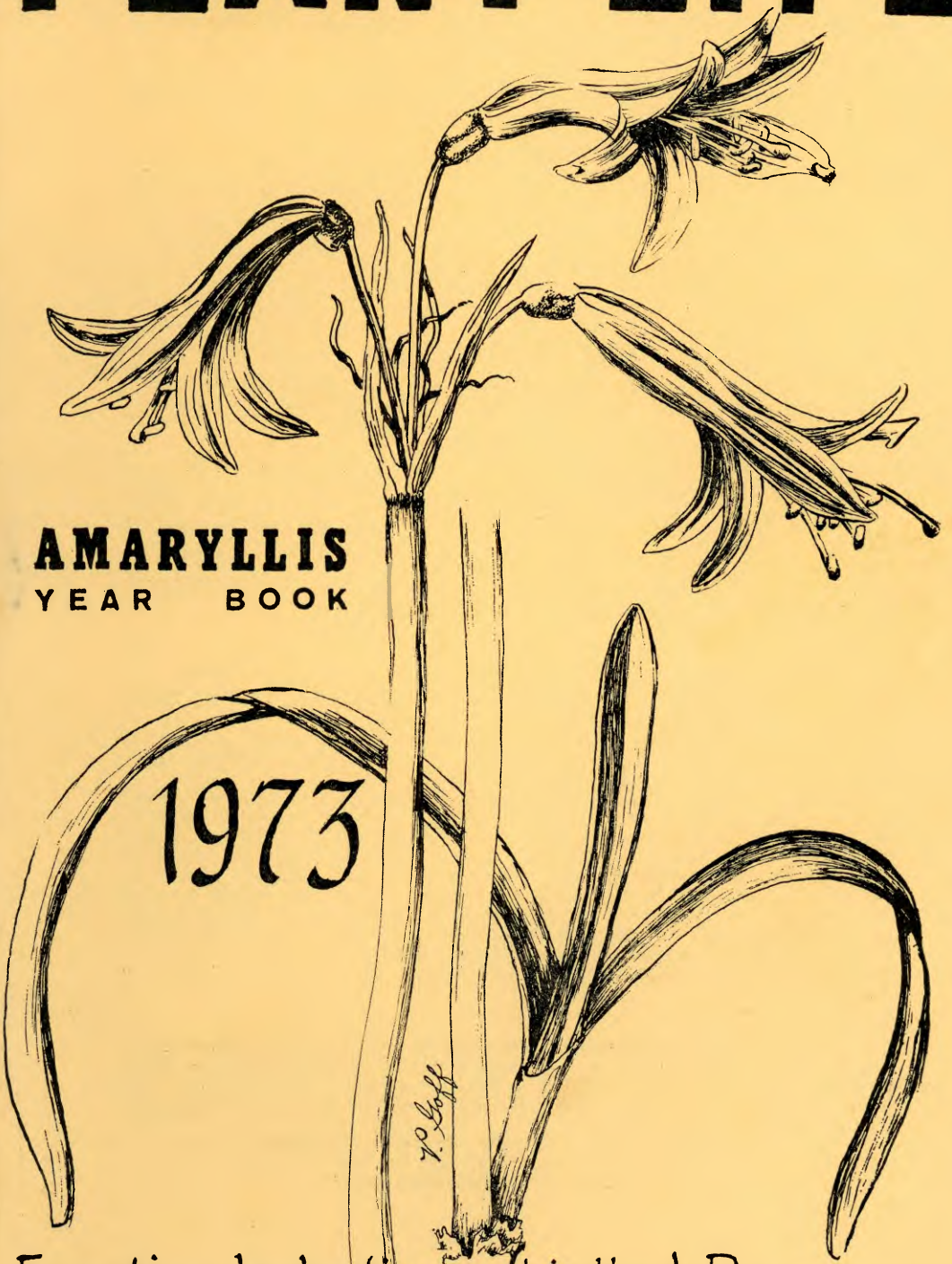
PLANT LIFE



AMARYLLIS
YEAR BOOK

1973

Famatina herbertiana (Lindley) Ravenna
Native to Argentina and Chile

THE AMERICAN PLANT LIFE SOCIETY

THE AMERICAN PLANT LIFE SOCIETY is organized for the "increase and diffusion of knowledge concerning plant life," and to carry out its objectives the main emphasis is placed on the publication of PLANT LIFE, the periodical devoted to plant life, incl. HERBERTIA, the yearbook devoted exclusively to the amaryllids, sponsored by the affiliated AMERICAN AMARYLLIS SOCIETY. The publications are international in scope. All paid up members are privileged to receive the current issues of PLANT LIFE, incl. HERBERTIA, THE AMARYLLIS YEARBOOK.

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MANUSCRIPTS AND PHOTOGRAPHS. *To insure against loss* in the mail, authors should *retain copies* of manuscripts and the *original negative or extra prints* of photographs sent for publication in PLANT LIFE incl. HERBERTIA. Photographs should have the *name and address* of the owner to whom credit should be given, and the *name and size* of the subject, written on the back. Those having color slides which they wish to use as the basis of illustrations, are requested to have black-and-white prints made, and to submit these with their articles. See PLANT LIFE 28: 110. 1972 (color slide prints).

