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Director's Report

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Rancho Santa Ana Botanic Garden

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THE DIRECTOR'S REPORT

RANCHO SANTA ANA BOTANIC GARDEN

1970

In several respects the year 1970 will stand out as special in the history of the botanic garden. Foremost perhaps was the building program which saw the completion late in the year of the new laboratory annex referred to briefly in last year's report. The annex was made possible by a National Science Foundation grant to the Claremont Graduate School and matching funds from the botanic garden. Enclosed by the administration building on the south and the annex on the west is a large freeform reflecting pool whose long axis is directed to Mt. Baldy in the distance. This attractive addition to the garden was not planned originally but developed as a solution to the problem of supplying a source of water adequate for fire protection. The annex, a building of steel and poured concrete, consists of a full basement and one floor devoted to laboratories. Plans call for a future second story which will be connected to the administration building by a bridge.

It has now been one year since the garden's main water pipeline system was ceramic lined and it is a pleasure to report that no new leaks have developed and that the water pressure in the system has never been greater. This modern approach to the repair of rusted and leaking pipe appears to have considerable merit. In addition to costing less than replacing pipe the work was completed with the destruction of very little planting, a most important consideration in a botanic garden.

All the events of the year were not on the positive side and it is depressing to have to report increased air pollution and increased damage to many of the garden's plantings. Unless the level of air pollution can be lowered within the next few years entire plantings may be eliminated and the garden will not be able to fulfill all the functions for which it was originally created. This may be a drastic prediction but it is not without foundation since we have witnessed an ever increasing amount of pollution since we have been in Claremont and no certain relief appears imminent.

ADMINISTRATION:

Two staff appointments were made during the year. In late January, Mrs. Betty Brunstad was appointed Secretary replacing Mrs. Cledith Rue. Before coming to the garden, Mrs. Brunstad had been with the Office of Development at Scripps College. By action of the Board of Trustees, the position of Librarian which has been half-time was raised to full-time and in June, Mrs. Beatrice Beck was appointed the garden's first full-time Librarian. The change was made necessary because of the growing size of the collection and the increased use which the library is receiving from

students, staff and visiting professional biologists. During the summer Mrs. Beck began to make a number of long overdue and badly needed changes in the library's operation. Mrs. Beck has an M.S. in Library Science and before coming to the garden was a librarian at California State College, Los Angeles, a position she had held for nine years.

In June, Dr. Benjamin accepted appointment for a five-year term as Editor-in-Chief of the journal *Mycologia*, official organ of the Mycological Society of America. In August, he attended the annual meeting of the American Institute of Biological Sciences held at Indiana University, Bloomington. Dr. Benjamin continues as a member of the Advisory Committee on Fungi, American Type Culture Collection, and the Board of Editors of the Mycological Society's *Mycologia Memoirs*. He completed his three-year term as the Botany Department's representative on the Graduate Council of the Claremont Graduate School in June.

In April, Dr. Carlquist attended a symposium, held in Washington, D.C., concerning Endangered Species in the Hawaiian Islands. He presented a paper on endangered endemic Hawaiian plants to an audience consisting of the participants of this symposium. Dr. Carlquist presented talks during the year at California State College units at San Bernardino, Fullerton, Long Beach and Los Angeles.

Dr. Lenz continued to serve as Chairman of the Graduate Faculty in Botany and completed a term as member of the Graduate School's Academic Programs Committee. He continues to serve on the Life Science's Field Committee and was appointed to the Academic Procedures Committee and to a three-year term on the Graduate Council of the Claremont Graduate School.

In March, Dr. Simon attended the 25th annual meeting of the Society for the Study of Evolution which was held at the University of Texas, Austin. There he presented a paper on the serological relationships of the order Nymphaeales. In June and July, Dr. Simon left Claremont for Washington, D.C., where he was an invited participant of the Institute of Systematics IV, sponsored by the Smithsonian Institution and the National Science Foundation. The end of the year found Dr. Simon in Chile and Argentina where he is spending three months collecting and studying several disjunct species groups found in western North and South America, particularly in California and Chile. This research is being sponsored by a National Science Foundation grant and is part of the International Biology Program (IBP).

In January, Dr. Thorne attended a conference at the University of California, Santa Barbara, of the curators of herbaria of the various branches of the University of California and selected private institutions. At this same conference Dr. Lenz attended the meeting of the botanic garden directors. In March, Dr. Thorne lectured to the field biology class at the Marine Biology Center of the University of Southern California on Santa Catalina Island. In July, at the garden he lectured to a group of teachers attending a Summer Institute at Loma Linda University. In August, he

spent several days at the California Academy of Sciences at San Francisco doing research in the herbarium. Later that month he participated at the American Institute of Biological Sciences meetings in Bloomington, Indiana.

WEATHER:

Rainfall for the 1969-70 season was 12.89 inches, four and one-half inches below normal and almost twenty-two inches less than the 1968-69 season, which was the wettest since 1957-58.

