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## Back Matter 6 (1)

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## THE DIRECTOR'S REPORT

RANCHO SANTA ANA BOTANIC GARDEN  
1964

The past year has been a successful one for the botanic garden. Although there were no spectacular new developments, the garden continued to make satisfactory progress along lines previously established. In spite of the shortage of rain and its irregular distribution, the floral displays were outstanding and garden attendance was at an all time high. The number of individuals and groups requesting information on the use of natives in gardens, along parkways, and in master plans for new communities reached a new peak. The graduate program in botany, a joint undertaking of the Claremont Graduate School, Pomona College, and the botanic garden, attracts able young students from many parts of the country. At the June commencement five students received advanced degrees.

The research activities of the staff and the preparation of results for publication continue to be one of the garden's major programs. During the past year, in addition to research papers, six books authored by staff members had been published or were in press.

### ADMINISTRATION:

The past year saw no staff changes or new appointments. Dr. Munz, director emeritus, and Mrs. Munz spent three months on a tour of the South Seas which included New Zealand, Tahiti, and Australia. During that time Dr. Munz was able to learn much about the tropical plant life of the area. Later in the year he spent ten days at Harvard University working on the literature of *Delphinium*.

During the year Dr. Grant was honored by receiving the Phi Beta Kappa Award in Science for his recent book, *The Origin of Adaptations*. In December Dr. and Mrs. Grant attended a meeting of the Senate of Phi Beta Kappa in Washington, D.C., where the formal presentation was made. The award carries with it a prize of 1000 dollars.

At the annual meeting of the American Institute of Biological Sciences at Boulder, Colorado, Dr. Benjamin was formally installed as president of the Mycological Society of America.

Dr. Thorne attended the Tenth International Botanical Congress at Edinburgh, Scotland, in August, where he participated in a symposium on "Recent Advances in Comparative and Interpretive Morphology and Anatomy." Prior to the formal sessions of the Congress, Dr. Thorne visited the central highlands of Scotland with members of a foray group. On his way home he attended the meetings of the American Institute of Biological Sciences at Boulder, Colorado.

Dr. Carlquist spent December in Hawaii collecting research materials for studies on wood anatomy of the Goodeniaceae and lobelioids. He also studied material preserved at the Bishop Museum in Honolulu.

Mr. Everett completed his term of office as president of the International Plant Propagators Society and attended the Western Region Conference meeting at Sacramento. He also attend the Western Chapter meeting of the International Shade Tree Conference held in Seattle, Washington, in June.

In August Dr. Lenz spent two weeks in the Cape Region of Baja California, a combined vacation and field trip. Later in the month he attended the meetings of the American Institute of Biological Sciences at Boulder, Colorado. In October he went to Chicago for the meetings of the Board of Directors of the American Iris Society.

#### WEATHER:

Although better than the previous year, the total rainfall for the season was below average, as the following table shows:

Rainfall Report—Monthly Totals  
(July 1—June 30)

Month	1962-63	1963-64	Average Monthly Rainfall
July	.00	.00	.01
August	.00	.01	.05
September	.00	2.94	.21
October	.25	.37	.71
November	.06	2.77	1.36
December	.11	.00	3.10
January	1.15	2.44	3.59
February	4.69	.44	3.64
March	2.49	4.08	2.79
April	2.04	.75	1.61
May	.00	.30	.47
June	.17	.22	.11
Total	10.96	14.32	17.65

The rainy season did not follow its normal pattern. It began in September with an unusual 2.94 inches of rain compared with an average for the month of .21 inches. On the other hand, December, a normally wet month having an average of 3.10 inches of rainfall, saw no precipitation at all. February also was far below normal with but .44 inches compared with an average of 3.64 inches. Fortunately in March we received 4.08 inches of rain and this allowed the development of many annuals late in the season. As a result the floral displays at the garden were unusually fine during the spring of 1964.

The highest temperature recorded during the year was 100°F reached on August 8. The lowest temperature was 30°F and was recorded during the nights of November 17 and March 7. This compares with a high of 108°F and a low of 23°F for the previous year. In 1964 there was a total of 42 days with temperatures over 90°F, 3 in April, 3 in June, 14 in July, 11 in August, 4 in September, and 7 in October. In 1963 there were only 32 days with tempera-

tures over 90°F and these were restricted to the months of July, August, and September. The average temperature for September, one of the hottest months, was 3.1°F below the average for that month. August, normally the hottest month, was only slightly below average. Winter temperatures were about normal. The lowest relative humidity for the year was 8% and was recorded on January 31 and February 20. During these periods some areas in Los Angeles County recorded only 1% relative humidity. There were few strong winds during the past year, the most severe occurring on March 15 and 16. During that period we lost 24 trees and shrubs. Among the trees were specimens of pines, junipers, and cypresses.



Dr. Thorne lecturing to a group of teachers about plants of the California deserts.

The amount of water used for irrigation reflects to a large extent the amount of rainfall received the previous year. The year 1963 was one of our driest with but 6.09 inches of precipitation and, as a result, the amount of water used in 1964 was greater than it was the previous year which followed a relatively wet year. Totals for the past five years are given in the following table:

Amounts of water used during the past five years

Year	Water used (cubic feet)	Rainfall for Calendar Year (inches)
1960	3,070,000	11.55
1961	4,316,900	6.85
1962	1,955,500	16.10
1963	1,382,700	6.09
1964	1,452,800	12.80

#### GROUNDS DEVELOPMENT:

In keeping with a plan initiated two years ago, we have continued our efforts toward refining the plantings in areas most visited by the general public. To accomplish these goals all areas have been carefully studied with the thought of developing new vistas through judicious pruning, removal of some weedy plants, consolidation of related groups, and the establishing of new plantings using elite clones, most of them selections made at the botanic garden. In 1964 a considerable amount of work was done along the stream on Indian Hill Mesa. This is an artificial waterway and a special effort is being made to make it appear as natural as possible by the addition of granite boulders and logs. When the logs decay, they will provide suitable planting areas for ferns, etc. Small water basins or secondary pools provide future spaces for semiaquatic plants. The labeling of plants in the garden has been a major project for a number of years and during the past year we added about 300 3 × 5 inch engraved plastic labels bringing the total in the major display area to about 1400. In order to enhance the educational value of the garden, a nature trail was created and 32 redwood directional signs were provided. Interesting information about plants bordering the nature trail is provided by specially engraved plastic labels. It will take several years to obtain all the labels necessary to complete this project. One large engraved plaque describes the geology of the area including the San Gabriel Mountains lying to the north of the garden.

