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Director's Report

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THE DIRECTOR'S REPORT

RANCHO SANTA ANA BOTANIC GARDEN

1968

As this is being written early in 1969, California, and particularly southern California, is recovering from one of the heaviest rainstorms in a century and loss of life and damage to property has been excessive. Fortunately, the botanic garden did not suffer as severely as many nearby areas and with the exception of the loss of some trees, damage was minor.

During 1968 the botanic garden continued to develop in an orderly manner and at a satisfactory rate, and while no new programs were initiated, those under way were pursued diligently. The relatively new youth education program expanded and for the first time we were able to enlist volunteers who contributed valuable time, particularly during the peak spring season. Late in the year a course was established for the training of future workers for this program.

The systematic collections, both living and dried, continue to receive the concentrated attention of all members of the staff, and at the present time the combined Pomona College-Rancho Santa Ana Botanic Garden herbarium contains well over a half million mounted specimens making it one of the largest in the West. The herbarium, the fungus collections, and the library, with its large holdings of works pertaining to taxonomy, make Claremont a leading center for systematic studies. With the appointment of Dr. Jean-Pierre Simon, whose interest is in biochemical systematics, the garden has entered into a new phase of taxonomy.

During the past year, 61,285 visitors passed the turnstile compared with 55,373 for the previous year. Since the garden has now reached the stage where many of the plantings have attained maturity, visitors find pleasant relaxation in the garden any time during the year. While no figures are available it has been observed that a large proportion of the visitors are students who come from the many southern California colleges and universities.

ADMINISTRATION:

Two staff appointments were made during the year. Dr. Jean-Pierre Simon of Cornell University, Ithaca, New York, was appointed Experimental Taxonomist at the botanic garden and Assistant Professor of Botany at the Claremont Graduate School. Dr. Simon, a native of France, received his training in Chile, Australia and Canada before going to Cornell. His special interest is biochemical systematics and his appointment has added another area of research to those already under way in the fields of syste-

matics and evolutionary botany. Dr. and Mrs. Simon and their two children arrived in Claremont in August after having spent part of the summer in France.

Mrs. Myra White was given a leave of absence from her duties as Librarian to accompany her husband, Dr. Alvin M. White, while he was on sabbatical leave from Harvey Mudd College. The Whites are spending the year at Stanford University. Mrs. Bertha Makow was appointed Librarian to serve during Mrs. White's absence.

Mr. Nick Lolonis, Horticulturist, resigned in late December to take a position with a large cutflower nursery in central California.

In January, Dr. Carlquist returned to Claremont after a year's sabbatical leave of absence during which time he botanized in a number of areas throughout the world.

In August, Dr. Benjamin attended the annual meeting of the American Institute of Biological Sciences, Ohio State University, Columbus, where the annual meeting of the Mycological Society of America also was held. He participated in the meeting of the Council of MSA as a member of the Finance Committee. Dr. Benjamin continues as a member of the Board of Editors, *Mycologia Memoirs*, of the Society as well as a member of the Advisory Committee on Fungi, American Type Culture Collection, Rockville, Maryland.

Dr. Thorne also attended the meetings of the American Institute of Biological Sciences. As President of the American Society of Plant Taxonomists, Dr. Thorne delivered at the annual banquet of the society his presidential address on "Magnolias, Mud, and Mishap," an illustrated account of some of the misadventures, techniques, and pleasures of extended botanical exploration.

During the past year Dr. Thorne also served as a member of the Council of Southern California Botanists and as member *ex officio* of the Council of the American Society of Plant Taxonomists. He remains Chairman of the Advisory Council and *ex officio* member of the Steering Committee for the AIBS *Flora North America* Project. Mainly as a consultant in angiosperm classification, he attended, in May, several days of meetings of the Editorial Committee of the project at Ottawa, Canada. Before leaving Ottawa the group participated in a foray with Canadian naturalists to the Laurentian highlands in adjacent Quebec. He later attended a brief joint meeting of the Steering and Editorial Committees at the American Institute of Biological Sciences meetings in Columbus. He also serves on the Scientific Field Trips and Commemorative Stamp Committees and is responsible for convening a symposium at the Eleventh International Botanical Congress to be held in Seattle in 1969.

In October, Dr. Simon visited several campuses of the University of California and Stanford University for consultations in the field of biochemical systematics.

In September Mr. Dourley attended the annual meetings of the National Association of Gardeners at Newport, Rhode Island. Before returning to Claremont he visited the Morris Arboretum in Philadelphia, Pennsylvania.

WEATHER:

Rainfall for 1967-68 season was 14.57 inches, 2.72 inches below the normal of 17.29 inches, and 13.93 inches below the season 1966-67. On July 28, 1968, 0.30 inches of rain fell on the garden, the first recorded in July in 17 years. Light snow fell on December 20.

RAINFALL REPORT
(Monthly Totals—July 1-June 30)

	1966-1967	1967-1968	Average Rainfall
July	0.00	0.00	0.01
August	0.00	0.00	0.05
September	0.13	0.23	0.25
October	0.10	0.00	0.66
November	2.53	5.01	1.39
December	10.19	1.83	2.90
January	6.02	1.32	3.43
February	0.01	1.06	3.63
March	3.61	3.79	2.72
April	5.17	1.07	1.69
May	0.38	0.13	0.45
June	0.36	0.13	0.11
	28.50	14.57	17.29

On September 9, 1968, the temperature rose to 103° F, the highest recorded this year. The lowest temperature, 23° F, was reached on December 21. Some frost injury occurred on the more tender plants, *Acalypha californica*, *Ambrosia ilicifolia* and *Cereus emoryi*.