RAINFALL REPORT

	1968-69	1969-70	Average*
July	0.30	0.00	0.05
August	0.03	0.00	0.02
September	0.00	0.00	0.41
October	0.34	0.00	0.22
November	0.65	1.90	2.98
December	1.18	0.29	2.44
January	16.69	1.61	3.67
February	13.48	1.97	3.29
March	0.99	6.85	2.23
April	1.02	0.06	1.77
May	0.13	0.00	0.22
June	0.00	0.21	0.10
	<hr/> 34.81	<hr/> 12.89	<hr/> 17.40

*Average based on the rainfall recorded for the past ten years.

On July 4, 1970, the temperature rose to 108° F, the highest recorded during the year. The lowest temperature of 30° F was recorded on January 2, 3 and 4. In comparison, the high for 1968 was 107° F and the low 32° F. In 1969, there were 66 days with temperatures above 90° F and in 1970 we had 87 days, fifteen of these were over 100° F. During 1970 the lowest relative humidity was 1%, recorded on September 25, we also experienced 44 days with a relative humidity of 10% or less.

Amounts of water used during the past five years

Year	Water used (cu. feet)	Rainfall for Calendar Year (inches)
1966	3,558,600	16.30
1967	2,816,800	22.62
1968	3,148,900	10.00
1969	3,910,500	33.50
1970	4,524,700	20.03

SEEDS AND PLANTS:

The requests made from our 1970 Seed Exchange List were many. The list consisted of 129 collections of which 124 were from the wild and the remainder from the garden. During the year we received 111 requests for seed; 30 of these were from foreign countries, the remainder from the United States, and together they totaled 1,252 packets of seed.

Seed required for specific purposes are usually sent in larger quantities. Stanford University, California, required three species of *Zauschneria* for

the study of light requirements in germination. The University College of Wales received five species of *Allium* for chromosome evolution research. The University of Helsinki, Finland, was interested in obtaining seed of the family Compositae for protein study and two genera and five species were sent. Eight packets of seed were dispatched to the Royal Botanic Garden, Kew, England, to enable it to build up its collection of wild source plants. Seed of *Solanum wallacei* was given to the Biology Department of Immaculate Heart College, Los Angeles, for a research project on lectins. Seed of *Platanus racemosa* was sent to the United States Forest Service, Redding, California, for photographic purposes in connection with the revised *Woody Plant Seed Manual*. The School of Pharmacy University of Leeds, England, required seed of *Antirrhinum multiflorum* and *A. kellogii* for chemotaxonomic studies. Three species of *Atriplex* were sent to Colorado State University for nutritional studies of photorespiring and non-photorespiring plants. Seed of *Lilaea scilloides* was sent to Professor H. J. Gloor, University of Geneva, Switzerland. Nine packets of seed of native plants found at high elevation were sent to an Alpine Plant Society in Plzen, Czechoslovakia, for testing in their environment. Twelve packets of seed of plants native to the Lytle Creek area that had been devastated by fire were sent to the Biology Department of Pomona College for germination tests using the burnt over native soil as a medium. Thirteen packets of seed were sent to Los Angeles Nature Study Unit to be used in replanting areas where the natural flora had been destroyed.

Last spring the United States Department of Agriculture, Research Division, National Arboretum, Washington, D.C., requested pollen from our sycamores, *Platanus racemosa*, for their plant breeding program. A liberal supply was collected and dispatched. The Morris Arboretum of the University of Pennsylvania was supplied, on request, with leaves from our sycamores for chemotaxonomic studies.

During the year the garden received many requests from both institutions and nurseries for plant material. Deigaard Nurseries of Duarte were given cuttings of the following plants: *Pickeringia montana*, *Carpenteria californica*, *Ceanothus purpureus*, *Arctostaphylos insularis*, *Arctostaphylos stanfordiana* 'Trinity Ruby', *Dendromecon harfordii* var. *rhamnoides*, *Chilopsis linearis* and seed of *Cercocarpus ledifolius*. Monrovia Nurseries received cuttings of *Arctostaphylos* 'Point Reyes', Pomona Wholesale Nursery cuttings of *Arctostaphylos* 'Point Reyes', *Baccharis pilularis* 'Twin Peaks #2' and *Ceanothus* 'Hurricane Point'. The following cutting material and seed were given to the Malibu Station of the Los Angeles Forestry Department, cuttings of *Arctostaphylos silvicola*, *A. hookeri*, *A. uva-ursi* 'Radiant', *Eriogonum fasciculatum* 'Theodore Payne', *E. crocatum*, *Fremontodendron decumbens*, seed of *Mimulus aurantiacus*, *M. flemingii* (hyb), *Eriogonum crocatum*, *E. cinereum*.

It has always been the custom of the garden to give surplus plant materials to other institutions to build up their collection or replace losses they may have sustained. The following plants were given to the Department of Ornamental Horticulture, California Polytechnic College, Pomona: 1 Ar-

butus menziesii, 1 *Ceanothus* $\times$ (*C. fresnensis* $\times$ *C. cuneatus*), 1 *Ceanothus* $\times$ Malcolm Nobs, 6 *Greyia spinosa*, 1 *Populus fremontii*, 1 *P. trichocarpa*, 1 *Populus fremontii* var. *arizonica*, 2 *Quercus chrysolepis*, 9 *Romneya coulteri* and 1 *Salix* sp. The Tucker Wildlife Sanctuary, Orange County, received the following plant material to enable them to replant the area that was devastated by flood in 1968: 6 *Prunus virginiana* var. *demissa*, 6 *Lyonothamnus floribundus* var. *asplenifolius*, 3 *Comarostaphylis diversifolia* var. *planifolia*, 2 *Cercocarpus ledifolius*, 3 *Populus fremontii*, 2 *Cneoridium dumosum*, 3 *Garrya elliptica*, 6 *Tetracoccus dioicus*.