All editorial correspondence should be addressed to: Dr. Hamilton P. Traub, *Editor, The American Plant Life Society, 2678 Prestwick Court, La Jolla, Calif. 92037.*

All persons and organizations interested in amaryllids, and other plants are invited to become members. The annual dues vary from (domestic) $5.00 to $6.00; (foreign, $6.00 to $7.00) depending on the publishing costs. At present they are (domestic) $5.00; (foreign $6.00) in advance which should be sent to:

DR. THOMAS W. WHITAKER, *Executive Secretary*
The American Plant Life Society
Box 150, La Jolla, California 92037

PLANT LIFE

VOLUME 29

[Nos. 1-4, Jan., Apr., Jul. & Oct.]

1973

EDITED BY
HAMILTON P. TRAUB
HAROLD N. MOLDENKE

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The cover design representing **Famatina herbertiana** (Lindl.) Rav., is based on Plate 1341, Bot. Reg. 1830.

PLANT LIFE, VOLUME 29, NO. 1, 1973—AMARYLLIS YEAR BOOK
GENERAL AMARYLLID EDITION

PLANT LIFE, VOLUME 29, NOS. 2—4, INCL., 1973
GENERAL EDITION

ILLUSTRATIONS

COLOR PLATES

CORREGENDA

PLANT LIFE VOL. 27. 1971

Page 141, 11th line from bottom, for *"anglise"* read *"anglice"*.
Page 142, 12th line from bottom, for *"subg. nov."* read *"subreg. nov."*
Page 143, 8th line from top, for *"anglise"* read *"anglice."*
22nd line from top, for "Paeophyta" read "Phaeophyta."
12th line from bottom, change "asexual" to "sexual."
Between 10th and 11th lines from bottom, add line, "Lineagics, 1964, p. 144."

PLANT LIFE VOL. 28. 1972

Page 20, text, line 5, and in legend (caption), Fig. 6, in line 3, for "National University" read "Agricultural School".
Page 43, text below Abstract, move 9th line, beginning "Verd. from So. Africa, etc." above the preceding line.
Page 129, text, 18th line, for "add" read "and".
Page 131, middle of page, "5. Steinmannia R. A. Phil. 1844", change "1844" to "1884".
Page 135, under 2b., second line, for "paex" read "apex".
Page 136, 7th line, for "Aleution" real "Aleutian".
Page 137, 8th line from bottom, change "folis" to "foliis".

SO. CALIF. AMARYLLIS SHOW—continued from page 26.

California Hemerocallis and Amaryllis Society, for the captions under the figures.—*Hamilton P. Traub*

AMARYLLIS JUDGES' CERTIFICATE

Since the last report in the 1971 Amaryllis Year Book (Page 27), the following numbered Amaryllis Judge's Certificate has been issued:

No. 196, Mrs. Clem C. Smith, Rt. 2, Box 76-MB, New Caney, Texas 77357. Horticulture only.

KEEPING UP WITH LATEST DEVELOPMENTS.—Current progress in the judging of Amaryllis is recorded in the Amaryllis Year Book. In order to insure that those holding Amaryllis Judge's Certificates keep up with these new developments, all certificates issued are valid only when presented with the current membership card of the American Plant Life Society which includes membership in the affiliated American Amaryllis Society. After several years a refresher course is recommended.

PLANT LIFE, VOL. 29, NO. 1, January, 1973

AMARYLLIS
YEAR BOOK
1973

Year Book of

The American Amaryllis Society

40th Issue

GENERAL AMARYLLID EDITION

EDITED BY

HAMILTON P. TRAUB

HAROLD N. MOLDENKE

THE AMERICAN PLANT LIFE SOCIETY

Box 150, La Jolla, California 92037

THE AMERICAN PLANT LIFE SOCIETY

For the roster of the general officers of the Society, the reader is referred to the inside front cover of this volume.

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PREFACE

We are indebted to Prof. Penrith B. Goff of Wayne State University, Detroit, Michigan, for the fine cover design featuring *Famatina herbertiana* (Lindl.) Rav.

This is the 40th annual appearance of Herbertia, or the Amaryllis Year Book, including 15 separate annual volumes, from 1934 to 1948, and 25 editions published in combination with PLANT LIFE, from 1949 through 1973.

HERBERTIA, vols. 1—15 (1934—1948), published separately
PLANT LIFE, vols. 1—5 (1945—1949)*
PLANT LIFE, vols. 6-29 (1950—1973)

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* HERBERTIA or AMARYLLIS YEAR BOOK published in combination with PLANT LIFE beginning in 1949.

The 1973 edition is dedicated to Dr. César Vargas Calderón, Emeritus Professor of Botany at the UNIVERSIDAD SAN ANTONIO ABAD DE CUZCO, in recognition of his outstanding contributions to the knowledge about the Amaryllidaceae.

Dr. Vargas is the founder of HERBARIO VARGAS with specimens numbering 22,000. This includes tuberiferous *Solanum* species, and many other plants, and particularly the Amaryllidaceae of Peru. It contains the holotypes of more than 50 new species discovered and named by Dr. Vargas, including among others, 11 *Bomarea* species, and various species of *Hymenocallis, Urcelina, Stenomesson* and *Amaryllis* For the past 12 years he has carried on an *Amaryllis* project, and the results from this work will be published as a comprehensive treatise on the Genus *Amaryllis* in Peru. In the present issue of the AMARYLLIS YEAR BOOK, Dr. Vargas contributes an interesting autobiography, and an article on his research activities, particularly with the amaryllids.