In comparison, the high for 1967 was 107° F and the low 23° F. In 1967 there were 76 days with temperatures above 90° F, and in 1968 we had 58 days—one in April, four in May, five in June, 19 in July, 13 in August, 11 in September and five in October. The lowest relative humidity of 4% was reached on April 9.

Amounts of water used during the past five years

Year	Water Used (Cubic Feet)	Rainfall for Calendar Year in inches
1964	1,452,800	12.80
1965	1,287,700	26.98
1966	3,558,600	16.30
1967	2,816,800	22.62
1968	3,148,900	10.00

SEEDS AND PLANTS:

In 1968 the garden carried out another of its many functions in fulfilling numerous requests for seed from various institutions throughout the world. In all, 522 packets of seed were distributed, 99 going to institutions within the United States, the remainder to 31 foreign countries. In addition we had requests for large amounts of seed, either to establish gardens or for specific purposes or studies. Northeastern University, Boston, Massachusetts, received 25 packets of seed of desert shrubs for developing a new xerophytic section of their garden; Las Palmas, Canary Islands, Spain, requested 40 packets of desert and semi-desert species for the development of a botanic garden; Holy Family Hospital, Rawlapindi, West Pakistan, asked for 40 packets of seed in order to have native California plants in their garden, no doubt this request was made through nostalgia as a great many of their personnel are native Californians. One pound of mixed seed was sent to the Orange County Girl Scouts, for beautification of vacant lots that were public eyesores. California State Department of Agriculture, Sacramento, received 300 packets of seed for taxonomic studies and San Luis Rey College in San Luis Rey received 44 packets for a proposed historic garden. Five ounces of *Lupinus excubitus hallii* went to Indio Junior High School. Smaller amounts of seed were sent to the following institutions — University of Liverpool, England, one packet of *Artemisia californica* for studies on biosynthesis of terpenes; school of Botany, Oxford University, Oxford, England, one packet of *Hymenoxis acaulis* var. *arizonica* for cytological studies; the Lancashire College of Agriculture, England, 34 packets of seed for student horticultural studies; University of California, Berkeley, 1 packet *Physalis crassifolia* for research on host range of tomato pinworm, *Kiefferia lycopersicella*; Brookhaven National Laboratory, Upton, New York, 2 packets of *Baeria* for radiobiological experiments; Los Angeles State College, 2 packets *Baeria* for genetic studies; University of Washington, Seattle, 2 packets *Dendromecon* for studies of elaisomes, and relationships between seed and ants; Washington State University, Pullman, 2 packets *Baeria chryso-stoma* for class laboratory experiments in photoperiodism; Forestry Research Station, Rabat, Morocco, 5 packets *Eriodictyon* and *Atriplex* for research on fire retardant plants; University of Wisconsin, Madison, 1 packet *Madia sativa* for plant physiology research; the University of Helsinki, Finland, 7 packets *Aquilegia*, *Bidens* and *Lathyrus* for developmental physiology studies. Eight rooted cuttings of *Fremontodendron* 'California Glory' were sent to the University of Washington Arboretum, Seattle. Eighty-one plants were sent to Virginia Russell for the redevelopment of Rancho Los Alamitos.

During the year, 197 collections of plants and seed were accessioned, several of the genera being new to our collections. The staff accounted for 73 from the field, 41 through exchange, 72 from the garden and the remaining 11 were received as gifts. *Brodiaea* (sensu lato) was again predominately represented.

The 1968 Seed Exchange List offering seed of 61 species of California native plants was prepared and mailed to 220 institutions, both in the United States and abroad. All seed listed had been collected by members

of the garden staff from native populations. Seed is not collected in the botanic garden because of the possibility of hybridization taking place when the plants are grown together under garden conditions.

GROUNDS:

Although we experienced a comparatively dry spring, it did not in any way affect our display of annuals. It was, however, necessary to apply several light irrigations at various intervals throughout May and June.

During the year, 133 plant identification labels were added to the plantings; also a large display board was erected near the main entrance on which was mounted photographs of scenes, indoor and outdoor, of the garden. The photographs were from our recently published booklet.

The Home Demonstration Garden was renovated somewhat this year. In addition to a fresh coat of paint, two small stone planters were built at either side of the fountain and planted with *Woodwardia fimbriata*. Another pool was constructed near the bridge, and is being used to pipe water into the stream bed below. We hope to have a collection of native ferns planted in this area some time in the future. Minor changes in the plantings included the establishment of a large bed of *Arctostaphylos* 'Emerald Carpet' (a presumed hybrid between *Arctostaphylos uva-ursi* and *A. nummularia*). This clone could not have been more appropriately named; it has a low compact habit with a height of about 6 inches, a rich green color, and a remarkable uniformity of growth — an excellent ground cover plant. Donald Blakemore, as a student project at California State Polytechnic College, Pomona, prepared a redevelopment plan for the Home Demonstration Garden, and when he submitted this we were impressed with many of his new ideas. Changes that he suggested would improve the present design, and we are considering a number of those that can be carried out gradually over a period of several years.