Through the generosity of the Simpson Lumber Company of Arcata, California, the botanic garden was given a cross section of a redwood log (*Sequoia sempervirens*) about six and a half feet in diameter. This is now on display beside the main west road on Indian Hill Mesa and is located between fine specimens of the coast redwood and the big tree (*Sequoiadendron giganteum*). A ring count of the log showed it to be about 1300 years old at the time that it was cut. Appropriate plastic information arrows were installed on the log to indicate well-known historical events which took place during the growth of the tree.

Since moving to Claremont in 1951, an average of about 12,000 plants a year has been added to the grounds. This past year was no exception and 12,267 plants and about 3500 bulbs were set out. For the past two years the genus *Arctostaphylos* has received special attention. At present we have 56 of a possible 70 species and varieties. Only six California species are missing from our collection. Seeds from plants of *Ornithostaphylos oppositifolia*, a monotypic genus closely related to *Arctostaphylos* and found only in northern Baja California, were collected and successfully germinated. This may be the first time that this species has been in cultivation. The plants will be grown for comparative studies with *Arctostaphylos*.

Many of the botanic garden collections, especially the shrubs, are now being propagated entirely by cuttings. This has been made possible to a large extent through the installation of a mist and fogging compartment in the greenhouse in 1960. We have found this facility especially valuable in establishing bare root collections made in the field. The established plants, held either in the greenhouse or in the lath house, are used as stock plants for producing cutting material.

Labor saving devices are used wherever possible. This past year we purchased a Little Wonder electrical hedge shear to speed up the clipping of some of the demonstration groundcovers and hedges. A Dayton, Model 1700, portable electric generator allows for the use of power tools and equipment in areas away from electrical lines.

The disease and pest control programs require a considerable amount of Mr. Lolonis' time. Again in 1964 the ceanothus stem gall moth (*Periploca ceanothiella*) continued to be a major pest on several species of ceanothus. It has been found that gall formation is favored by moderate to heavy irrigation of the plants. This stimulates an off-season flush of growth that is especially susceptible to attack by the insects. Control by the use of Cygon 4E (43.5% dimethoate) is erratic, due undoubtedly to a number of factors. Results obtained from three years of experimentation indicate that for the successful use of Cygon, susceptible species should be prevented from making any new growth between June and the middle of October. Cygon 4E should be used at the maximum safe level of three pints per 100 gallons of water. The first application should be made about three weeks after a new generation of the moths appears. A second application should be made about four weeks later and this should be followed by a third application in about three to seven days.

Although the spring was relatively cool, aphides were not as numerous as usual. Even the bush anemone (*Carpenteria californica*), one of the native shrubs most sensitive to aphid damage, was not attacked to any extent and required no spraying. This past year the manzanita leaf gall aphid (*Tamalia cowenii*) caused a certain amount of disfigurement of some of the species and hybrids of *Arctostaphylos*. This is the first time that these insects have appeared in the garden in any great numbers. They can be controlled by the application of Malathion during the fall. For general insect control, Malaphene-D applied at the rate of 3½ pints per 100 gallons of water was satisfactory. For scale insects the insecticide was increased to 4½ pints per 100 gallons of water. It again was necessary to use wire cages to protect many young seedlings from bird damage. Slugs and snails, formerly absent from the garden, have become numerous and require baiting with pellets containing metaldehyde and arsenic.

Witches broom which in the past few years has caused considerable damage to a wide variety of shrubs was not so severe as usual. The California State Department of Agriculture has shown interest in this problem but so far has not been able to determine the cause of the disorder. Oak root fungus (*Armillariella mellea*) continues to take its toll and in the past year has been blamed for the death of several plants of *Rhododendron occidentale* and *Gaultheria shallon*. Several plants of *Arctostaphylos* 'Point Reyes' and *A. edmundsii* were lost from 'Branch Die-back'. The cause of this condition is unknown, but it may be associated in some way with compacted soil.

Interveinal leaf chlorosis on new growth of species of *Arctostaphylos*, especially *A.* 'Point Reyes' and *A. hookeri*, continues to be a problem. However, a satisfactory control may have been found. The chlorosis appears to be lime induced and the best remedy is moderate to heavy applications of fertilizers high in ammoniacal nitrogen or those that will produce ammonium after application. Generally ten weeks are required before a response to the effects of the fertilizer can be noticed. Chlorosis also continues to be a problem with our Torrey, Coulter, and Jeffrey pines. Although plant pathologists of the United States Department of Forestry thought that the condition might be due to a 'Virus X' it now appears that it too may be lime induced. Heavy applications of 'Fas-Green' to plants of Jeffery and Coulter pines last winter have given very good results.

Weed control requires more man hours of labor during the year than any other routine job in the garden. For that reason herbicides are used wherever possible. Ortho-Diquat (a chloride salt of 1-1 ethylene 2-2 dipyridylum) has been found to be very satisfactory in the control of annual weeds when applied as a post-emergence spray. It has the advantages over weed oil in that it will not stain soil or fences and it leaves no offensive odor. It does not injure yuccas or most opuntias and may be sprayed over these plants. Simazine (2-chloro-4, 6-bis [ethylamino]-S-triazine) gave excellent results as a pre-emergence treatment. During the year 112 cubic yards of compost were made, using the Indore method.