Other articles on *Amaryllis* appear in the present issue. Mr. Doran reports on a successful search for *Amaryllis traubii* in South America. Mr. Blossfeld writes about *Amaryllis calyptrata* and the breeding for yellow *Amaryllis*. Dr. Cardenas describes two new *Amaryllis* species; and Mr. Korsakoff writes about two new hybrid *Amaryllis*. Dr. Cage considers the value of in- and outbreeding in *Amaryllis* breeding. Dr. Bell reports on the role of triploids in *Amaryllis* breeding, and the culture of *Amaryllis* ovules. Prof. Mertzweiller writes about his *Amaryllis* breeding project and Mr. Clouette describes his experience in growing *Amaryllis* from seeds.

Some years ago, the late Robert Fleming in England crossed *Alstroemeria aurantiaca lutea* and *A. violacea* and this gave rise to the tall vigorous, large-flowering hybrid now named, 'Walter Fleming' in his honor. This single stroke of fortune laid the foundation of the thriving *Alstromeria* cut-flower industry in Europe, showing what the hybridizer can accomplish. Mr. Sahin reports on this *Alstroemeria* cut

flower industry in Europe. Those members who are not growing Alstroemerias at present are urged to look into the advantages of growing these charming plants as amateurs or possibly for the cut flower trade. This is a real success story.

Dr. Cardenas describes new *Zephyranthes* and *Haylockia* species; Mrs. Katherine L. Clint writes about an apparently vanishing Mexican *Habranthus* species. Mr. Karsakoff reports on some hybrids in the Tribe Zephyranthes. Mrs. Marcia Clint Wilson contributes a comprehensive report on the species and hybrids under cultivation from the Tribe Zephyrantheae. Mr. Hardman presents the report from the Nerine Committee. Mrs. Menninger writes about her breeding project for white Nerine hybrids, and Mr. Lindsay reports on Nerines in Australia, and on the quest for miniature amaryllids.

Mr. Christianson writes about his extensive collection of cultivated amaryllids in Portugal; Mr. Ellenbecker traces the history of *Paramongaia weberbaueri* under cultivation. Mr. Tisch recites his experiences with amaryllids. Leonora Milstead writes about her experiences with *Lycoris;* Mr. Beckwith D. Smith reports on the growing of amaryllids in north Florida. Mr. Buck presents the 1972 Daylily Report. There is a report on the second decade of *Hemerocallis washingtonia*, the tetraploid species, 1959—1968. There are reports on the 1972 Amaryllis shows, and other articles as shown by the table of contents.

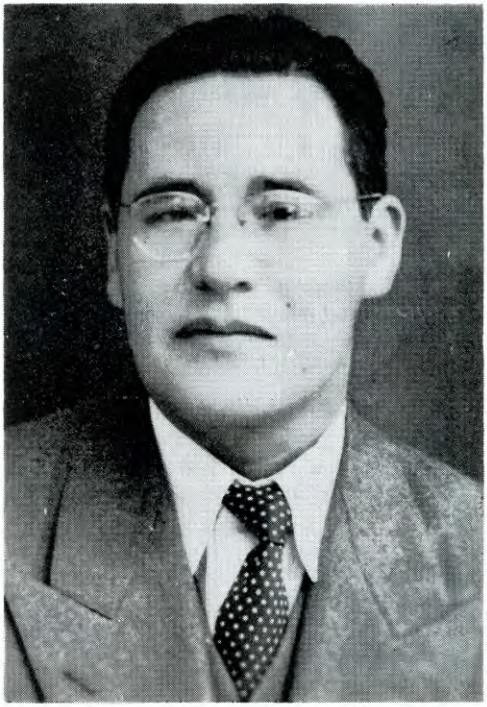
Contributors to the 1974 issue of the AMARYLLIS YEAR BOOK are requested to send in their articles by August 1, 1973, in order to insure earlier publication of this edition. Unless articles are received on time, publication will again be delayed to June or July or even later as with some issues in the past. Your cooperation toward earlier publication will be greatly appreciated. *Those having color slides or transparencies which they wish to use as the basis of illustrations, are requested to have black-and-white prints made, and to submit these with their articles.*

We are grateful to the SOUTHERN CALIFORNIA HEMEROCALLIS AND AMARYLLIS SOCIETY for sponsoring the four color plates of the outstanding Peck tetraploid daylilies (*Hemerocallis washingtonia* Traub) facing page 124.

December 12, 1972,
2678 Prestwick Court,
La Jolla, California 92037

Hamilton P. Traub
Harold N. Moldenke

Dedicated to
Dr. Cesar Vargas Calderon



HERBERT MEDALIST—DR. CESAR VARGAS CALDERON

CESAR VARGAS CALDERON

AN AUTOBIOGRAPHY

I was born at Cuzco, Peru, the ancient capital of the Inca Empire, on April 26, 1905, the son of Angel P. Vargas and Conception Calderón. I married Antonia Carrillo, and we have been blessed with four children, Yolanda, Carmen, Hugo, and Martha.

I studied and received my doctorate degree at the Universidad Nacional San Antonio Abad de Cuzco in 1934. In the following year, I was invited by the same University to teach botany, succeeding my former Professor, Dr. Fortunato L. Herrera, who had moved to Lima.

