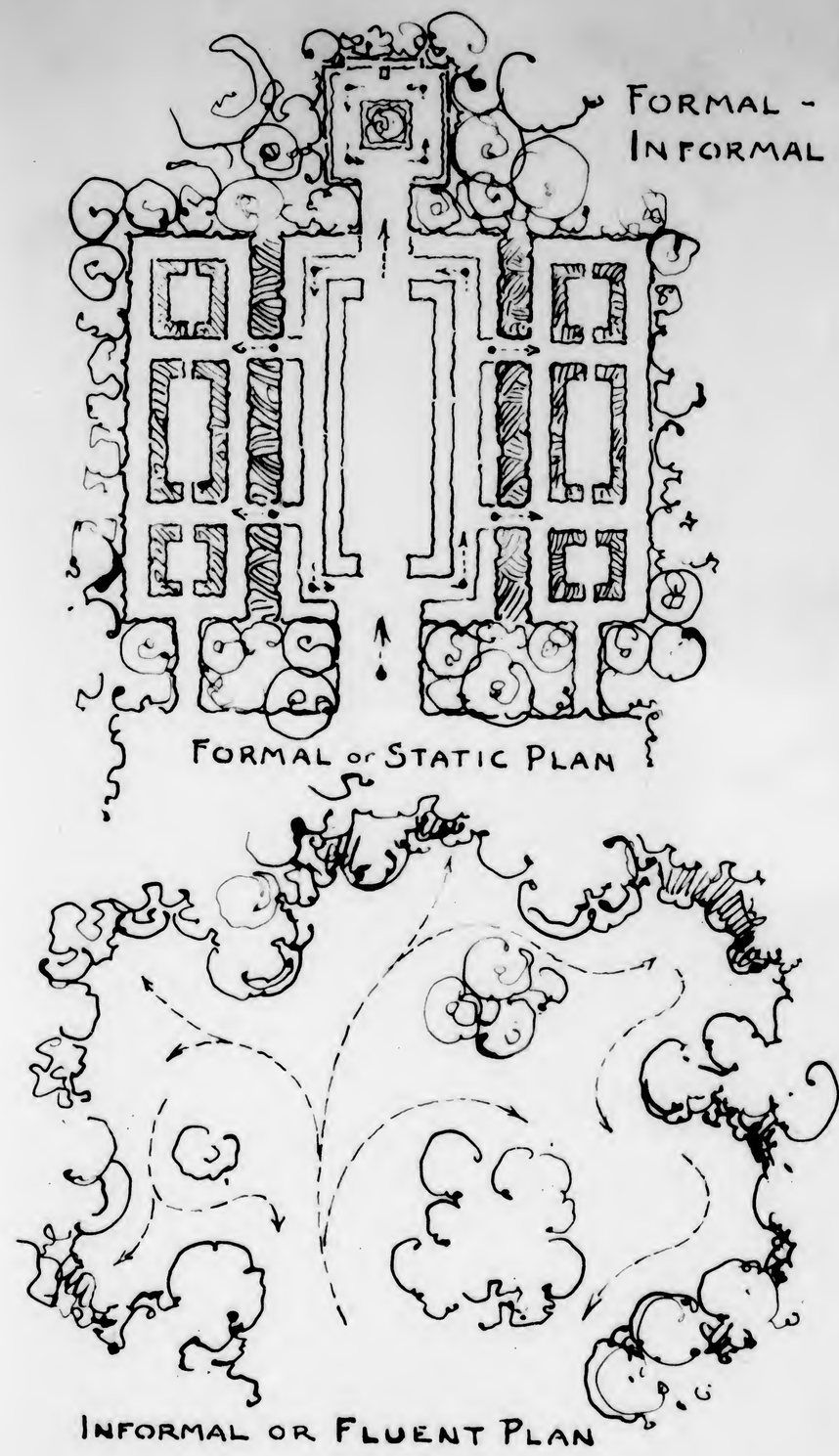