#### SEEDS AND PLANTS:

A total of 263 collections of seeds, plants, and cuttings was accessioned during the year. Included were 78 collections made by members of the staff while carrying on field work, 95 collections represented gifts from friends of the garden, and 90 collections were made from plants growing in the garden. The latter were mainly seeds of annuals and cuttings taken from specially selected plants. Of the total of 263 collections, 43 represent plants that are new to the garden. We continue to supply large amounts of propagating material to other institutions as well as to commercial growers. Among those receiving material this past year were: Perry's Plants, La Puente, large numbers of cuttings of *Baccharis pilularis*; University of California Botanical Garden, Berkeley, 20 plants and 10 lots of seed; Monrovia Nursery Co., Azusa, a wide assortment of seeds and cuttings; Lord Talbot de Malahide, Malahide Castle, County Dublin, Ireland, cuttings of *Ceanothus rigidus* 'Snow Ball' and Hybrid Ornamental Strawberry #25; Pasadena Girls' Club, 22 plants; South Coast Botanical Garden, Department of Arboreta and Botanic Gardens of Los An-

geles County, 75 plants; California State College, Fullerton, 25 plants plus several lots of cuttings; Chaffey College, Alta Loma, 100 plants.

The annual seed exchange list was mailed in December to 182 institutions, 161 of them in foreign countries, and 21 in the United States. A total of 2,091 packets of seed was distributed: 1,688 went to institutions in 25 foreign countries, the remainder to institutions within the United States. In addition, special distribution of large quantities of seed went to a number of schools and universities including: Florida State Collection of Anthropods, Hialeah, 22 packets of seed of composites for a study of the feeding habits of *Melanogromyza agromyzicae*; California State Polytechnic College, Pomona, 30 packets of seed to start a native plant garden; Diablo Valley Junior College, Concord, Calif., 28 packets of seed to start a native plant garden; University of California, Riverside, one pound of seed of *Simmondsia chinensis*; Los Angeles Beautiful, five pounds of seed of mixed annuals; Basset Unified School District, Calif., 39 packets of seed; Los Angeles State and County Arboretum, Arcadia, 35 packets of seed for continued studies on fire resistant plants.

#### FIELD WORK:

Because of lack of adequate rainfall over much of the state during the past several years, less field work has been conducted by members of the staff than is usual. Nevertheless, by selecting favorable areas it has been possible to accomplish a great deal. Dr. Grant confined many of his field studies to the Mojave Desert during the spring months and to the Sierra Nevada during the summer months. In addition to local forays Dr. Benjamin traveled about 3,500 miles during the year collecting mycological material. He and two graduate students, Robert Rutherford and James Henrickson, also made a number of collections on their way to Boulder, Colorado, to attend the meetings of the American Institute of Biological Sciences. Dr. Thorne collected widely throughout the state, visiting such areas as the Mojave and Colorado Deserts, Death Valley, the Mother Lode Country of the Sierra Nevada foothills, Santa Catalina Island, and the coastal regions of Mendocino County. On the latter three trips he was accompanied by Mr. Everett. The collecting trip to the Pine Barrens area of Mendocino County was made successful to a large extent through the efforts of Mr. and Mrs. Walter Knight of Petaluma and Mr. Wayne Roderick of the University of California Botanic Garden, Berkeley. On a trip to Ione to study *Arctostaphylos myrtifolia* Dr. Thorne and Mr. Everett were accompanied by Dr. Roman Gankin of the University of California, Davis. In connection with his attendance at the International Botanical Congress in Edinburgh and the meetings at Boulder, Colorado, Dr. Thorne collected plants from the Scottish Central Highlands, the southern Adirondacks in New York, and the alpine tundra of the Rocky Mountains in Colorado.

#### THE SCIENTIFIC COLLECTIONS:

During the year 4,979 sheets of vascular plants were mounted and inserted, bringing the botanic garden herbarium total to about 169,000 sheets. The Pomona College herbarium which is also located in the main administration building contains about 330,000 specimens, bringing the total number of sheets



of the two herbaria to approximately 500,000. The botanic garden received on an exchange basis 3,977 sheets from 21 herbaria, but distributed only 179 sheets to 4 herbaria. A large distribution of duplicates will be made early in 1965. At least 5,015 sheets of vascular plants were received as gifts from 16 individuals, 573 sheets were received for determination from at least 8 sources, and 1,192 sheets were added by members of the staff. Several sets donated by Dr. Thorne, totaling 3,329 sheets, included 3,000 from Australia, 248 from Minnesota and 81 from Hawaii.

Of the nearly 5,000 processed sheets, 2,971 were from California, 987 from the other states, 723 from Latin America (including 444 from Mexico), 181 from the Old World, and 117 were from cultivated plants. Old World specimens from Polynesia (S. Carlquist), Japan, and South Africa, obtained on a selective exchange basis for phylogenetic studies, were specimens of 20 angiosperm families and numerous genera previously unrepresented in the herbarium.

During the year 368 herbarium sheets were sent on loan from the herbarium to 6 herbaria, and 413 sheets in 10 loans were returned to the herbarium from 6 herbaria. We received 3,434 sheets in 12 loans from 12 herbaria, mostly Asiatic and African *Delphinium* for study by Dr. P. A. Munz.

Additions to the wood-sample collection included 200 specimens from the Institute of Forestry, University of the Philippines, Manila.

Field collections in 1964 resulted in the addition of approximately 150 cultures to the mycological culture collection, bringing the total to about 1200. Nearly 500 specimens of Mucorales and Gymnoasaceae were prepared for insertion into the fungus herbarium. In addition, about 500 slide mounts of Laboulbeniales were prepared. These include nearly 20 as yet undescribed species obtained from a large collection of Streblidae (a family of flies parasitic on bats) from Costa Rica kindly provided for study by Dr. F. S. Truxal, Dept. of Entomology, Los Angeles County Museum.