HERBARIO VARGAS (CUZ)*

In 1935, I started to organize an herbarium, with the objective of collecting plant specimens around Cuzco, and also in southern Peru. from the Pacific Coast, the sierras, cordilleras and the forest regions. The collection has now grown to 22,000 specimens. The collections, apart from the cultivated and wild potato specimens, which number more than 3,000, include the Bues Herbarium with 2,000 specimens of cryptigams, mostly ferns, from the Convencion Provincia (Departamento Cuzco); the numerous specimens of tuberiferous *Solanum* species (2,000 specimens), various Amaryllidaceae and other plants. Among these are 200 new species of plants, including the new genus *Vargasiella C. Schweinf.* of the Orchid Family. HERBARIO VARGAS contains the holotypes of more than 50 new species described by me, mostly tuberiferous *Solanum* species, but also species of *Bomarea, Urceolina, Eustephia, Hymenocallis, Stenomesson* and *Amaryllis.* My descriptions, excluding the *Bomarea* species, were made from living plants under cultivation over a period of many years.

RESEARCH WORK

Over the years, I have carried on research within the genera *Hymenocallis* and *Amaryllis,* leading to the growing of hybrid seedlings. During the 15 years in which I conducted research with the cultivated native species of potatoes of southern Peru, I accumulated a living collection of native tuberiferous *Solanum* species numbering about 1,200. The results of my research were published in Papas SUDPERUANAS. In recognition of this work, I was awarded the PREMIO NACIONAL DE LA CULTURA ANTONIO RAMONDI.

I was a member of the following indicated foreign botanical expeditions in Peru:—(a) 1938-1939, the Second Botanical Expedition to the Andes, directed by Dr. T. H. Goodspeed, Professor of Botany and Director of the Botanical Garden, Berkeley: (b) 1959, the Botanical Expedition of the Max-Planck Institute, Koeln, Germany, Dr. Hans

* (CUZ) is the international abbreviation for **HERBARIO VARGAS.** See J. Lanjouw & F. A. Stafleu. Index Herbariorum, Part 1. The Herbaria of the World. 5th ed. Utrecht. 1964.

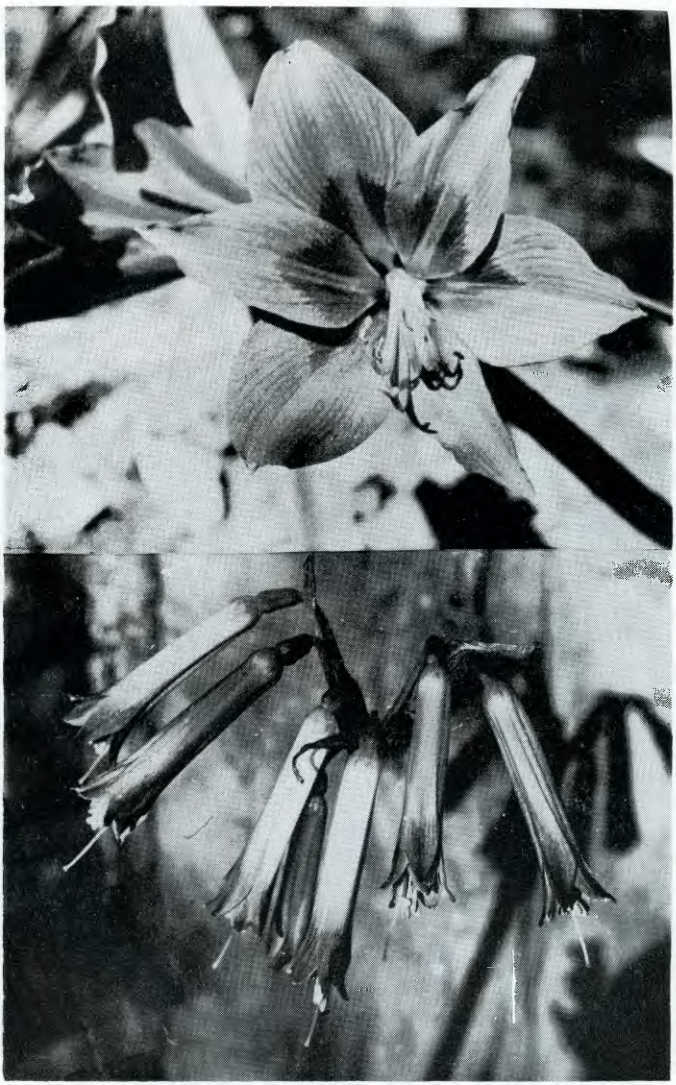


Fig. 2. Upper, **Amaryllis intiflora** Vargas, and Lower, **Eustephia darwinii** Vargas.

Ross, Director; and (c) 1961, the John Hopkins Expedition, Dr. Dodds, Director, England.

I have represented the University of Cuzco at many Botanical Congresses in America and Europe.

My interest in the genus *Amaryllis* was stimulated in the first instance by the request from interested persons in the Republic of Colombia, The United States of America, and England, for bulbs to be collected by me. When I visited certain European countries, I turned special attention to *Amaryllis* in the herbaria at London, Edinburgh, Paris, Madrid and Berlin. Then I began to collect many *Amaryllis* species native to southern Peru. Up to the present, I have more than 20 Amaryllis species under cultivation. I have taken notes and other records on *Amaryllis,* including more than 300 color photographs in order to obtain data on color, form, etc. Dried specimens have been deposited in Herbario Vargas. I hope to be able in a few months to publish the preliminary results from 12 years' research on the genus *Amaryllis* in Peru.