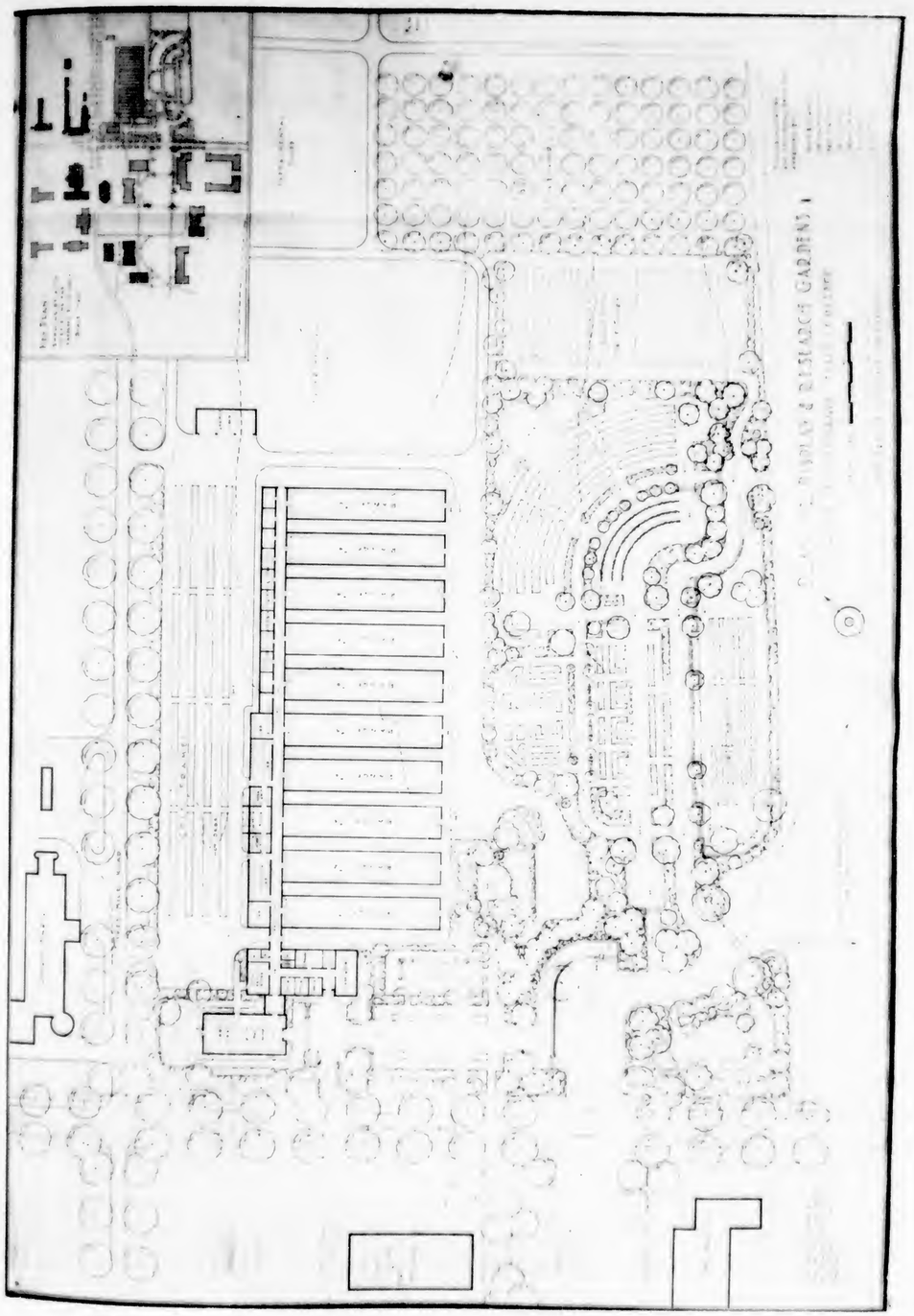