A permanent irrigation system that should give a more even water coverage was installed in the large ground cover planting of *Arctostaphylos* 'Point Reyes' to the north and south of the Administration Building.

Vandalism continues to be one of our major problems. Possibly the worst outbreaks were during the Easter school vacation when many plant identification labels were badly damaged, and most of them had to be retrieved from the pond. During Thanksgiving weekend 15 redwood signs in the plant communities area were destroyed and had to be replaced.

Fires occurred in the parking area on July 2nd and 9th; both outbreaks were attributed to arson. Over 45 trees and shrubs were either partially or wholly destroyed in the outer plantings, while several trees within the garden proper were badly damaged by the flames. The situation in the garden could have been more serious had it not been for the alertness of our own garden staff who prevented the fire from spreading farther.

During the past several years a definite decline has been evident in all our sequoiadendrons; this was brought sharply to our attention in February, 1968, when we lost a 19 year old tree in Block 1323 and found all the others

to be suffering extensively from die-back. It has been confirmed that the pathogen is *Botryosphaeria ribes*, an ascomycete which often attacks sequoiadendrons growing out of their natural habitat. The first symptom is an exudation of resin which invariably occurs near the end of branches. The infection then usually girdles the branch and the portion beyond the diseased area gradually turns purple and dies. Occasionally the infection stops before it has completely girdled the branch and the area (canker) will callous over; however, another infection starts farther out on the branch. It is interesting to note that the lower branches are attacked first, and it is also evident that the less vigorous trees are unable to withstand a heavy infection. This is quite obvious in the plant communities area. It was also observed that *Botryosphaeria* is active in spring and fall. A decision was made to remove all dead and dying branches from diseased trees as well as debris from underneath the trees. As no fungicide effective against the disease on redwoods was known, we chose Parzate C applied at the rate of 2 pounds to 100 gallons of water, plus a sticking agent. On February 22 a second application was made, this time a fertilizer with a chemical ratio of 20-20-20 was added to the spray at the rate of 3½ pounds of fertilizer to 100 gallons of water. These applications were repeated on July 5, August 22 and September 20.

In late June we requested a new systemic fungicide from E. I. Du Pont de Nemours, Palo Alto, hoping that this might be the answer to our problem. The company kindly sent us a sample of Fungicide 1991 for trial. The suppliers were interested in receiving a report on the effectiveness of the product against this pathogen, particularly as found on the giant sequoias.

On July 5, two trees that had had no previous treatment were selected for the experiment. Four ounces of active 1991 and 4 ounces of Surfactant 'F' were added to 100 gallons of water, and the solution was then applied as a foliar spray. This was repeated August 22 and September 20.

It will take some time to determine whether Parzate C or Fungicide 1991 was more effective. The sequoiadendrons looked much better as of December, 1968; the spray program and the cooler summer were probably the contributing factors.

In the spring all of our digger pines were severely damaged by one of the many needle blight fungi. The trees displayed a reddish brown scorched appearance. Most of the fungi causing such symptoms are members of the Phacidiales. This particular pathogen was not determined at the time. The trees were treated, at 10 day intervals with three applications of Parzate C plus a sticker. When new growth commenced they received three foliar feedings with a fertilizer having a 20-20-20 composition. All trees responded to this treatment and are at present looking remarkably healthy, though there is every possibility that this condition may recur this spring. If so, it would seem to be advisable to repeat the treatment at that time.

The garden lost nine monterey pines during the year, one fine specimen on the mesa and eight in the plant communities. Whether these losses can be attributed to heavy smog conditions this year is difficult to ascertain, although what is determined as smog damage was evident, i.e., a chlorotic

condition at the tip of the needles and the chlorotic banding of the more severely injured needles. Dr. Paul Miller, University of California Air Pollution Center at Riverside, verified the diagnosis when he visited the garden. He also found evidence of smog damage on *Pinus jeffreyi* and *P. coulteri*, which although slight does give us cause for concern.

Smog injury was also observed on *Lupinus densiflorus* var. *aureus*, *L. stiversii*, and *L. milo-bakeri*. All these plants were quite severely damaged, old leaves usually being affected first. On *Lupinus albifrons* moderate to severe injury was observed throughout the summer. Leaves become badly burned and finally drop off. Many plants were completely defoliated and died. *Eriogonum proliferum* sustained light injury and *E. arborescens* light to moderate damage while in the lath house.

In February it was noticed that redwood scale (*Anonidia shastae*) was in great abundance on *Cupressus* in the plant communities. It was advised that we spray the trees with a mixture of Sevin 80% wettable powder applied at the rate of 2 pounds to 100 gallons of water, plus 2 ounces of a spreader. The treatment was most effective. This scale has not as yet been found on our redwoods.

Last year's Director's Report carried a detailed summary of many of our most troublesome problems with diseases and insects, and it is safe to assume that these problems will tend to increase rather than decrease as the garden approaches maturity. In the future it will be necessary to place greater emphasis on plant protection and nutrition, i.e., regular feeding and spraying. These programs constitute an additional burden on the outdoor staff, but to keep the garden plantings in a healthy condition they are vitally important. Until now it has been necessary to combat both disease and insects as they appeared, and this has been done more or less successfully in most instances. It is upon the basis of past recorded information that our regular spray schedule will be formulated, a program which will stress prevention rather than cure. Much credit must go to our former Horticulturist, Nick Lolonis, who did a commendable job of compiling information for this program.