One hundred and fifty-two accessions were made during the year. One new genus and three new species have been added to our collections. There are 72 collections still to be accessioned, 12 from another institution, 21 privately donated and 39 collected in the wild by the staff. It is now the practice of the garden to wait until seed has germinated before an accession number is given.

Thirty-six collections of seed were made by John Dourley and Dick Tilforth on trips into the San Gabriel, San Bernardino and Riverside areas. Seed was also submitted by Dr. Philip Munz and Mary Coffeen.

GROUNDS:

After an extremely dry season, the month of March generously supplied us with much needed moisture, but 5½ inches of rain over a three-day period caused "damping off" of many annuals, especially *Clarkia* sp. and hybrids; however, apart from these setbacks our display of annuals was most colorful.

As the year progressed it brought weather conditions that would be detrimental to the well-being of any garden. It was hot, dry and possibly the smoggiest on record. The Los Angeles area had six smog alerts during the year, three of which occurred in June and the remainder in the generally accepted smog month of September. Evidence to corroborate this statement can be seen throughout the garden, especially in the conifer collection. Smog still takes a heavy toll of our Monterey pines, this year eight succumbed including one of our finest specimens. Losses have also occurred among *Pinus muricata* and for the first time *Pinus attenuata* has been affected, although only one accession (no. 8851) was affected and no evidence of smog damage has yet been observed on other plantings. Smog damage was observed on *Pinus murrayana*, *P. contorta* and *Picea sitchensis*. In the 1969 Director's Report, toxic damage was reported on these trees, supposedly caused by the herbicide Simazine. This year we lost one of each of the above mentioned species of pines and three *Picea sitchensis*, and though there was smog damage to these trees it is still difficult to say which of the contributing factors was responsible for killing them.

The cypress bark beetle (*Phloeosinus cristatus*) described in the Director's Report for 1969 attacked the garden plantings this year with devastating effect. It was possible on many occasions to rake up a wheelbarrow load of dead twigs from under badly affected trees. Three *Cupressus pygmae* succumbed to the attack, but it was observed that these trees had been weakened by the disease *Coryneum cardinale* (Fungi Imperfecti,

Melanconiaceae). It would appear that any cypress, weakened by drought or lack of nutrition, might succumb to a heavy infestation of this beetle. Although we sprayed with 80% wettable Sevin as recommended, our timing was poor and we were not prepared for two broods of this insect, the first in early May and the second in late June and early July. Next year we hope to obtain better results using a systemic instead of 80% wettable Sevin, with application in mid-March rather than late March.

It is never a happy task to report each year that vandalism continues within the garden. Although not quite so bad as last year, it is an irritating factor in the operation of the garden. Last spring vandals started a fire in the center of a *Yucca whipplei* in the Plant Community Area. The fire burned out of control and spread rapidly to a group of digger pines, severely damaging two of them. If an alert local resident had not called the Fire Department the situation would have become very serious. Another form of vandalism not encountered before was the wanton destruction of new plantings. Seventeen young *Ceanothus cyaneus* were pulled out of the ground and left to dry in the hot sun. Six young *Platanus racemosa* and eight *Penstemon antirrhinoides* suffered the same fate. During the course of the year 32 redwood signs were badly mutilated, 17 of these were repairable but the remainder had to be remade. Most aggravating is removal by vandals of the aluminum labels from our new bulb plantings. Usually, the bulbs are dormant and when several plantings consist of alliums and brodiaeas it is necessary to wait until the bulbs flower before the labels can be replaced. Many of our plastic labels are missing but no doubt some will be recovered when we clean the pond.

More than 9,500 plants were planted on the grounds this year, over 2,000 of these were seedlings of Pacific Coast hybrid iris lined out in the experimental garden.

The Laird Paving Company, Claremont, gave the garden, on request, over 160 truckloads of soil and fill. Pomona College granted the garden permission to store this on their property which lies east of the garden. Much of this material has been added to the Coastal Sand Dune Area, which now has greater depth and dimension. This will be advantageous in displaying the wide variety of plants that grow on coastal sand dunes and bluffs.

FIELD WORK:

The amount of field work carried on in the state by the staff varies from year to year depending to a large extent upon the favorableness of the season. For several years the desert areas have failed to receive sufficient moisture during the winter to produce a good growing season and as a result little field work in the deserts has been possible. In 1970, lack of rainfall throughout much of the state curtailed field work in many areas. Dr. Benjamin's field studies were limited to local forays in southern California. Dr. Lenz collected in the area of the Pinnacles National Monument and San Luis Obispo County but it was a poor year of brodiaeas.