The collection of alcohol-preserved insects from which Laboulbeniales have been removed or which still bear these fungi is being transferred from assorted cork-stoppered vials to a standard tubular vial employing a neoprene closure. This will facilitate long-term storage, for it eliminates the need for periodic replenishment of alcohol and the replacement of deteriorated corks. Approximately 1500 vials were processed during the year.

#### LIBRARY:

The development of the library continues to be one of the most important projects carried on at the garden. During the past year the number of accessioned items, mainly books, totaled 193. This does not include books purchased by the Claremont Graduate School and Pomona College which form part of the combined botany library maintained in the administration building at the garden. As in the past, some old and rare works were added in the form of microfiches. Continuing a program initiated two years ago, special emphasis was placed on the binding of periodicals and at the end of the year this program was nearly completed. The number of physical volumes added during the year included 272 serials, 23 books, and 6 pamphlets. In addition the librarian binds certain pamphlets in photomount covers. A second project completed

during the fall was the treating of all leather bindings with a special preservative and restorative. As in the previous year, the work was done by one of the graduate assistants. No outstanding titles were added to the collections this past year although we were able to fill some lacunae in our holdings of periodicals. New library equipment included a proper cabinet for the card catalogue.

Sets 243-245 totaling 3000 cards of the *Gray Herbarium Card Index of American Plants* were filed as was set 19 of the *Index Nominum Genericorum*.



Richard Breyer, fourteen year old high school student, is shown watering his plants in one of the botanic garden greenhouses. Young Breyer was interested in learning what effect detergents had on the growth of the plants. His project was entered in the Science Fair sponsored by the Claremont High School.

#### RESEARCH ACTIVITIES:

As in the past, the publications cited in the bibliography record the achievements of the staff, but it is also desirable to note the work now in progress at the botanic garden.

Dr. Benjamin's work on the Thamniaceae and especially the families of merosporangiferous Mucorales was continued, supported in part by a grant from the National Science Foundation. Several unusual fungi were obtained this year including an undescribed species of *Dispira* (Dimargaritaceae). Studies on this and other related fungi are in progress. In addition, work on the Laboulbeniales and Gymnoaceae that is not yet completed was carried on.

Dr. Carlquist devoted most of the year to the production of a book dealing with the characteristics and peculiarities of island plants and animals. This book, an outgrowth of his interest in anatomical studies of island plants, is semi-popular in nature, well illustrated, and will be published mid-1965 by Doubleday & Co. The book deals with phenomena rather than particular floras or faunas, and is unique in covering the topics of dispersal, establishment, adaptive radiation, gigantism, flightlessness, special mechanisms, relictism, fearlessness, and extinction. Dr. Carlquist is also planning a series of technical papers dealing with some of these topics.

A study of the curious relict family Lactoridaceae native to the Juan Fernandez Islands, was completed by Dr. Carlquist earlier in the year.

Dr. Grant's research included a study of flower pollination in the Phlox family. He completed the field studies on this project in 1964, analyzed and collated the data accumulated during the preceding five years of field work, and prepared a 363-page manuscript summarizing the results and evolutionary significance of the study. The manuscript will be published as a book-monograph entitled *Flower Pollination in the Phlox Family*. Karen A. Grant is a co-author of this work which will be published by the Columbia University Press.

During 1964 Dr. Grant also made pollination studies in the general flora as a project secondary to the Phlox family studies; but with the completion of the latter he plans to study the pollination of other plant groups in the California and western American flora more intensively in the future.

The results of many years of research on the small-flowered desert Gilias—their genetic relationships among themselves, their ecological relationships to the desert environment, and their evolution—were summarized in a paper written by Dr. Grant for the 12th volume of *Advances in Genetics*.

A long-term selection experiment carried out with some of these Gilias was also completed in 1964, and Dr. Grant spent most of the summer months analyzing the data of this experiment.

Dr. Lenz continued his studies in the genus *Iris*, especially with members of the "spuria" alliance. A number of new interspecific hybrids bloomed for the first time. These included plants having as parents species with very different chromosome numbers, i.e., crosses between species with  $n=22$  with those having  $n=8$  and  $n=10$ . Many of these hybrids produced considerable amounts of stainable pollen, and viable seed was harvested from open pollinated flowers as well as from back crosses. Further cytological work is necessary to discover the reason for the fertility in these hybrids. Spuria irises are relatively slow growing and it will take a year or so for the plants to become large enough to supply cytological material. This project was supported earlier by a grant from the National Science Foundation. The plant breeding program and the selection of elite clones was continued under the joint cooperation of Dr. Lenz and Mr. Everett. A number of promising prostrate manzanita hybrids were selected for propagation and further trial. It has been demonstrated that species of the genus *Berberis* (including *Mahonia*) hybridize when grown together in the garden. From one hybrid population two very beautiful and distinctive forms were selected for increase and further trial.

Dr. Munz spent part of the year on a revision of a manuscript prepared earlier on the *Onagraceae of North America* which is being published by the

New York Botanical Garden with the aid of a grant from the National Science Foundation. It is scheduled for early 1965. He also spent some time on a supplement to *A California Flora* which includes corrections, additions, extensions of range, etc. The date of publication of the supplement is at present not known. His *Shore Wildflowers of California, Oregon and Washington* was completed and the University of California Press announces that it will be available early in 1965. In collaboration with J. T. Howell of the California Academy of Sciences, Dr. Munz edited a manuscript prepared years ago by Marcus E. Jones, an early western collector, whose herbarium specimens are widely distributed in America and Europe, but whose place names are often very obscure. This manuscript enables the botanist to determine rather exactly where Jones was on a given date and thus place the occurrence of his specimens. Mr. Howell plans to publish this paper in 1966.