Plate 23

April 1936 general plan for gardens and greenhouses
(now approved by Board of Trustees, College Administration,
College Landscape Architect)
(By C. W. Wild)



SKETCHES

(By C. W. Wild)

Plate 24

Plan of gardens showing location from which sketches have been taken

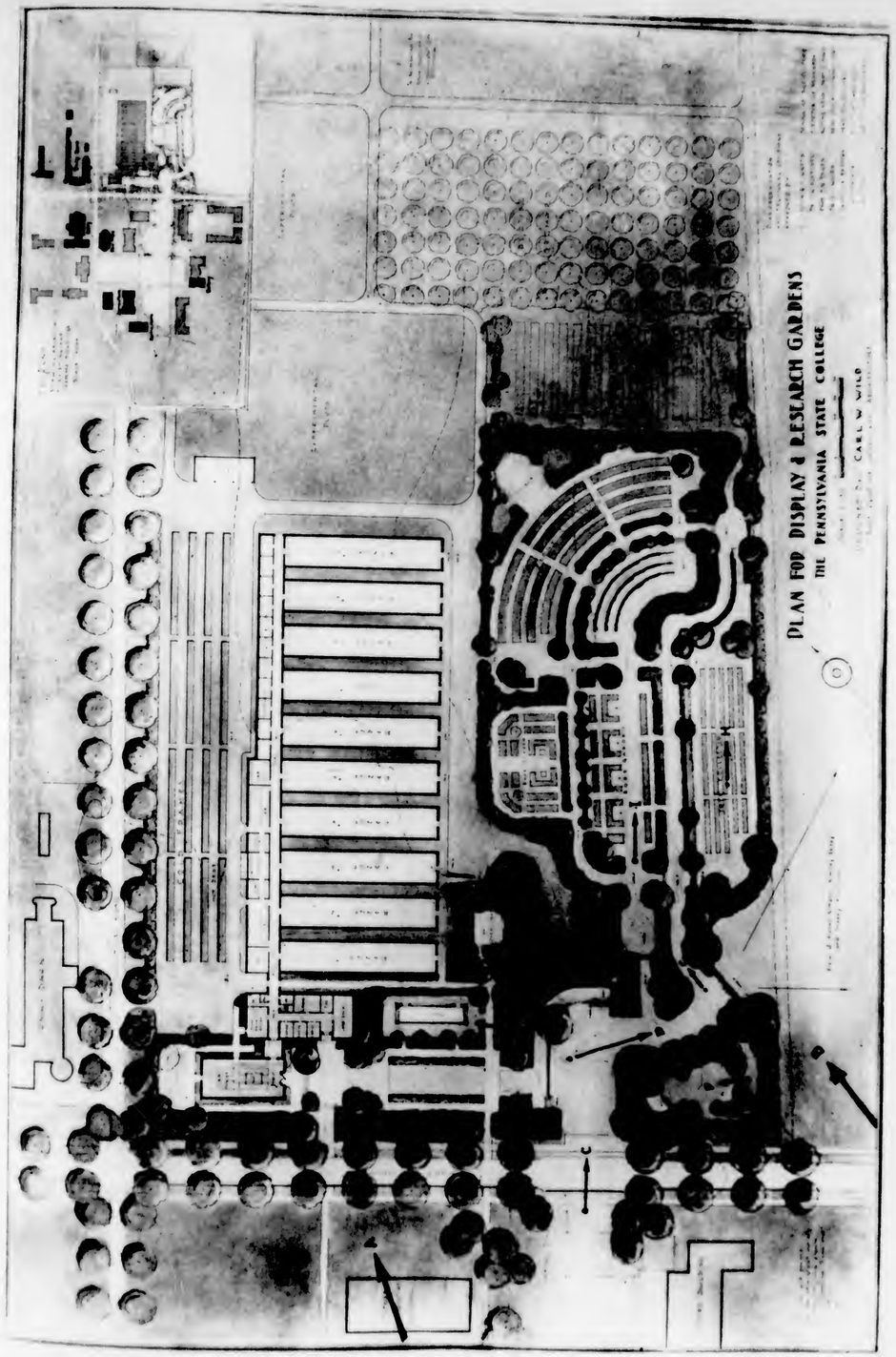


Plate 24

Plan of gardens showing location from which sketches have been taken

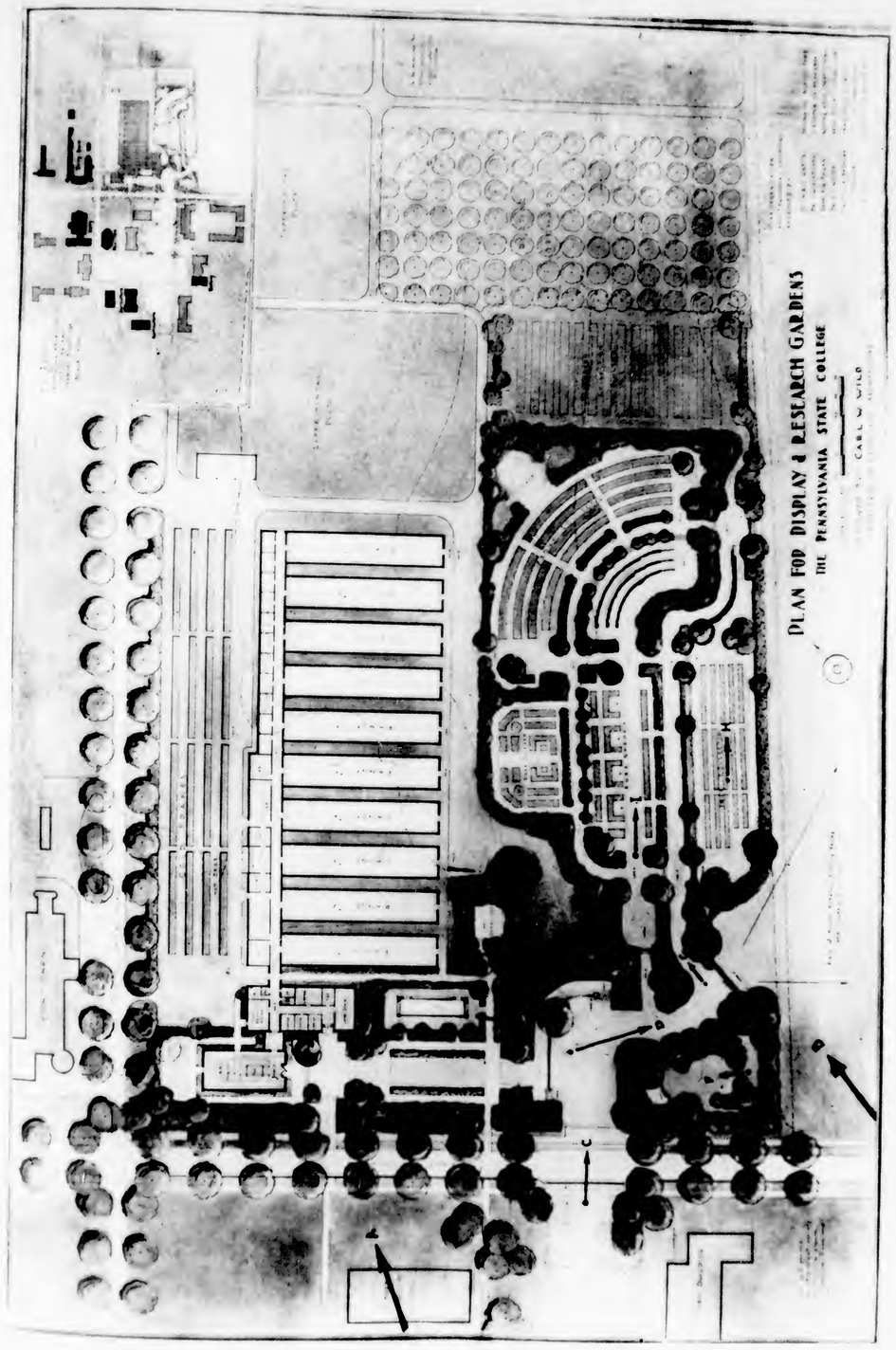
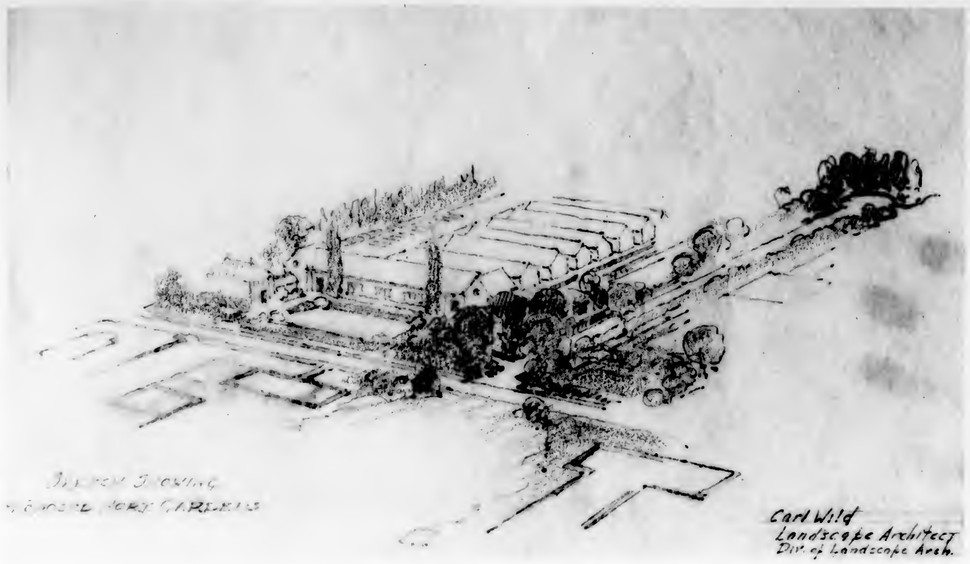