Dr. Thorne continued his local collecting on Santa Catalina Island and the mountains of southern California. In addition he took two short trips into Baja California, and participated in two longer expeditions to mainland Mexico, with concentration on the upland cloud and pine-oak forests and lowland tropical rain forests of Chiapas and the mountain forests of the Sierra Surotato of Sinaloa. More than 1,500 Mexican collections were made to fill in the serious gaps in our representation of that country.

During late spring, Dr. Simon made several collecting trips to the foothills of the Sierra Nevada and to the coastal mountains of central California. His main interest has been to survey and collect populations of *Lupinus densiflorus* in order to compare them with the disjunct species *L. microcarpus* from Chile. The end of the year found Dr. Simon in Chile and Argentina where he carried out an extensive survey and collections of selected disjunct species groups which also occur in California.

SCIENTIFIC COLLECTIONS:

The integrated herbaria of Pomona College and the garden are now generally in excellent conditions although some of the Pomona collections are still being repaired. All are now in new color-coded genus or species covers with the California specimens arranged alphabetically by county within each species, and the non-California collections arranged geographically by states, provinces, and countries within the alphabetically arranged species. More than 9,000 newly mounted specimen belonging to the garden have been filed into the vascular plant collections, necessitating the addition of hundreds of new genus or species covers. From the combined herbaria 1,623 sheets were sent on loan to 12 institutions in 15 shipments; 4,127 sheets in 25 loans were returned to us from 20 institutions; 251 sheets were borrowed by us from four herbaria; and 26 sheets were returned by us to one herbarium. During 1970, the graduate assistants mounted 9,091 sheets of vascular plants, bringing the botanic garden collection to more than 214,000 sheets and the integrated herbaria to perhaps 529,000 sheets of vascular plants. Received on an exchange basis were 5,203 specimens from 31 institutions; whereas, the garden sent out on exchange 4,302 specimens to 45 institutions or individual botanists. At present the garden owes 14,604 sheets to 40 herbaria, and is owed 10,204 sheets by 51 herbaria. More than 5,000 specimens of vascular plants were received as gifts, some for determination, from 17 individuals or institutions.

Of the 9,091 sheets processed, nearly 3,000 were from California; more than 1,000 from mainland Mexico; 1,300 from other parts of North America, especially the Queen Charlotte Islands of British Columbia, Idaho, Iowa, and Florida; 3,000 from the Pacific Islands; and nearly 800 from Europe and tropical America. The acquisition of the processed sheets included nearly 5,100 from exchanges; 3,500 by gifts; and about 500 through recent staff and student collections.

The efforts of the garden herbarium staff to achieve adequate representation of the various groups of vascular plants from all parts of the world for research, reference, and teaching purposes have continued with consid-

erable success. A recent survey of the collections showed representation in 348 of the 364 vascular plant families recognized as valid in the curator's current system of classification. The 16 missing families are mostly monogeneric taxa of tropical Africa, Madagascar, and Communist China. The integrated herbaria, of course, remain strongest in California and other Western American plants although our collections from throughout the Pacific area have become quite significant and often consulted.

During the summer John Dourley visited the Morris Arboretum of the University of Pennsylvania to arrange for a mutual exchange of herbarium material.

Approximately 80 new isolates were added to the fungus culture collection. The type cultures of several recently-described fungi were among these, including that of a new genus of Mucorales, *Hesseltinella vesiculosa* Upadhyay, received from the Northern Regional Laboratories, United States Department of Agriculture, Peoria, Illinois. Mr. David Malloch, University of Toronto, kindly sent cultures of 29 cleistothecial Ascomycetes to Mr. Gerald Benny, a graduate student in mycology, for use in his studies. Approximately 100 slide-mounts representing 80 accessions of Laboulbeniales were prepared by Dr. Benjamin. These additions included a number of undescribed taxa found on specimens from two large accumulations of insects kindly provided for examination by Drs. E. L. Sleeper, Department of Entomology, Long Beach State College, and John T. Polhemus, Englewood, Colorado. Routine maintenance of the culture collection required over 1,000 transfers of isolates to fresh media. Much of this work was carried out by Mr. Benny.

LIBRARY:

Organizational improvement has continued to be the library's theme during 1970. This included a much needed inventory of the periodicals which in turn generated numerous additional projects, thus, continuing the work started earlier on improving the serial records. Many lacking issues are being requested and the completed volumes are being bound. Perhaps the largest single bindery shipment of 228 volumes was sent in December.

Serial and periodical statistics show 424 current titles received; 1,670 single issues checked in, including 18 bound volumes; 8 new titles added; 4 titles deleted; and 271 volumes sent to the bindery. The periodical inventory produced many items that needed cataloguing. During the year, 524 volumes were catalogued; 350 volumes accessioned; 113 new books received, 53 were deposited in the garden library by Honnold Library; 125 volumes reclassified; and 71 old volumes assigned subject headings. Number 31 of *Index Nominum Genericorum* and numbers 257 through 259 of the *Gray Herbarium Card Index* were filed as were 222 reprints.

Additional projects included the reorganization of the "rare book" room, which is now used for storage as well as the housing of rare materials, and the reconditioning of leather-bound volumes by the graduate students as part of their traineeship assignment.