In addition to his writing, Dr. Munz spent some weeks identifying specimens sent to him. These collections included plants from California, Arizona, and South American Onagraceae.

Dr. Thorne spent much of his time collecting and determining plants from various parts of California. He has begun a systematic survey of the flora of Santa Catalina Island. He has completed a study of the floristic relationships of the French Pacific island of New Caledonia, including a sizable contribution to the flora based on about 750 collection he made on the island in 1959. He has also continued work on earlier floristic studies of Iowa, Florida, and a limited area of Minnesota. He has identified several collections of perhaps 500 sheets of Florida plants sent for determination. He has also continued work on a book on angiosperm phylogeny. Research by graduate students on the Fouquieriaceae, *Fremontodendron*, *Krameria*, and *Pilostyles*, the latter of the Rafflesiaceae, will perhaps clarify the phylogenetic relationships of these locally represented taxa of uncertain position.

#### GRADUATE INSTRUCTION:

The botanic garden continues to cooperate with the members of the botany department of Pomona College and with the Claremont Graduate School appointee in botany in presenting a unified botanical program leading to the M.A. and Ph.D. degrees. Alva Day completed her doctoral thesis on polyploidy and evolution in desert gilias and received her Ph.D. in June. Dr. Day is now with the Department of Genetics, University of California, Davis. William M. Klein, Jr. also completed his graduate work and was awarded the Ph.D. degree at the commencement exercises in June. Dr. Klein's thesis was a biosystematic study of four species of *Oenothera*, subgenus *Anogra*. Dr. Klein is employed by the U. S. Air Force, San Antonio, Texas.

Students who hold botanic garden half-time research assistantships are: Robert Rutherford, James Henrickson, and Patricia Wilder. Mr. Rutherford, who is studying *Pilostyles thurberi*, a rare angiospermous parasite on *Dalea emoryi*, one of the indigo bushes, spent considerable time in the desert mapping natural populations of the host and checking the plants for the parasites. He has collected large quantities of *Pilostyles* seed and is attempting to study its germination and possible mode of infection of the host. His studies also include an investigation of the morphology and anatomy of the parasite and

its relationship to its host. After receiving his M.A. in June, Mr. Henrickson spent part of the summer conducting field studies in Mexico, Arizona, and California, in connection with his study of species of Fouquieriaceae. Patricia Wilder received her M.A. in June and during the fall started work toward her Ph.D. which will be an anatomical study of the leaves of species of *Ceanothus*. Peter Gail also received the M.A. degree in June and is now studying at Rutgers University, New Brunswick, New Jersey. Ruth Wilson, a graduate of Los Angeles State College, has commenced work toward her Ph.D. Other students who are continuing their studies are Mark Parratt, Warren Drugg, and David Walkington.

#### PUBLIC SERVICE:

The public service features of the garden's activities increase every year, not only in numbers but also in variety. As reported last year, with the increase of interest shown by gardeners in the use of California plants, the number of inquiries regarding the handling of the plants, their adaptability, and their availability has grown to the point where not a day goes by without calls from persons asking for advice or help. Among those seeking advice this past year were members of the Carnegie Institution of Washington regarding planting of the Mount Wilson observatory, the City of Upland on the choice of a street tree for Euclid Avenue, and California City on the use of native plants in the Mojave Desert.

During the year both Dr. Lenz and Mr. Everett spoke to members of garden clubs and horticultural societies. Dr. Thorne is called upon regularly to identify plants either sent in or brought in for determination. Some of the plants are natives but many are from other parts of the world and at times identification is slow and time consuming. Dr. Benjamin is often called upon to identify mushrooms and other fungi found locally.

In addition to presenting papers at professional meetings, members of the staff are asked to lecture to college and university groups. This past year Dr. Grant lectured at the Rockefeller Institute, New York; University of California, Los Angeles and Riverside. Dr. Thorne lectured at San Diego State College, the University of North Carolina, and the summer institute of the Pigeon Lake Biology Field Station of Wisconsin University. Dr. Benjamin was a speaker in the Allan Hancock Lecture Series at the University of Southern California, Los Angeles, and he also spoke before the members of the Lorquin Society at the Los Angeles County Museum and the Fellows of the San Diego Natural History Society, Balboa Park, San Diego. Dr. Carlquist presented a seminar at the University of Hawaii, Honolulu, and spoke to members of the Hawaiian Botanical Society. He also gave a talk at the Santa Barbara Botanic Garden. In December, Dr. Lenz gave two lectures in the University of California, Riverside, University Extension Series.

Mr. Everett presented a lecture in the Santa Barbara Botanic Garden afternoon series. He also talked to members of the Agricultural Extension Service of the Los Angeles County Farm Advisor's Office.

The Rancho Santa Ana Botanic Garden Popular Lecture Series was continued and three programs were presented during the year. Mr. Everett gave one on the flowers in the botanic garden, Dr. Grant spoke on certain aspects

of the Phlox family, and Dr. Thorne talked on the wildflowers of western Australia. The botanic garden cooperated with the members of the TV and Radio section of the Los Angeles City School Board in preparing two 30-minute educational films for televising to classrooms throughout the area. In one film Dr. Thorne discussed plant classification and in the other Dr. Grant talked on flower pollination and seed formation in plants.



Portion of a plant of *Dalea emoryi*, one of the desert indigo bushes, heavily parasitized by *Pilostyles thurberi* (Rafflesiaceae). The other species of the small genus *Pilostyles* are found in Central and South America, southwest Australia, Iran, Syria, and Africa.