The desert sand dune garden received considerable attention during the year. Several loads of compost were first incorporated into the otherwise impoverished soil and over 28 tons of fresh sand were applied at a uniform depth of 3-4 inches. A number of desert type boulders were added, giving more visual depth to the dunes.

During 1968, 10,500 plants and 2,700 bulbs and corms were added to the garden plantings, these included several items new to our collection. Many of our old plantings of bulbs were lifted and divided, and over 5,000 were replanted in new locations.

It was necessary to do a great deal of thinning in the plant communities, particularly in the island chaparral where 62 shrubs were removed. Several pines were removed from the yellow pine forest to provide growing room for some of the big cone spruce (*Pseudotsuga macrocarpa*).

The main four-inch water line continues to give us trouble during the year and over 26 clamps were applied to repair breaks.

New equipment purchased this year included two Cushman vehicles, one new and the other used. These two small machines have proved an invaluable asset for transporting both men and tools. One vehicle is being used to patrol the garden during the weekend; constant patrolling may help to reduce vandalism. A thirty gallon Spartan Sprayer and a Homelite Power Saw were also purchased.

Thirty-two New Zealand nurserymen visited the garden on November 19. Guests of the Southern California Nurserymen's Association, they were visiting many of the better nurseries in the state. Mr. Percy Everett assisted the garden staff in taking the party on a tour of the garden. A letter later was received from the President of the New Zealand Nurserymen's Association thanking the Rancho Santa Ana Botanic Garden for its hospitality.

The garden staff cooperated with the California State Fish and Wild Life representatives in trapping over one hundred California quail. The birds were to be part of a shipment sent to India on an exchange arrangement for game birds from that country. The trapping did not reduce our quail population to any great extent as evidenced by the damage to strawberries, annual and bulbous material. If these birds would only confine themselves to keeping down the population of snails, slugs, sow-bugs, etc., we would certainly encourage their multiplication.

It appears that a pair of coyotes has taken up permanent residence in the garden, for they have been seen regularly by the outdoor staff. The pair of resident gray fox was successful in rearing a litter of young, as they have done now for a number of years. Apparently the garden is not large enough to support more than a single pair as the population has remained at that figure. It also appears that the foxes and coyotes occupy sufficiently different ecological niches to allow them to maintain permanent territories within the 83 acres occupied by the garden.

FIELD WORK:

Dr. Benjamin's field work during 1968 was limited mostly to collecting forays in southern California. These included a trip in May to the Santa Rosa Plateau, Santa Rosa Mountains, with Drs. Thorne and Munz, and a trip to Whitewater Canyon and the Joshua Tree National Monument in October with Dr. Thorne and Dr. Armen Takhtajan, Komarov Institute, Leningrad, USSR, who was a guest of the garden. In early July he accompanied Dr. Lenz on a collection trip to the Greenhorn Mountains of Tulare County.

Dr. Lenz concentrated his field work in Los Angeles, Kern and Tulare counties and made a number of collecting trips during April, June and July.

During late summer and early fall John Dourley and Nick Lolonis made several trips to areas in Los Angeles, San Bernardino and Riverside counties to collect seed for propagation of plants for the botanic garden and for exchange purposes. Fred Oettinger, a graduate student, collected in the Marble Mountain Wilderness area of northern California during the summer and returned with a number of living plants and seeds for the garden.

Dr. Carlquist's field work during the year while he was on sabbatical leave is described elsewhere in this report.

Dr. Thorne continued to concentrate his collecting on localities in southern California, especially on the Los Angeles County offshore islands, the San Gabriel Mountains, the Santa Rosa Plateau of the Santa Ana Mountains, and the southern deserts.

SCIENTIFIC COLLECTIONS:

The integration of the Pomona College and Rancho Santa Ana Botanic Garden herbaria has now been essentially completed by the Curator, by Dr. Munz, and by the Herbarium Botanist. Numerous mounted duplicates continue to be removed from the collections for use in exchanges; many sheets continue to be repaired; genus or species covers in poor condition continue to be replaced by new color-coded covers (manila for California, green for Old World tropics, and gray for the rest of the world), and many thousands of newly mounted sheets are being filed.

During the year, 2,946 sheets of the combined herbaria were sent on loan to 18 institutions in 22 shipments; 2,262 sheets or packets in 21 loans were returned from 15 institutions; and 3 sheets were borrowed from 3 institutions. During 1968 the graduate assistants mounted 6,165 sheets of vascular plants, bringing the total botanical garden sheets to nearly 197,000 and the combined herbarium to about 514,000 sheets. Received on an exchange basis were 4,185 sheets from 14 herbaria plus 1,000 packets of the *Fungi Exsiccati Fennici* from the University of Turku. The botanic garden sent out on exchange 11,393 sheets to 54 different institutions. As of December 31, we owe 8,238 sheets to 22 herbaria, and are owed 11,890 sheets by 59 herbaria. Also sent out were 181 sheets on a gift basis to 7 institutions or individuals. More than 3,750 specimens of vascular plants were received as gifts from 25 individuals or institutions, including many received for determination, and nearly 2,500 sheets were collected by Dr. Thorne, other members of the staff, and graduate students.