Capital equipment expenditures included: a secretarial chair, paper cutter, and a new typing table. Physical changes within the library are two wooden panels, a large bulletin board and the painting of the office area.

Work will continue into 1971 on a periodical listing that will become part of a computer print-out that Honnold Library is compiling of the science holdings of The Claremont Colleges.

RESEARCH ACTIVITIES:

Dr. Benjamin's research activities during the year centered around his continuing studies of Laboulbeniales. He completed and published in *Aliso* a second paper on studies of Laboulbeniales on semiaquatic Hemiptera in which a new genus, *Prolixandromyces*, was described. Final revisions of the galley and page proof of his *Introduction and Supplement* to Thaxter's monograph of the Laboulbeniales were made. An advance copy of the work has been received by Dr. Benjamin from the publisher, J. Cramer, Lehre, Germany, but it is not scheduled for general release until January, 1971, along with the reprint of the monograph itself.

Lyman Benson's research during the year continued to emphasize the Cactaceae. Treatments of the family for Texas appeared in C. L. Lundell's *Flora of Texas* and in Donovan S. Correll and Marshall C. Johnston's *Manual of the Vascular Plants of Texas*, and papers on the cacti appeared in the *Cactus and Succulent Journal*. The manuscript for *The Cacti of the United States and Canada* was completed and the illustrations are nearly ready for publication. Preparation of the third edition of *The Trees and Shrubs of the Southwestern Deserts* became a major undertaking, the work having moved forward slowly since publication of the second edition in 1954.

Dr. Carlquist's research during the year has featured completion of work on the anatomy of the Juan Fernandez genera *Robinsonia*, *Rhetinodendron*, and *Symphyochaeta* (Asteraceae: Senecioneae). He completed two manuscripts: "Wood anatomy of Macaronesian and other Brassicaceae," and "Plant Anatomy's 300th Anniversary." Dr. Carlquist's current research efforts feature completion of studies on insular woodiness, and initiation of studies of wood anatomy in non-insular plants as well. These studies have been pursued with the assistance of a grant from the National Science Foundation, GB 14092. Dr. Carlquist currently has in planning stages a scientific book on biology of insular areas, and a book on evolutionary plant anatomy.

Dr. Lenz continued his investigations of *Triteleia*, particularly from the cytological standpoint. During the year he prepared two manuscripts describing new taxa, one being a very interesting and attractive endemic from Guadalupe Island. He also prepared for publication a manuscript describing two new species of *Dandya* from Mexico and at the same time reviewed the genera *Behria* and *Bessera*. Cytological work on the species of *Milla* continued and a manuscript reporting chromosome numbers of 15 taxa was completed.

Dr. Munz continued working on his flora of southern California and at the end of the year the manuscript was nearly completed. The work will be

published by the University of California Press. In addition to helping staff members with Latin descriptions and counseling graduate students he found time to continue his studies of the Onagraceae for a flora of Santa Catarina, Brazil, and the flora of Ecuador.

Dr. Thorne has continued his studies of the flora of the southern California islands and the Santa Rosa Plateau of the Santa Ana Mountains, with additional papers published on these areas. He has done considerable additional field work on the San Gabriel Mountains, most recently on the desert slopes, in preparation for the projected flora of that range in cooperation with Dr. Louis Wheeler of the University of Southern California and Dr. Joseph Ewan of Tulane University. Work has been continued on his new system of classification of the Angiospermae and upon the plant communities of California. A paper for publication has been sent to the Smithsonian on the floristic relationships between tropical America and tropical Africa. An annotated checklist is being prepared in conjunction with Dr. Earl Lathrop of Loma Linda University and Dr. Dennis Breedlove of the California Academy of Sciences on the vascular plants of the Pueblo Nuevo Solistahuacan area of the Northern Highlands of Chiapas. An annotated list of the vascular plants of Iowa is in preparation for publication by the University of Iowa Studies in Natural History.

Dr. Simon is continuing his serological investigation of the order Nymphaeales. A preliminary account of the relationships of *Nelumbo* was published in the 1970 issue of *Aliso* and a second publication of this series is presented in this issue. He also made good progress in the study on the relationships of the disjunct species groups of *Prosopis* (Leguminosae) found in North and South America. Dr. Simon prepared an invited paper on the serological relationships of *P. juliflora* and *P. chilensis* that was given at the meeting of the International Biology Program which was held December 16-23 at Salta and Tucuman, Argentina.

GRADUATE INSTRUCTION:

The graduate program in botany is the joint undertaking of the Claremont Graduate School, Pomona College and the botanic garden. During the past year two students completed the requirements for the Ph.D. Theodore Mortenson's thesis subject was an anatomical and ecological study of species of *Cercocarpus*. Ruth Wilson's thesis was a study of the reproductive biology of certain species of *Abronia*. Both theses were directed by Dr. Carlquist. Dr. Mortenson accepted a position as assistant professor at Chapman College in Orange. Dr. Wilson is an instructor at California State College, Los Angeles.