Staff members continue to serve in various capacities in professional organizations. Dr. Benjamin became president of the Mycological Society; Dr. Grant served on the editorial board of the *American Naturalist*; Dr. Lenz continues to serve as a member of the Board of Directors of the American Iris Society and chairman of the Scientific Committee. He is also publications consultant for the American Orchid Society. Dr. Thorne is a member of the council of the American Society of Plant Taxonomists. As noted elsewhere, Mr. Everett completed his term as president of the International Plant Propagators' Society. From time to time, all members of the staff review manuscripts submitted by editors of various botanical journals. They also act as consultants to the National Science Foundation on the merits of various research proposals.

## VISITORS:

During the year, 39,110 visitors were recorded at the turnstile. This compares with 36,280 for the previous year. The percentage of increase in 1964 over 1963 is not as great as was the increase between 1962 and 1963. Undoubtedly the main reason for the smaller gain in 1964 is the fact that March, one of the months with the greatest number of visitors was also one of the wettest months during the year and as a result there were fewer visitors in the garden.

Press coverage of events at the garden continues to be good and for the first time we used short radio spot announcements to call attention to the garden and the wildflower displays.

Among the out-of-state scientists and scholars who visited the garden in 1964 were:

- Dr. Y. Aitken, Melbourne University, School of Agriculture, Victoria, Australia.
  - Dr. T. M. Barkley, Kansas State University, Manhattan.
  - Dr. A. D. Bradshaw, University College of North Wales, Bangor.
  - Prof. Angel L. Carbrera, Museo de la Plata, Argentina.
  - Dr. S. Challenger, Dept. of Horticulture, Lincoln College, Christchurch, Canterbury, New Zealand.
  - Dr. Arthur Cronquist, New York Botanical Garden, Bronx.
  - Dr. T. L. Das, S. V. Agricultural College, Tirupati, Andhra Pradesh, India.
  - Dr Jean Delacour, Clères, France.
  - Dr. Walter Eschrich, Dozent, Pharmakognotisches Institut, Bonn, Germany.
  - Dr. K. S. Gill, Punjab Agricultural University, Ludhiana, India.
  - Dr. William F. Grant, McGill University, MacDonald College, Quebec, Canada.
  - Dr. Walter Hodge, Director, Division Systematic Biology, National Science Foundation, Washington, D.C.
  - Dr. R. C. Jackson, University of Kansas, Lawrence.
  - Dr. Keith Jones, Royal Botanic Gardens, Kew, England.
  - Dr. D. J. de Laubenfels, Dept. Geography, Syracuse University, New York.
  - Dr. B. S. Mehrotra, Botany Department, Allahabad University, India.
  - Dr. John Popenoe, Fairchild Tropical Gardens, Coconut Grove, Florida.
  - Dr. Francis V. Ranzoni, Vassar College, Poughkeepsie, New York.
  - Dr. Velva Rudd, Smithsonian Institution, Washington, D.C.
  - Dr. Harold St. John, Professor Emeritus of Botany, University of Hawaii, Honolulu.
  - Dr. A. C. Smith, Director of Research, University of Hawaii, Honolulu.
  - Dr. H. U. Stauffer, Institut für Systematische Botanik der Universität Zürich, Switzerland.
  - Prof. William Stephenson, Dept. of Zoology, University of Queensland, Australia.
  - Dr. J. W. Thompson (retired), University of Washington, Seattle.
  - Dr. John Zukel, Naugatuck Chemical Division, U.S. Rubber Company, Naugatuck, Connecticut.
- Former students of the garden who returned for visits in 1964 were: Dr. Edward F. Anderson, Dept. of Biology, Whitman College, Walla Walla, Washington; Dr. Richard M. Beeks, Division of Life Sciences, Alta Loma, Calif.; Dr. William M. Klein, Jr., U. S. Air Force, San Antonio, Texas; Mr. Robert M. Lloyd, Dept. of Botany, University of California, Berkeley; Mr. John Olmsted, Strybing Aboretum, San Francisco, Calif.; Dr. Richard M. Straw, Dept. of Botany, Los Angeles State College, Calif.; Dr. Stephen S. Tillett, Dept. of Biology, Occidental College, Los Angeles, Calif.; Dr. Delbert Wiens, University of Utah, Salt Lake City.

## PUBLICATIONS:

The fourth and final number of Volume 5 of the botanic garden journal, *Aliso*, edited by Dr. R. K. Benjamin, appeared on May 15, 1964, and was mailed to all subscribers and to institutions with which we maintain an exchange arrangement. This number consisted of 138 pages and contained, in addition

to contributions by staff members which are listed elsewhere, papers by Dr. David P. Gregory on hawkmoth pollination in the genus *Oenothera* and by Dr. Peter H. Raven on the "California" portion of the botany of the Sulphur Expedition.