At present I am retired from my teaching duties at the University of Cuzco, as Emeritus; and have been awarded the honor of the Gold Medal, Amauta. In July 1972, I was honored with the Gold Medal, Garcilaso de la Vega by the Casa de la Cultura of Cuzco.

Finally, I should like to thank my good friends and colleagues, Dr. Martin Cardenas, Cochabamba, Bolivia, Dr. Hamilton P. Traub and Mr. John Leonard Doran, both of the United States of America, who gave me their valuable advice in many ways. I am also grateful to my many students and assistants who have assisted me in my field trips over many years of collecting various plants including *Amaryllis* bulbs; and to the American Plant Life Society for awarding me the William Herbert Medal in 1973.

November 28, 1972,
Herbario Vargas,
Cuzco, Casilla 79, Peru.

AMARYLLIDACEAE I HAVE COLLECTED

Cesar Vargas Calderon, *Cuzco, Peru*

As botanical collector for Herbario Vargas, I have accumulated many plants since the 1930's, including many amaryllids other than *Amaryllis* species. At first, my attention was drawn to the genus *Bomarea,* a group which includes a great many very beautiful species in Peru. I discovered about ten new *Bomarea* species. After several years, I had planned to undertake a revision of the genus *Amaryllis* in Peru.

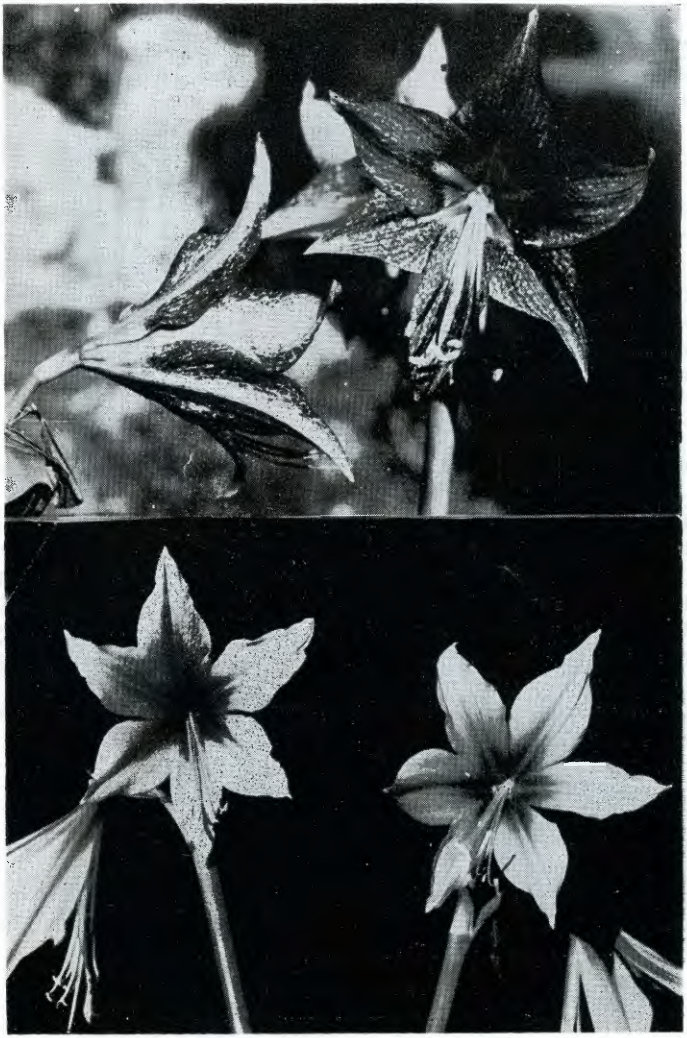


Fig. 3. Upper, **Amaryllis machupijchensis** Vargas, and Lower, **Amaryllis macbridei** Varga.

This required that I pay special attention to the collection of bulbs, taking field notes about these plants, and attempts at the cultivation of *Amaryllis* species at Cuzco.

The following listing includes the various amaryllids, other than *Amaryllis* species, which I have collected and named:

Bomarea ampayesana Vargas
Bomarea biflora Vargas
Bomarea killipiana Vargas
Bomarea cuzcoensis Vargas
Bomarea tacnaensis Vargas
Bomarea velascoana Vargas
Bomarea herrerae Vargas
Bomarea longistyla Vargas
Bomarea calcensis Vargas
Bomarea ferreyrae Vargas
Bomarea cerratea Vargas
Eustephia coccinea Cav.
var. *multiflora* Vargas
Eustephia darwinii Vargas
Hymenocallis multiflora Vargas
Urceolina weberbaueri Vargas
Urceolina urubambae Vargas
Stenomesson morrisonii Vargas
Stemonesson imasumac Vargas

Stenomesson imasumac Vargas is the most handsome and gorgeous in the genus. Fortunately, at the present time I have many plants of it under cultivation for use in my experiments.