Students enrolling for the first time are David Wheat, a graduate of Pomona College, and Colin Wainwright from San Fernando Valley State College, Northridge. Other students are Christopher Davidson, Gerald Benny, Arthur Gibson and Gary Cromwell. Professor Homer Metcalf, whose Ph.D. thesis is to be a study of the irises of the Longipetalae complex was not in residence during the year.

The science laboratory annex which was mentioned in the 1969 report was completed late in the year and is now occupied by Drs. Simon and Carlquist and their students. Released space in the administration building is being converted into a mycological laboratory for Dr. Benjamin and his students. The annex was built with matching funds from the National Science Foundation and the botanic garden.

The Claremont Graduate School is one of the graduate institutions in the United States planning to offer the Doctor of Arts degree in certain fields. This is a degree directed toward fulfilling the needs of students who plan to devote most of their time to teaching rather than to research and teaching and who usually receive the Ph.D. After a careful study of the program, the faculty in botany developed plans to offer a Doctor of Arts in botany hopefully to begin with the 1971-72 academic year. Already two students have indicated an interest in enrolling for the program.

YOUTH PROGRAM:

The second annual Nature Interpretation class conducted during January and February added ten people to our corps of volunteers. Those completing the course were: Arlene Banks, Caroline Beatty, Miki Bratt, Peg Davis, Doris Drewes, Kathryn Knapp, Betty Lu Muraszew, Joan Palladino, Isaac Rabinovitch and Rena Smilkstein.

During January and February, a group of the volunteers worked with Molly Cornell on a broad revision of the teaching resource slides. The result was four new sets of slides titled "Natural Life" with an accompanying script suitable for all elementary school ages. These are used by the teachers in preparing their classes for a visit to the garden.

In response to increasing inquiry from teachers and youth group leaders, the Youth Department put together a three-page list entitled "Some Helpful Books for Fostering an Ecological Viewpoint." Mrs. Coffeen was aided in this project by the volunteers and Winifred Ragsdale of the George G. Stone Center for Children's Books at the Claremont Graduate School.

Georgia Hall, a student at Pitzer College, joined the Youth Department this fall to help with the clerical work of the program.

The afternoon junior ecology study groups continued during 1970 to be a small but active part of the garden's program for youth. Leadership for these young naturalists was provided by Sally Vogel, Lucile Housely, Liz Allen, Molly Cornell, Beth Platt, Dave Powelson, Jeff Caldwell and Barbara Preston, with Mrs. Cornell, Mrs. Housely and Mrs. Vogel serving throughout the academic year. The Pomona Valley Audubon Society, who co-sponsor this program, purchased two junior microscopes for use by the children. During the fall the local Audubon board pledged a \$125 camper-ship to the summer session at the Audubon Camp of the West, with the stipulation that the successful applicant must contribute one school year of service to the junior ecology study groups.

During the fall Dr. William Wirtz of Pomona College Zoology Department demonstrated the setting up of mist-net and bird-banding. The 34

Audubon members who came at 6 a.m. were rewarded by being able to observe much bird activity and an informative demonstration.

On April 22nd the garden participated in Earth Day activities. The nature interpreters gave trail talks in the garden and Mrs. A. A. Banks spoke about our program as part of the teach-in activities at The Claremont Colleges. This was in addition to the regular school tours scheduled for that day.

Margaret (Mrs. George) Vennedge represented the garden at the fall conference of the Association for Outdoor Education in Santa Barbara.

The highlight of the fall Friday Foragers activities was a field trip to the Smilkstein cabin at Green Valley in the San Bernardino Mountains.

Regretfully, we lost the service of two of our nature interpreters; Arlene Banks is doing post-graduate work in urban planning and Doris Drewes is working toward a teaching credential in biology.

In order to better prepare themselves to serve as volunteers, many members of the Youth Education Program enroll in programs of continuing education. During the past year Arlene Banks, Harriett Johnson and Mary Coffeen enrolled at the University of California, Riverside, for an extension course entitled Natural History of Insects. Also at the same institution, Mary Coffeen enrolled in a course in Field Geology of the Sierra Nevada. Rena Smilkstein took a course in Plants in the Ecology of Man which was given at the University of California, Los Angeles. Molly Cornell and Harriett Johnson also enrolled in a course given at the Los Angeles State and County Arboretum entitled Natural History of Spiders, and one entitled Natural History of Death Valley.

SUMMARY OF YOUTH EDUCATION PROGRAM

Number of students or adults participating in organized programs during 1970:

	<i>Winter</i>	<i>Spring</i>	<i>Fall</i>	<i>Total</i>
Preplanning and Public Relations	79	146	88	311
Schools: Elementary	732	2,381	529	3,642
Junior and Senior High	208	450	400	1,058
College and Adult	32	0	0	32
Youth Groups	283	604	285	1,172
Non-school Adults	126	58	129	313
Afternoon Junior Ecology				
Groups: 4th grade	0	0	100	100
5th grade	140	80	100	320
6th grade	0	28	0	28
Junior high	0	0	48	48
Senior high	25	0	0	25
Nature Interpreters Service Record:	231	322	121	674
Average Nature Interpreter to student ratio: 1 to 8				
Classes/groups cancelled: 13				

PUBLIC SERVICE:

The public service portion of the garden's activities continues as a varied and interesting program participated in by all members of the garden staff. During the year Drs. Munz and Thorne were called upon on numerous occasions to identify plant material, both native and exotic. Dr. Lenz, John

Dourley and Dick Tilforth were consulted by many home gardeners during the year on a wide range of problems, most of them of a general horticultural nature rather than problems specifically related to the native flora. These men were also often called upon for consultation on major developments by land developers, landscape architects and employees of the county, state or federal government. In some instances consultations demand on-site inspections before definite recommendations can be made. Because of increased pressures at the garden, fewer talks have been made to garden clubs than in years past and fewer personally conducted tours of the garden are given except for the Youth Education Program, tours now largely are handled by garden volunteers.