#### PUBLISHED WRITINGS OF THE BOTANIC GARDEN STAFF:

- Carlquist, S. 1964. Go back to the islands for the answers. *Claremont Quarterly* 11(2): 59-67.
- . 1964. Plant Morphology in in the Pacific Basin. *Newsletter of the Hawaiian Botanical Society* 3(3): 15-17.
- . 1964. Leaf anatomy as an indicator of *Salvia apiana*—*mellifera* introgression (with Alice-Ann Webb). *Aliso* 5: 437-449.
- . 1964. Morphology and relationships of Lactoridaceae. *Aliso* 5: 421-435.
- . 1964. Plant Hairs, by J. C. T. Uphof (Review). *The Quarterly Review of Biology* 39: 300-301.
- . 1964. Pollen morphology and evolution of Sarcolaenaceae (Chlaenaceae). *Brittonia* 16: 231-254.
- . 1964. Recent Advances in the Embryology of Angiosperms, by P. Maheshwari (ed) (Review). *Science* 45: 805-806.
- . 1964. Wood anatomy of Vernoniaceae (Compositae). *Aliso* 5: 451-467.
- Everett, P. C. 1964. The Culture of Manzanitas at Rancho Santa Ana Botanic Garden. *Journal, California Horticultural Society* 25(2): 37-52.
- Grant, V. 1964. *The Architecture of the Germplasm*. John Wiley and Sons, New York. 236 pp.
- . 1964. Genetic and taxonomic studies in *Gilia*. XII. Fertility relationships of the polyploid Cobwebby *Gilias*. *Aliso* 5: 479-507.
- . 1964. The Biological Composition of a Taxonomic Species in *Gilia*. in, *Advances in Genetics*, vol. 12. Academic Press, New York.
- Grant, K. A. and V. Grant. 1964. Mechanical isolation of *Salvia apiana* and *Salvia mellifera* (Labiatae). *Evolution* 18: 196-212.
- Munz, P. A. 1964. A new Peruvian Fuchsia. *Brittonia* 16: 229.
- . 1964. New combinations in *Fremontodendron*. *Leaflets W. Bot.* 10: 119.
- . 1964. The Kaweah fawn lily, a new subspecies in California (with J. T. Howell). *Leaflets W. Bot.* 10: 104-105.
- Thorne, R. F. 1964. Biotic distribution patterns in the tropical Pacific, in, J. L. Gressitt (ed.). *Pacific Basin Biogeography*. Bishop Museum Press, Honolulu (1963).
- . 1964. The flora of Giles County, Virginia. II. (With T. S. Cooperrider). *Castanea* 29: 46-70.
- . 1964. Relict nature of the flora of White Pine Hollow Forest Reserve, Dubuque County, Iowa. *State Univ. of Iowa Studies in Natural History* 20(6): 1-33.

#### GIFTS AND GRANTS:

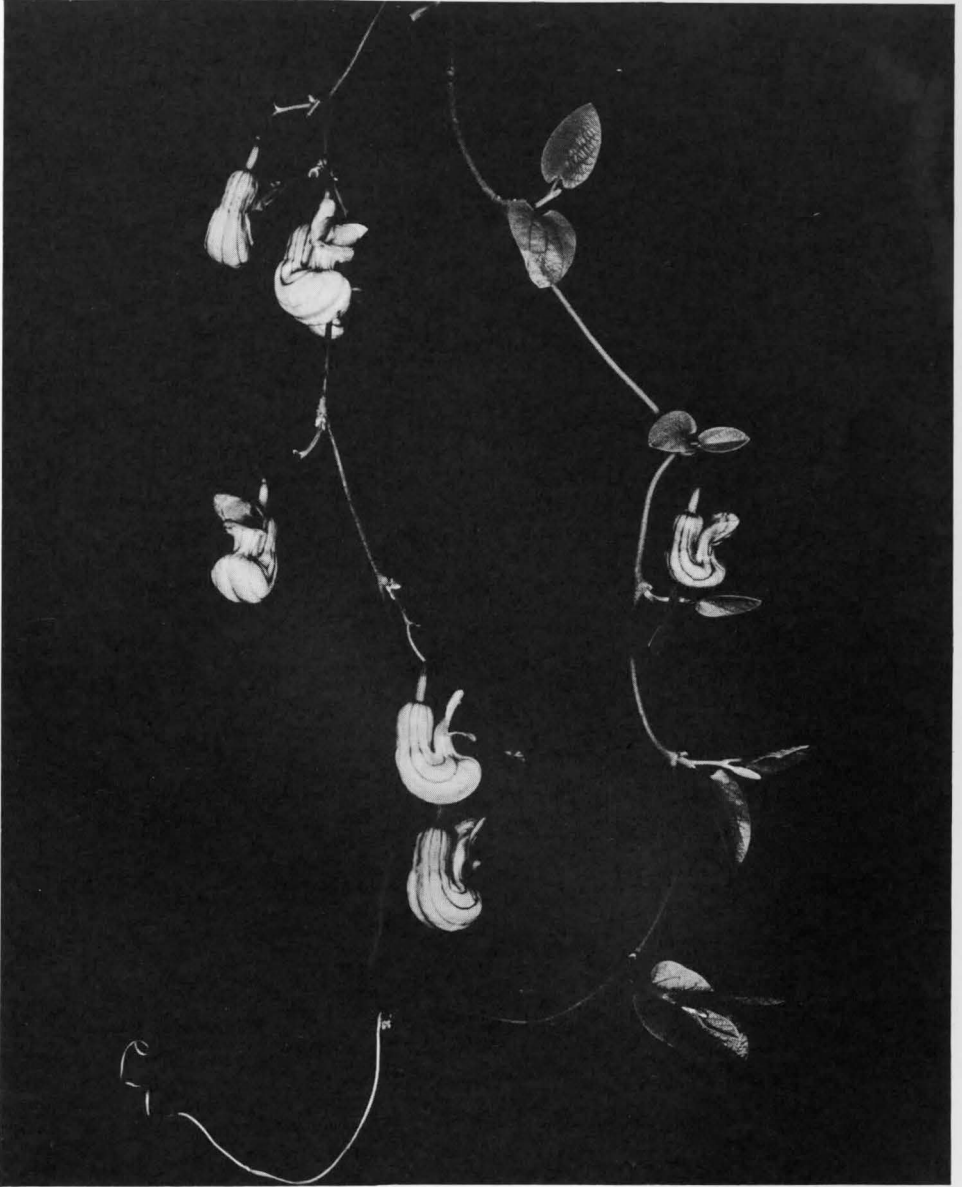
- Mr. S. Bamberg and Dr. Jack Major, Univ. of California, 6 herbarium specimens.
- Mr. Rupert Barneby, New York Botanical Garden, Bronx. 20 herbarium specimens.
- Mr. L. J. Brass, Archbold Biological Station, Lake Placid, Florida. 28 herbarium specimens.
- University of California, Berkeley. 75 plants, 7 collections seed, 50 bulbs of *Allium unifolium*.
- Prof. H. S. Conard, Lake Hamilton, Florida. 34 herbarium specimens.
- Dr. Delzie Demaree, Arizona State College, Flagstaff. 84 herbarium specimens.
- Mrs. M. G. Edwards, Pasadena, Calif. Collections of periodicals and books.
- Mr. Percy Everett, Claremont, Calif. 67 kodachrome slides.
- Dr. T. C. Fuller, California Dept. of Agriculture, Sacramento. 31 herbarium specimens.
- Dr. and Mrs. E. A. Gaw, Glen Ellen, Calif. Cash gift.
- Mrs. Clare Hardham, Paso Robles, Calif. 438 herbarium specimens.
- Mrs. H. J. Hawkins, Claremont, Calif. Books for library.
- Dr. R. F. Hoover, California State Polytechnic College, San Luis Obispo. 2 species of *Arctostaphylos* cuttings.
- Huntington Botanical Garden, San Marino, Calif. Cuttings of an albino Ocotillo (*Fouquieria splendens*).