STUDIES IN THE GENUS AMARYLLIS

About 12 years ago, I started collecting trips especially dedicated to the Genus *Amaryllis*. These explorations included the following localities:

Departamento Cuzco, including the forest valleys of Kosnipata, (Paucartambo Provincia); "15 Mil" to Inambari (Quispicanchis Provincia); localities in Convencion Provincia, and also in the Provincias of Uruamba, and Calca.

Departamento of Puno: the valley of Ollachea, (Carabaya Provincia); the localities and valleys of Limbani, Oconeque, San Jose, San Juan del Oro, and Cuyo-Cuyo, in Sandia Provincia.

In Departamento of Puno, I found many interesting *Amaryllis* species and varieties, including for instance, *Amaryllis macbridei* Vargas (see Fig. 3). In addition to the field notes which I have taken down year after year during the flowering season, I made color slides of the flowers. I have also compiled other data which may be useful when the results of the project are written up in the future as a preliminary report of the genus *Amaryllis* in Peru.

I have taken the liberty of including a few illustrations of new *Amaryllis* species which I have discovered and named, *Amaryllis intiflora* Vargas, *A. macbridei* Vargas and *A. machupijchensis* Vargas (Figs. 2 and 3).

BIBLIOGRAPHY OF PAPERS CONCERNING AMARYLLIDS

Vargas, César. Two New Bomareas and a New *Stenomesson*. National Hort. Mag. (Oct. 1943), pages 130—133, plates 1 and 2.

_____. Two New Species of *Bomarea* from Peru. Bull. Gray Herb. Harvard Univ. June 1945.

_____. Especies Nuevas o Críticas de la Flora del Perú. Rev. Universitaria, Cuzco, Perú. Nro. 107. 1954.
_____. De Novis Speciebus Florae Peruvianae. Bol. Facultad de Ciencias, Univ. de Cuzco. Nro. 1. 1960.
_____. Two New *Bomarea* Species from Peru. Plant Life 21: 155—158, plates 38 and 39. 1965.
_____. New *Eustephia* Species. Plant Life 23: 47—48. 1967.

Fig. 4. James Edward Mahan.

_____. Especies Nuevas para la Flora del Sur-Perú. Biota. VII, Nro. 61, Dic. 1969.
_____. Una Nueva especie de *Amaryllis* del Sur-Perú. Biota. VIII. Nro. 65. Dic. 1970, Lima. Peru.

November 28, 1972,
Herbario Vargas,
Cuzco, Casilla 79, Peru.

IN MEMORIAM—JAMES EDWARD MAHAN, 1909-1972

James Edward Mahan (Jim), our Registrar of Amaryllis names, died suddenly on Sunday, September 10, 1972, at the age of 63, of a heart attack. He had been hospitalized for a short period in July and August and was apparently progressing nicely when the fatal attack came.

Jim, as he was so fondly known to his many friends and acquaintances, was born in New Orleans, Louisiana, on August 20, 1909, where he attended Sacred Heart Elementary School and Warren Easton High School, where he earned many honors. Upon graduation he attended Tulane University in New Orleans.

He entered the Army in 1941 and served until 1946. During that time he suggested and helped to install some accounting practices in the Quartermaster Corps which I understand are still in use. After his tour of duty was over, being discharged as a Captain, Jim returned to private business and in 1948 joined the James E. Comiskey Company in New Orleans as Office Manager and Secretary, from which position he retired on April 1, 1972.

From 1967 until his death Jim held the important position of Registrar of Amaryllis Names in the AMERICAN PLANT LIFE SOCIETY, which he administered with his usual efficiency. He helped reform the exhibition schedule for staging Amaryllis shows and also wrote an article on The Staging of Amaryllis Shows (PLANT LIFE 1968), and at the time of his death was attempting to set up standards for classification and divisions of the newly developed Double Amaryllis which were coming into prominence in the New Orleans area.

He was a PATRON LIFE MEMBER of the AMERICAN PLANT LIFE SOCIETY (1969). He was also a member of the MEN'S AMARYLLIS CLUB OF NEW ORLEANS INC., having joined the organization shortly after its inception, and had held various offices in the Club. He served as its Fourth President, was Show Chairman for one of its Shows, and then served as permanent Classification Chairman. He wrote many articles for its News Letter.

Among his other club memberships were the AMARYLLIS SOCIETY OF BATON ROUGE, Louisiana, THE LOUISIANA SOCIETY FOR HORTICULTURAL RESEARCH, THE JEFFERSON ORCHID SOCIETY and the LIONS CLUB of Metairie.

Needless to say, he was held in high regard and esteem by all who knew him and his passing will mean a great loss to the MEN'S AMARYLLIS CLUB OF NEW ORLEANS and also to the officers and members of the AMERICAN PLANT LIFE SOCIETY.

To keep up the tradition of Jim's donating a trophy in the annual Men's Amaryllis Club show, his sister Helen has established a trust fund to continue awarding an annual "James E. Mahan Memorial Award."

Jim is survived by his brother Henry and two sisters, Helen T. Mahan and Mrs. Adele Johannesen.—*Walter R. Latapie.*

1972 HERBERT MEDAL PRESENTED TO JOHN LEONARD DORAN

FAY ROSOFF, *Secretary, Southern California Hemerocallis and Amaryllis Society, 5617 Natick Ave., Van Nuys, California 91041*

At our regular meeting on January 22, 1972, we were again honored to have one of our members, Mr. John Leonard Doran, presented with the WILLIAM HERBERT MEDAL by Dr. Thomas W. Whitaker, Executive Secretary of the AMERICAN PLANT LIFE SOCIETY, on behalf of the Amaryllis Section. Mr. John Leonard Doran is Chairman of the Amaryllis Committee and was presented with the HERBERT MEDAL for his extensive work in collecting in the field (Central and South America), various species of plants and seeds of Amaryllis, other Amaryllids, flowering plants, shrubs, and flowering trees, all of which can be grown in Southern California.