Of the 6,165 sheets processed, about 2,600 were from California, 1,000 from the Southwest and Mexico, 900 from the southeastern states, 1,300 from Hawaii and other Pacific islands, with the remainder from other states, tropical America, and Europe. The acquisition of the processed sheets included nearly 3,000 from exchanges; 1,800 by gifts, many for determination; and about 1,350 through staff collections (nearly 1,200 of these by the curator).

About 40 new isolates were added to the fungus culture collection including the type culture of a new genus of Mucorales, *Backusiella circina*, received from Dr. John Ellis of the Northern Regional Research Laboratory, United States Department of Agriculture, Peoria, Illinois. Seventy accessions were made to the Laboulbeniales collection. Routine maintenance of the culture collection required about 1,675 transfers of isolates to fresh media.

LIBRARY:

The library continues, concurrently, its growth and organizational improvement. The number of serials currently received is 472, including two titles obtained through new exchange agreements. There were 1,569 individual issues of periodicals received.

The project to provide more complete and bibliographically accurate records of serial holdings has continued and is near completion. A new project has been undertaken to verify sources of all serials received and to claim any lacunae or late issues.

Two hundred seventy-four bound periodical volumes and 182 new books have been added to the collection. In addition, 63 bound periodical volumes and 62 books were deposited by the Claremont Colleges. Eight hundred sixty-eight reprints were added to the reprint collection.

There were 415 books and serials cataloged and 30 books reclassified. Sixty-nine books previously acquired were assigned subject headings in a continuing effort to make the new subject catalog accurately reflect the collection.

A complete listing of duplicate periodicals has been prepared and will be sent to dealers and other parties who may be interested in their purchase.

Distributions 253-254 of the *Gray Herbarium Card Index* and 26-27 of the *Index Nominum Genericorum* have been received and filed.

During the past year there has been a considerable increase in the number of persons using the library facilities. Most of the increase is made up of college and university students from southern California institutions. This increase in the use of the library has at times presented certain problems mainly due to the fact that the Librarian works part time and students who may require assistance often do not find a librarian on duty.

During recent years the Claremont Graduate School through the Honnold Library budget has provided certain funds for the purchase of books for use in the graduate program in botany. Unfortunately for the 1968-69 academic year there are no funds available for book purchases. This presents a problem of some magnitude since the botanic garden's book budget for 1969 is less than it was for the previous year. Most severely handicapped was Dr. Simon who is offering a new course in biochemical systematics and requires a number of standard texts and reference works which are not found in the botanic garden's library.

RESEARCH ACTIVITIES:

Dr. Benjamin continued his studies of the Laboulbeniales and completed two papers in which were described two new genera of this order of fungi that are obligate parasites of living insects. Much of his time during the latter half of the year was devoted to the preparation of an Introduction and Supplement to Professor Roland Thaxter's five volume monograph of the Laboulbeniales which is to be reprinted during the coming year by the publishing firm of J. Cramer, Lehre, Germany.

Lyman Benson's research activity during the year was concentrated upon the Cactaceae. The third edition of *The Cacti of Arizona*, University of Arizona Press, and *The Native Cacti of California*, Stanford University Press, will be published in the first half of 1969. The treatment of the Cactaceae for C. L. Lundell's *Flora of Texas* is in the late stages of preparation. *The Cacti of the United States and Canada*, Ronald Press Company, is in the final polishing. A book, *Evolution in Action*, D. C. Heath and Company, is completed and ready for printing.

During January, Dr. Carlquist was engaged in field work in New Caledonia, the last stop in a 9½-month overseas expedition which also included the Canary Islands, Madeira, Kenya, Western Australia, and New Zealand. This travel featured studies of evolutionary phenomena on insular areas, particularly of herbaceous groups which have woody representatives on insular areas. Attention was focused on *Sonchus* and *Echium* in the Canary Islands and Madeira, on *Lobelia* and *Senecio* on Mount Kenya, and on Goodeniaceae and Stylidiaceae in Western Australia. Collections from these areas include herbarium specimens, wood samples, pickled materials, and many photographs. Dr. Carlquist's field work in Australia resulted in the discovery of new taxa in Stylidiaceae and Goodeniaceae.

Dr. Carlquist spent much of 1968 in completion of a book, *Hawaiian Natural History*, to be published by Natural History Press. He also wrote a chapter, "Morphology and Anatomy," for a book on history of botany in the United States, a book being prepared for release at the 1969 International Botanical Congress to be held in Seattle. Dr. Carlquist's studies of Stylidiaceae resulted in preparation of a paper dealing with field observations and new taxa in this family. For the 1969 *World Book Year Book*, Dr. Carlquist wrote a feature article, "Hawaiian Ecology." Projects Dr. Carlquist currently has in progress include studies on wood anatomy of lobelioids and Goodeniaceae, and a review of problems in interpretation of floral anatomy.