Plate 25 (A)

View of greenhouses and gardens looking from Botany Building



COLOR PLATE

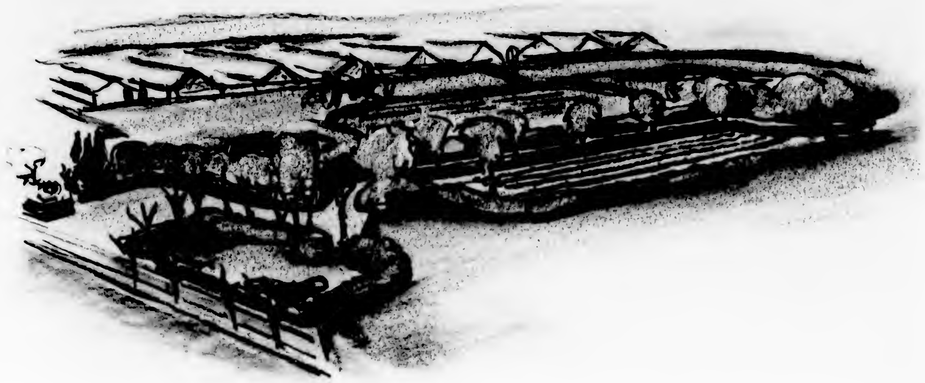


Plate 26 (B)

General view of gardens

COLOR PLATE

Plate 27 (C)

Entrance area

COLOR PLATE

Plate 28 (D)

Entrance and view toward overlook

COLOR PLATE

Plate 29 (E)

Bird's-eye view of entrance

COLOR PLATE

Plate 30 (F)

Native shrub area

COLOR PLATE

Plate 31 (G)

View toward lilac walk

COLOR PLATE

Plate 32 (H)

View in iris garden

COLOR PLATE

Plate 33 (I)

View in rose garden

COLOR PLATE

Plate 34

Model of gardens looking northeast

COLOR PLATE

Plate 35

Model of gardens looking northwest

COLOR PLATE

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