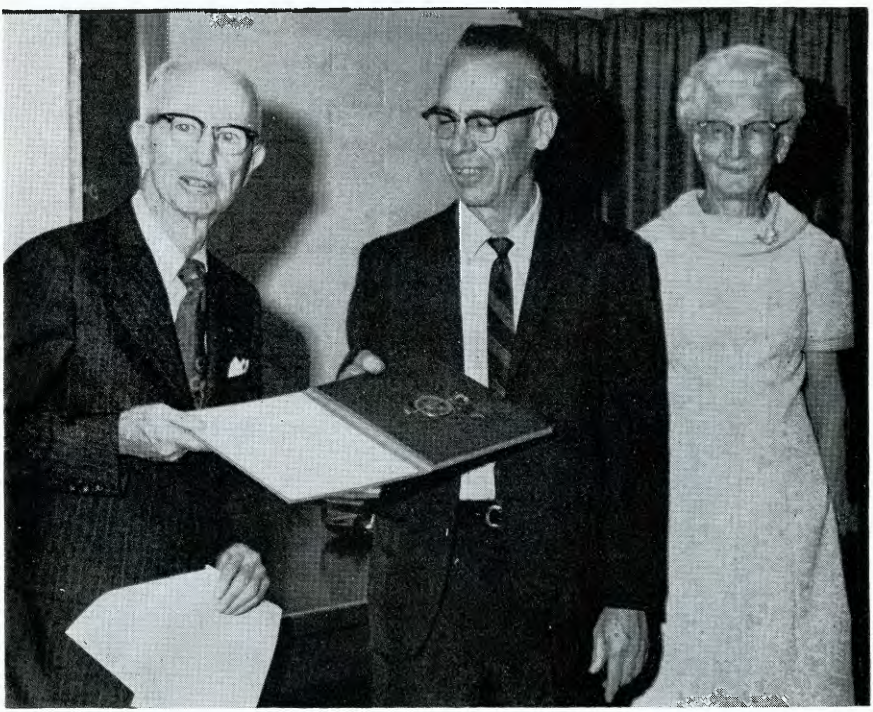


Fig. 5. Dr. Thomas W. Whitaker (left is shown presenting the 1972 Herbert Medal to John Leonard Doran at the January 22, 1972 meeting of the Southern California Hemerocallis and Amaryllis Society held at the Los Angeles State and County Arboretum. Mrs. Corabelle Whiting Doran, his mother, beaming, approves the selection. See the 1972 PLANT LIFE for the autobiography of John Leonard Doran and a brief biography of Mrs. Corabelle Whiting Doran. Photo by I. K. Rosoff.

The official citation from Dr. Hamilton P. Traub was read by Dr. Thomas W. Whitaker. Mr. Doran responded with a few words of thanks to Drs. Traub and Whitaker for their valuable assistance in classifying the species of bulbs he brought back to the United States, and added a few more words about his mother, Mrs. Corabelle Whiting Doran, who has accompanied him on some of his collection trips. He also informed the members that at the March 18th meeting, he would give a lecture on potting mixtures, etc., percentage of water the various potting ingredients will hold, together with parts per million of fertilizer recommended; and then present the educational "travelogue" of his 1971 trip to Bolivia and Peru.

Among those present to honor Mr. Doran were Mr. W. Quinn Buck, 1969 HERBERT MEDAL recipient; Dr. John Cage, and Mrs. Flores Foster, Amaryllis Committee members; Mrs. Bert Williams, Official Amaryllis Judging Instructor; Mrs. K. B. Anderson, Amaryllis Round Robin Group Leader; Mrs. Emma D. Menninger, Emeritus Registrar of Plant Names (Nerines); and Mr. Charles Hardman, Associate Registrar of Plant Names (Nerines).

As a tribute to Mrs. Corabelle Whiting Doran, and the general interest in Nerines, Mr. Charles Hardman gave a 20 minute illustrated lecture on Nerines.

EDITOR'S MAIL BAG

Under date of July 21, 1972, we are informed that Mr. & Mrs. Vincent R. Fesmire will move on July 27, 1972 to 252 Tierney St., Perris, Calif. 92370. Thereafter they will spend the six winter months of each year at the above address, and the six summer months at Ocean City, New Jersey. Mr. Fesmire promises to contribute an article on winter amaryllids in due course.

The last letter received from Dr. J. C. Th. Uphof, 2903 San Nicholas Street, Tampa, Florida 33609, was dated June 10, 1968, and was answered on June 30, 1968. Letters sent to this address since that date have been returned marked "left no address." Anyone having knowledge of the present residence of Dr. Uphof (a HERBERT MEDALIST; see PLANT LIFE Vol. 8. 1952) are requested to report to the editor.

Since the above was written, we have received word that Dr. Uphof died in October or November 1969. The exact date has not been obtained.