Dr. Lenz continued his studies of members of the genus *Triteleia*, particularly from the standpoint of their cytology and hybridization. Using pot grown cultures maintained in the insectproof screenhouse, he was able to make several hundred inter- and intraspecific pollinations in an attempt to learn more about the genetic relationships of the various taxa, as well as the various barriers to hybridization exhibited by many of the plants. Since seedlings require at least three years to bloom, this part of the study will not be concluded for some time. With the completion of the drawings, the manuscript describing new species of *Dandya* was nearly ready for publication by the end of the year. Work on the manuscript covering the species of *Milla* was delayed due to the discovery of new taxa by Dr. T. M. Howard during his explorations in Mexico. The chromosome numbers of most of the known millas have now been determined.

Work continued on the selection of improved forms of Pacific Coast iris hybrids and a number of plants were divided. The selected clones will be multiplied as rapidly as possible in order to get the new varieties into the commercial trade. In the United States these irises are successful only in

the three Pacific Coast states, but overseas they have been found to be valuable garden plants in England, New Zealand, and Australia. This past year we have had reports that they apparently thrive in several areas in Japan, and some of our better forms were sent to growers in that country for further trial.

Although officially retired, Dr. Munz continues to maintain a very active interest in taxonomy. During the year the third and final part of his study of the Asian delphiniums was published in the *Journal of the Arnold Arboretum*. Another major accomplishment was the publication of *A Supplement to a California Flora* on which he had been working for several years. The supplement, published by the University of California Press, contains 224 pages and incorporates new material that has appeared since the publication of the *Flora* in 1959. This supplement is of the greatest value to anyone using the *Flora*. Dr. Munz has now begun work on yet another flora, this time a *Manual of Southern California Botany* which will occupy much of his time for the next few years. He is also working on the Onagraceae of Ecuador for a flora of that country now being prepared by a group in Sweden. In addition to his writings he has also spent many hours identifying botanical specimens and in integrating several plant families in the herbarium.

Dr. Simon joined the botanic garden staff the first of August and during the remainder of the year he surveyed the California flora for possible groups that would be suitable for his biochemical approach to plant systematics. Dr. Simon's particular interest is in the area of protein homology in plants and he is examining isozyme patterns found in Western American species of grasses belonging to the genera *Agropyron*, *Elymus* and *Sitanion* with the aim of selecting suitable material for further genetic and evolutionary studies.

Dr. Thorne has continued his studies of the flora of the Los Angeles County offshore islands and of the Santa Rosa Plateau of the Santa Ana Mountains. Supplements to the flora of the Santa Rosa Plateau, prepared jointly with Dr. Earl Lathrop of Loma Linda University, Loma Linda, and to the floras of Santa Catalina and San Clemente islands are published in this issue of *Aliso*. Field work in the San Gabriel Mountains continues as part of a joint study of their flora with Professor Louis Wheeler of the University of Southern California, Los Angeles, and with Professor Joseph Ewan of Tulane University, New Orleans, Louisiana. The study of California plant communities has been continued with investigation and photography of several that are poorly represented in southern California. He has continued work on his system of classification of the Angiospermae and his angiosperm phylogeny book to back up the synopsis of the new system published in the last issue of *Aliso*. He has also presented papers, one or more to be published in 1969, on the relationship of the flora of New Caledonia with that of the Solomon Islands and on the diversity of the flora of the Australasian-Papuan areas. He has continued work on the identification and labelling of his thousands of collections from the Australasian area.

GRADUATE INSTRUCTION:

The graduate program in botany at the Claremont Graduate School presented through the cooperation of the faculty in botany at Pomona College, the Claremont Graduate School and the Rancho Santa Ana Botanic Garden was continued and during the year three students were awarded degrees. James Henrickson completed the requirements for the Ph.D. under the direction of Drs. Carlquist and Thorne. His thesis was on the Fouquieriaceae, the ocotillo family. Dr. Henrickson is an instructor at the California State College, Los Angeles. Christopher Davidson completed requirements for the M.A. degree under Dr. Lenz's direction. His thesis was on the relationship between pollen size and polyploid level in certain members of the *Brodiaea* alliance. Mr. Davidson is continuing work at Claremont for his Ph.D. Late in the summer Larry Kistler completed the requirements for the M.A. degree and left shortly thereafter for Cambridge, Massachusetts, where he is continuing his graduate study at Harvard University. His thesis was concerned with the identification of plant fibers used by some of the southwestern Indian tribes in basketmaking and was under the direction of Drs. Lenz and Carlquist. Homer Metcalf, Theodore Mortenson, Ruth Wilson and John Adams continued work toward their degrees. Fred Oettinger, a graduate of Syracuse University, New York, commenced work on his M.A. degree during the fall. He spent much of the summer collecting in the Marble Mountain Wilderness area of northwestern California and plans to prepare a flora of the area as partial fulfillment for the M.A.

YOUTH EDUCATIONAL PROGRAM:

During the third year of its operation the youth education programs were attended by 6,072 persons as compared with 4,337 for the previous year. Included in the 6,072 were 4,427 from elementary schools, 57 from junior high schools, 197 from senior high schools, 78 college students or other adults, 959 from organized youth groups and 96 from junior Audubon clubs. In addition to organized botanic garden groups, thousands of students used garden facilities either on their own or in class groups organized by their teachers.