Dr. Thorne continues to serve as chairman of the Advisory Council and *ex officio* member of the Steering Committee for the AIBS-Flora North America project. In February he attended joint meetings of the Editorial and Steering Committees of the project at Stanford University and the California Academy of Science. He has continued to serve as Secretary-Treasurer of The Claremont Colleges Sigma Xi Club, and for the City of Claremont as a member of the Parkways and Street Trees Commission. He is a Research Associate of the University of Hawaii Botanical Garden, and has served for some years as a member of the Council of the Southern California Botanists.

During the year staff members reviewed manuscripts for scientific journals and research proposals for the National Science Foundation.

PUBLICATIONS:

The second number of Volume 7 of *Aliso*, edited by Dr. Benjamin, was published on 22 June. This issue consisted of 163 pages and included 12 scientific papers and the Director's Report. All but four of the research reports were by members of the garden staff or present or former students.

PUBLISHED WRITINGS OF THE BOTANIC GARDEN STAFF:

- Benjamin, Richard K. 1970. Laboulbeniales on semiaquatic Hemiptera. II. *Autophagomyces*, *Dioicomycetes*, and *Prolixandromycetes* gen. nov. *Aliso* 7: 165-182.
- Benson, Lyman. 1970. Cactaceae. In C. L. Lundell, Flora of Texas. 2: 221-317. Pl. 1-14.
- . 1970. Cactaceae. In Donovan S. Correll and Marshall C. Johnson, Manual of the vascular plants of Texas, pp. 1087-1113.
- . 1970. Crawling Prickly Pears. *Cact. Succ. J.* (Los Angeles) 42: 89.
- . 1970. The Rainbow Cactus and the Phoenix of Long Ago. *Cact. Succ. J.* (Los Angeles) 42: 172-173.
- . 1970. *Welwitschia mirabilis* in the Namib Desert, South West Africa. *Cact. Succ. J.* (Los Angeles) 42: 193-200.
- . 1970. The status of *Welwitschia mirabilis*. *Cact. Succ. J.* (Los Angeles) 42: 200.
- Carlquist, Sherwin. 1970. Wood anatomy of Lobelioideae (Campanulaceae). *Biotropica* 1: 47-72.
- . 1970. Wood anatomy of *Echium* (Boraginaceae). *Aliso* 7: 183-199.

- . 1970. Toward acceptable evolutionary interpretations of floral anatomy. *Phytomorphology* 19: 332–362.
- . 1970. Wood anatomy of Goodeniaceae and the problem of insular woodiness. *Ann. Missouri Bot. Gard.* 56: 358–390.
- . 1970. A new species of *Scaevola* (Goodeniaceae) from Tahiti. *Ann. Missouri Bot. Gard.* 56: 469–470.
- . 1970. (copyrighted 1970, scheduled for release in Feb. 1971). *Hawaii: A Natural History*. Natural History Press, New York. 463 pp.
- Lenz, Lee W. 1970. A new species of *Triteleia* (Liliaceae) from Guadalupe Island. *Aliso* 7: 145–148.
- . 1970. *Triteleia tubergenii*, an amphidiploid of garden origin. *Aliso* 7: 157–160.
- . 1970. The Director's Report. *Aliso* 7: 289–308.
- Simon, J. P. 1970. Comparative serology of the order Nymphaeales I. Preliminary survey on the relationships of *Nelumbo*. *Aliso* 7: 243–261.
- Thorne, R. F. 1970. The California Islands. *Ann. Missouri Bot. Gard.* 56: 391–408.
- . 1970. (with E. W. Lathrop). *Pilularia americana* on the Santa Rosa Plateau, Riverside County, California. *Aliso* 7: 149–155.
- . 1970. (Review of) J. Hutchinson's *Evolution and Phylogeny of Flowering Plants*. *Dicotyledons: Facts and Theory*. *Pl. Sci. Bull.* 16 (2): 10–11.