- David Hutt, University of California, Berkeley. 1 fern plant.  
 Inland Iris Society of Riverside and San Bernardino Counties, California. Cash gift for research at Botanic Garden.
- Mr. Larry Kiefer, Gardena, Calif. 3 herbarium specimens.  
 Mr. and Mrs. E. O. Kincher, Pomona, Calif. Books for library.  
 Mr. H. B. Leech, Dept. of Entomology, Calif. Academy of Sciences, San Francisco. 4 collections of water beetles.
- Robert Lloyd and David Hutt, University of California, Berkeley. 1 herbarium specimen.  
 Los Angeles State and County Arboretum, Arcadia, Calif. 2 packets of seed.  
 Mr. Jack McCaskill, Pasadena, Calif. Cash gift.  
 Dr. B. S. Mehrotra, Botany Department, Allahabad University, India. 2 fungus cultures.  
 Monrovia Nursery Co., Monrovia, Calif. 1 load of composted redwood shavings.  
 Dr. R. A. Norris, Tall Timbers Research Station, Tallahassee, Florida. 400 herbarium specimens.
- Mr. John Olmsted, Riverside, Calif. 331 herbarium specimens.  
 Perry's Plants, La Puente, Calif. Cash gift.  
 Mr. R. S. Pore, Dept. of Botany and Plant Pathology, University of California, Los Angeles. 4 fungus cultures.
- Dr. Peter Raven, Stanford University, Calif. 1 packet of seed.  
 Dr. William Robertson, Everglades National Park, Florida: 64 herbarium specimens.  
 Mr. Lewis Rose, California Academy of Sciences, San Francisco. 215 herbarium specimens.  
 Mr. F. B. Sampson, Victoria University, Wellington, N.Z. 2 herbarium specimens.  
 Santa Catalina Island Co., Calif. 3 collections of seed.  
 Simpson Lumber Co., Arcata, Calif. Cross-section of redwood trunk.  
 Mrs. Chester Small, Paradise, Calif. 4 collections of plants.  
 Mr. Trow Stephens, Glendora, Calif. 12 collections of plants, 8 of seed, and 1 of cuttings.  
 Dr. Bonnie Templeton, Los Angeles County Museum, Calif. Cash gift.  
 Mrs. K. B. Thompson, Lake Hughes, Calif. 4 collections of seed.  
 Dr. Robert F. Thorne, Claremont, Calif. Cash gift.  
 Tilden Regional Parks, Berkeley, Calif. 4 collections of *Amelanchier* seed.  
 Dr. F. S. Truxal, Dept. of Entomology, Los Angeles County Museum, Los Angeles, Calif. Collection of Laboulbeniales.
- Mr. Ernest Twisselman, Cholame, Calif. 244 herbarium specimens.  
 Dr. F. C. Vasek, University of California, Riverside, 5 herbarium specimens.  
 Wood's Floral Nursery, Portland, Ore. 1 plant of *Arctostaphylos*.  
 Mr. L. B. Ziegler, San Jacinto, Calif. 1 packet of *Salvia* seed.

National Science Foundation grants made previously and continued through 1964 included one to Dr. Benjamin for study of the Mucorales, and one to Dr. Grant for study of pollination in the Phlox family. One made earlier to Dr. Carlquist for study of members of the genus *Scaevola* (Goodeniaceae) terminated during the year. During 1964 Dr. Munz was awarded a National Science Foundation grant for revision of the Asiatic species of *Delphinium*.

Lee W. Lenz, Director



*Aristolochia californica*. This species of dutchman's pipe is a woody climber usually found growing on shrubs and trees along stream banks in the Coast Ranges from Monterey County north and in the Sierra Nevada foothills from Sacramento County north. The large and widely distributed family Aristolochiaceae is represented in California only by one species of *Aristolochia* and three species of *Asarum*.

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## RANCHO SANTA ANA BOTANIC GARDEN

Dedication of Garden Foundation to the Board of Trustees for the Rancho Santa Ana Botanic Garden of the Native Plants of California:

“The Nature, Object and Purpose of the Institution hereby Founded and to be Maintained Hereunder:

“Its Nature: A botanic garden of the native plants of California, herbarium and botanical library, containing living and/or preserved specimens of trees, plants and flowers native to California, and literature relating thereto.

“Its Object: The preservation and improvement of the property now transferred and such property as may hereafter be transferred to the Trustees for those who not only wish to enjoy, but to study, assembled in one accessible locality, native California plants; and for the advancement of science and education with reference to plant life indigenous to the State of California.

“Its Purpose: (a) An institution founded primarily for scientific research in the field of local botany.

(b) To preserve the native California flora, try to replenish the depleted supply of some of the rarest plants which are rapidly being exterminated, and bring together in a comparatively small area as complete a collection of the rich store of native California plants as can be grown in this southern section of the state, thereby promoting the general welfare of the people of the state by providing the means for encouraging and carrying on the above mentioned activities in said state and by doing such other things as may be necessary and desirable to carry out the objects thereof.”