Mrs. Coffeen was assisted during the year by members of a volunteer group called the Friday Friends. Among those donating their time were Mesdames George Shipway, Bryon Crader, Stanley Adams, Harry Krueper and Jay Slosberg. Without the help of these dedicated people we would have had to curtail the program. From suggestions made by members of the Friday Friends, and at conferences on youth education at other institutions, we have organized a Volunteer Tour Guide Training Course. This program, which began meeting just before the end of the year, was attended by ten trainees and is being given by Mrs. Susan Richmond who has had practical experience in science teaching. These volunteers will have completed their training course and will be available to help handle groups during the peak spring season.

PUBLIC SERVICE:

Public service activities performed by members of the staff constitute an important function of the garden's operation and as in the past often require considerable amounts of time. During 1968 Dr. Benjamin served as a member of two committees of the Mycological Society of America, Finance and Mycologia Memoirs. He reviewed the manuscripts for one research paper for the journal *Mycologia* and a book on the genus *Gymnopilus* (Agaricales) for *Mycologia Memoirs*. Some 35 fungus cultures were sent to other investigators, at their request, during the year, and numerous cultures were received for identification. Dr. Benjamin also served as the faculty representative on the Graduate Council of the Claremont Graduate School.

Mrs. Coffeen served on the board of the Pomona Valley Chapter of the Audubon Society. During the autumn she organized and recruited leaders for a Junior Audubon Club which met at the garden on alternate Tuesdays. Students from last year's nature study classes provided the nucleus for this group of young naturalists. Mrs. Coffeen also worked with Mrs. Edith de Avila of Honnold Library, Claremont Colleges, who designed and executed a display about the botanic garden which was mounted in the glass cases of the library foyer. This exhibit opened in late spring and continued through the summer.

Dr. Thorne continues to serve as chairman of the Advisory Council and *ex officio* member of the Steering Committee for the American Institute of Biological Sciences-*Flora North America Project*. He has given several lectures: on the flora of Santa Catalina Island at Avalon, at the Santa Barbara Botanic Garden and at Orange Coast College; on angiosperm phylogeny at the University of California at Santa Barbara; on the flora of New Caledonia at the University of California at Irvine and at Orange Coast College; in a Royal Society Discussion on the Solomon Islands at London (in absentia); and in a Southern California Academy of Science symposium on Plant Adaptations in the New World and Old World Tropics at San Fernando Valley State College. He also presented the presidential address on field exploration at the annual meetings in Columbus, Ohio, of the American Society of Plant Taxonomists.

During the year Dr. Lenz met with members of a number of garden clubs and in February was guest speaker at the annual dinner of the Southern California Iris Society. He also continued as a consultant in scientific matters for the American Iris Society. Both Dr. Lenz and Mr. Dourley met with a wide variety of representatives of various local and state agencies and real estate developers in regard to the use of native materials for planting parks, highways, streets and in beautifying new housing developments. The use of native trees and shrubs appears to be increasing at a steady rate although at the present time their use is still far less than that of exotics. The number of nurseries carrying native material is increasing and as more material becomes available its use by home owners will also increase. The heavy freeze in December proved that many of the exotic plants are only marginally adapted for use in southern California.

The cooperative project on *Echium* with Dr. Kornelius Lems of Goucher

College, Baltimore, Maryland, reported last year was continued until his tragic death in August just before he was to return to Claremont to complete the project. Dr. Lem's assistant, Miss Christina Holzapfel, made final collections later in the year.

Dr. Lenz continued to serve as Chairman of the Department of Botany of the Claremont Graduate School and as a member of the Field Committee for the Life Sciences. He also served on the Claremont Graduate School's Academic Programs Committee.

As in the past all members of the scientific staff reviewed manuscripts sent by editors of scientific publications and served as referees to the National Science Foundation on grant proposals.

PUBLICATIONS:

The final number of Volume 6 of the garden's journal, *Aliso*, was edited by Dr. Benjamin who also prepared the index for the four numbers comprising the volume. This issue of *Aliso* contained 102 pages including the index, and was made up entirely of staff contributions some of which are listed below.

PUBLISHED WRITINGS OF THE BOTANIC GARDEN STAFF:

- Benjamin, Richard K. 1968. *Balazucia*, a new genus of Laboulbeniales allied to *Cucumyces* Spegazzini. *Aliso* 6(4): 47-56.
- . 1968. *Sandersoniomyces*, a new genus of Laboulbeniales allied to *Diplomyces*, *Symplectomyces* and *Teratomyces*. *Aliso* 6(4): 1-16.
- Carlquist, S. 1968. Philip A. Munz: A portrait. *Plant Sci. Bull.* 14(2): 1-2.
- Lenz, Lee W. 1968. The Director's Report. *Aliso* 6(4): 67-84.
- . 1968. The Rancho Santa Ana Botanic Garden. 48 pp. ills. Robert Wenzel Publishing Co., Upland, California.
- Lolonis, Nick F. 1968. The biology and control of the ceanothus stem-gall moth, *Periploca Ceanothiella* (Cosens). *Calif. Hort. Jour.* 29: 89-92.
- Munz, P. A. 1968. A synopsis of the Asian species of *Delphinium*. *J. Arn. Arb.* 49: 73-166, 233-259.
- . 1968. A Supplement to a California Flora. 1-224, Univ. Calif. Press.
- . 1968. The Claremont Herbarium. *Aliso* 6(4): 41-45.
- Simon, J. P., and D. W. Goodall. 1968. Relationship in annual species of *Medicago*. VI. Two-dimensional chromatography of the phenolics and analysis of the results by probabilistic similarity methods. *Aust. J. Bot.* 16: 89-100.
- Thorne, R. F. 1968. Synopsis of a putatively phylogenetic classification of the flowering plants. *Aliso* 6(4): 57-66.
- . (with E. W. Lathrop). 1968. Flora of the Santa Rosa Plateau of the Santa Ana Mountains, California. *Aliso* 6(4): 17-40.