GIFTS AND GRANTS:

- Anderson, D. L., Instituto Nacional de Tecnologia agropecuaria, Villa Mercedes, Argentina, seed of *Prosopis chilensis*.
- Anderson, Dr. E. F., Whitman College, Walla Walla, Washington, 331 herbarium specimens.
- Anonymous, gift books.
- Balazuc, Dr. J., Eaubonne, France, collection of insects bearing Laboulbeniales, mostly from France.
- Beard, Dr. J. S., Director, King's Park and Botanic Garden, Perth Western Australia, 522 herbarium specimens, seed of *Hibbertia*.
- Boutin, F., Huntington Botanic Garden, San Marino, seed of *Magnolia* sp.
- California Academy of Sciences, San Francisco, 946 herbarium specimens.
- California State College, Los Angeles, gift books.
- Carlquist, Dr. Sherwin, Claremont Graduate School, ca. 500 herbarium specimens, books.
- Chien, Dr. Chiu-yuan, University of Georgia, Athens, 2 fungus cultures.
- Coffeen, Mrs. Mary, Claremont, plants and seed.
- DeDecker, Mrs. Mary, Independence, 56 herbarium specimens.
- Deigaard Nurseries, 10 *Sequoia sempervirens* (one-gallon cans).
- Ellis, Dr. J. J., Northern Regional Research Laboratory, Peoria, Illinois, 11 fungus cultures.
- Everist, S. L., Queensland Herbarium Department of Primary Industry, Indorooipilly, Australia, seed of various primitive species of Annonales.
- Fairbrothers, D. E., Rutgers University, New Brunswick, New Jersey, seed of *Magnolia* species and other Annonales.
- Hartley, Dr. Thomas, Arnold Arboretum, Harvard University, Cambridge, Massachusetts, 1,385 herbarium specimens.
- Hendrickson, Dr. James, California State College, Los Angeles, 257 herbarium specimens.
- Hesseltine, Dr. C. W., Northern Regional Research Laboratory, Peoria, Illinois, 16 fungus cultures.

- Hodges, Dr. Charles S., Forestry Sciences Laboratory, Research Triangle Park, North Carolina, 2 fungus cultures.
- Hoogland, R. D., The Australian National University, Canberra, ACT, seed of *Tasmanina* (*Drimys*).
- Hotchkiss, A., University of Louisville, Louisville, Kentucky, seed of *Nuphar*.
- Huang, Professor T. C., National Taiwan University, Taipeh, 100 herbarium specimens.
- Hunzinger, J., University of Buenos Aires, Argentina, seed of several *Prosopis* species.
- Lailhacar, S., Santiago, Chile, seed of various *Prosopis* species.
- Lathrop, Dr. E. W., Loma Linda University, Loma Linda, ca. 200 herbarium specimens.
- Leech, Hugh B., California Academy of Sciences, Golden Gate Park, San Francisco, several collections of insects bearing Laboulbeniales.
- Lenz, Dr. L. W., Claremont, gift books.
- Mair, K., Royal Botanic Gardens, Sydney, Australia, seed of primitive Annonales.
- Malloch, David, Department of Botany, University Toronto, Ontario, 29 fungus cultures.
- Milko, Dr. A. A., Kiev, U.S.S.R., 9 fungus cultures.
- Moseley, M. F., Jr., University of California, Santa Barbara, seed of *Nelumbo*.
- Munz, Dr. Philip, Claremont, *Stanleya pinnata* ssp. *inyensis*, gift books.
- Parbery, Dr. D. G., University of Melbourne, Australia, 2 fungus cultures and 2 specimens.
- Parham, John, Government Botanist, Fiji Department of Agriculture, Suva, 25 herbarium specimens.
- Pincheira, G., University of Chile, Santiago, seed of *Drimys winteri* and *Prosopis chilensis*.
- Polhemus, Dr. John T., Englewood, Colorado, 500 specimens of Hebridae (Hemiptera) in alcohol for examination for Laboulbeniales.
- Propst, Douglas, Avalon, *Quercus chrysolepis* and other specimens.
- Reitz, P. Raulino, Herbario "Barbosa Rodrigues", Itajai, Santa Catarina, Brasil, 11 herbarium specimens.
- Rose, Lewis S., San Francisco, 101 herbarium specimens.
- Rzedowski, J., Instituto Politecnico Nacional, Mexico D.F., seed of *P. laevigata*.
- Sleeper, Dr. E. L., Department of Entomology, Long Beach State College, large accumulation of miscellaneous insects in alcohol for examination for Laboulbeniales.
- Stambach, George, Pasadena, *Salvia sonomensis*.
- Stern, Professor W. L., University of Maryland, College Park, 92 herbarium specimens.
- Takhtajan, Professor Armen, Komarov Institute, Leningrad, U.S.S.R., 14 herbarium specimens.
- Thomas, R. D., Northeastern Louisiana State College, Monroe, seed of *Nuphar*, *Nymphaea* and *Brasenia*.
- Thompson, Mrs. Wandalee, Lake Hughes, 1 herbarium specimen.
- Tickner, Mr. and Mrs. A. J., Pasadena, 1 herbarium specimen.
- Tilforth, C. W., Claremont, gift books.
- Triem, Peter, Ventura County, 18 seed collections.
- Twisselmann, Ernest, Cholame, 312 herbarium specimens.
- United States Department of Agriculture, Forest Service & Range Experiment Station, Placerville, 28 seedling pines.
- University of California, Berkeley, 12 collections.
- Wager, R. E., Panama City, Florida, seed of *Brasenia* and herbarium specimen of *Cabomba*.
- Wilson, Dr. Ruth, Claremont, gift books.