GIFTS AND GRANTS:

Adams, Mrs. Stanley, Pomona, cash donation.

Balazuc, Dr. J., Eaubonne, France, collection of insects bearing Laboulbeniales, mostly from France.

Balls, Mr. E. K., Carmel Highlands, 10 herbarium specimens.

Beeks, Dr. R. M., Claremont, 4 herbarium specimens.

- Beneke, Dr. E. S., Michigan State University, East Lansing, 1 fungus culture.
Buchli, Dr. H., University of Strasbourg, France, slide mount of type specimen of his *Laboulbenia geminata* parasitic on termites.
Carlquist, Dr. S., Claremont Graduate School, 2 Journal Volumes and 755 herbarium specimens.
Clarke, Mr. Oscar F., University of California at Riverside, 2 herbarium specimens.
Crader, Mrs. Margaret, Diamond Bar, 1 book.
Davidson, Mr. Christopher, Claremont, 23 herbarium specimens.
DeDecker, Mrs. Mary, Bishop, 253 herbarium specimens.
Demaree, Dr. Delzie, Dallas, Texas, 35 herbarium specimens.
Doe, Mrs. Dorothy, Claremont, cash donation.
Eiten, Dr. George, Sao Paulo, Brasil, 4 herbarium specimens.
El Monte Junior Women's Club, El Monte, cash donation.
Fuller, Dr. T. C., California Department of Agriculture, Sacramento, 24 herbarium specimens.
Hall, Mr. Brower, Fort Lauderdale, Florida, cash donation.
Henrickson, Dr. James, California State College at Los Angeles, about 600 herbarium specimens.
Hopkins, Mr. Milton, Fitzgerald, Georgia, 4 herbarium specimens.
Kimbrough, Dr. J., University of Florida, Gainesville, insect specimens bearing Laboulbeniales.
Kistler, Mr. Larry, Claremont, 5 books.
Lacy, Mrs. Lori L., La Habra, cash donation.
Laird Paving Co., Claremont, paving of road.
Lathrop, Dr. Earl, Loma Linda University, 242 herbarium specimens.
Leach, Dr. Charles M., Botany Department, Oregon State University, Corvallis, 1 fungus culture.
Leech, Mr. H. B., California Academy of Science, Golden Gate Park, San Francisco, 8 specimens of insects bearing several species of Laboulbeniales.
Lenz, Dr. Lee W., Claremont, 3 books and 2 journal volumes.
Lockwood, Dr. L. B., Miles Laboratories, Elkhart, Indiana, 1 fungus culture.
MacMillen, Mrs. Richard, Claremont, cash donation.
Moran, Dr. Reid, San Diego Museum of Natural History, plants of *Solanum wallacei* from Guadalupe Island.
Mukerji, Dr. K. G., Department of Botany, University of Delhi, India, 2 fungus cultures.
Munz, Dr. P. A., Claremont, 3 books and 5 journal volumes.
Muth, Mr. Gilbert, Angwin, 153 herbarium specimens.
Norris, Dr. Robert, Valdosta, Georgia, 175 herbarium specimens.
Oettinger, Mr. Fred, Claremont, 1 book.
Pehl, Mrs. Richard, Upland, cash donation.
Philbrick, Dr. Ralph N., Santa Barbara Botanic Garden, 1 herbarium specimen.
Pollard, Mr. H. M., Santa Barbara, 2 herbarium specimens.
Rasma, Mrs. Richard, Upland, cash donation.
Rose, Mr. Lewis W., San Francisco, 150 herbarium specimens.
San Marino Garden Club, San Marino, cash donation.
Sato, Dr. Tada, Upland, cash donation.
Simpson, Mr. C. F., Montclair, 1 book.
Slosberg, Mrs. Jay, Claremont, cash donation.
Stern, Dr. William, University of Maryland, College Park, 84 herbarium specimens.
Templeton, Dr. Bonnie C., Curator, Los Angeles County Museum, cash donation.
Tewari, Dr. J. P., Botany Department, University of Lucknow, India, 1 fungus culture.
Thompson, Mrs. Wandalee, Lake Hughes, herbarium specimens and 1 book.
Thorne, Dr. Robert F., Claremont, 1,475 herbarium specimens and 3 books.
Townsend, Mr. R. W., Temple City, 10 herbarium specimens.
Tubbs, Mrs. Eldred, Claremont, cash donation.
Twisselmann, Mr. E. C. Cholame, 420 herbarium specimens.
Vessa, Mrs. Bernard, Claremont, cash donation.
Wierzbinski, Mrs. Stephen, Pomona, cash donation.
Wright, Mr. Walton W., Diamond Bar, 3 herbarium specimens.
Ziegler, Mr. Louis B., San Jacinto, 6 herbarium specimens.

photograph by Robert Wenzel