Mr. Zilmir K. T. Sahin, 't Huys met de Beyen, Uiterweg 34, Aalsmeer 1210, Netherlands, writes under date of October 16 that he is looking for a source of the White Vallota, *Cyrtanthus speciosa* (L. f) Traub, syn—*Vallota purpurea* Ait. It is hoped that those who have this information will report it either to him directly or in PLANT LIFE.

Mr. G. A. Zuidgeest, Middlebroekweg 71, Honselerdijk, Netherland, writes under date of October 12 that he would be pleased to have the address of Mr. Peterson, "who has a nursery for carnation cuttings."

Will anyone with this information please send it on to him or report it in the next issue of PLANT LIFE. He is also interested in having the name and address of a grower of Bouvardias.

Mr. Burr Cluette, 701 7th Ave., San Diego, Calif. 92101, writes under date of Oct. 19, 1972, that he will visit his niece in Buenos Aires, Argentina, over Christmas leaving December 15 and returning 31, 1973. The Editor has asked him to publish a brief report on his trip in PLANT LIFE.

Mr. J. J. Barbour, Department of Biology, Grower and Superintendent, University Greenhouses, University of Akron, Akron, Ohio 44304, is in search of seeds and bulbs of *Amaryllis* species. He is particularly interested in obtaining *Amaryllis aglaiae, A. calyptrata, A. evanisae, A. papilio, A. pardina, A. parodii,* and also *Worsleya rayneri.* It is hoped that members will assist Mr. Barbour in obtaining these species.

Mrs. Meta M. Korsakoff, wife of Alek Korsakoff, 7634 Oriole St., Jacksonville, Fla. 32208, writes under date of Nov. 22, 1972, that Alek is very sick, having had 10 cobalt treatments on his spine. The tumor on his spine has paralyzed him from the waist down. He knows that his is a terminal case. However, he is a very brave and courageous man, indicating that "Our Father in Heaven knows best." His mind is as sharp and alert as ever. He is eager to hear from his many friends who should write to the address given above.

During 1972, we had the great pleasure of a visit from Dr. A. Graham Sparkes, of Churchfield, Station Road, East Preston, England, who is an enthusiastic plant collector and gardener. He recently collected many plants in Chile, including a large assortment of *Alstroemeria* species, and related *Bomarea* and *Leontochir* species.

The sad news has reached us that Wilfred McDonald James, 17950 Los Olivos Drive, Saratoga, California 95070 died on Dec. 27, 1972. Mr. James received the William Herbert Medal for 1941 in recognition of his outstanding contributions toward the advancement of knowledge about the Amaryllidaceae. Members are referred to **HERBERTIA** Vol. 8. 1941, pp. 33—35, Plate 203 (portrait), for his autobiography.

1. REGIONAL ACTIVITY AND EXHIBITIONS

INTRODUCTION

Most of the local and regional Amaryllis shows were held again in 1972. However, Mr. W. A. McCollum, Mobile, Alabama, writes that the Greater Gulf Amaryllis Show was not staged in 1972 due to unusual spring weather which was unfavorable for Amaryllis blooms at the proper time. Plans are being made for the 1973 Show.

No reports were received from those in charge of the usual Greater Houston Amaryllis Club Show, and the Garden Circle Amaryllis Club (New Orleans) Show. These clubs apparently will stage shows for the 1973 season.

The members of the Mattiesburg (Miss.) Amaryllis Society, who are keenly interested in these plants, plan to exhibit Amaryllis in the homes of members of the Society. The 1973 showings were based on the arrangement as given in the Traub—AMARYLLIS MANUAL. Accurate records will be kept of the hybridizing efforts.

1972 OFFICIAL AMARYLLIS SHOWS

The show season began with the 1972 Official Corpus Christi (Texas) Amaryllis Show, and the 1972 Greater New Orleans Official Show All-Horticulture Amaryllis Show, both held on the same dates, April 8 and 9. These were followed on April 15 and 16 by the 1972 Official Houston Amaryllis Society Show.

The 1972 Baton Rouge (Louisiana) Official Amaryllis Show was held on April 23, and the show season closed with the 1972 Southern California Official Amaryllis Show on April 29 and 30.

NOTE TO AMARYLLIS SHOW ORGANIZERS

It is important to designate some one to write a *brief* review of the official show, and to send this promptly to Dr. Hamilton P. Traub, Editor, Amaryllis Year Book, 2678 Prestwick Court, La Jolla, Calif. 92037. *Your plans are not complete until this appointment has been made.* Only in this way is a permanent international record of your show assured.

1972 OFFICIAL CORPUS CHRISTI AMARYLLIS SHOW

MRS. CARL C. HENNY, *Corresponding Secretary, P. O. Box 3054, Corpus Christi, Texas 78404*

Once again it is time to report that our Coastal Bend Amaryllis Society held it's annual Amaryllis Exhibit in conjunction with the "Festival of Flowers", held by the Corpus Christi Council of Garden Clubs on April 8th and 9th, 1972, in the City Coliseum building We

were very fortunate in having 63 entries exhibited by members and non-members in our exhibit, since our winter months were very mild this year, causing many bulbs to bloom ahead of time.

Since we no longer have a Ludwig Challenge Trophy to be awarded to our club members, we are now awarding a large Silver Revere Bowl to the club member receiving the most "blue ribbons" in the Ludwig Registered and Named Amaryllis Section. Mr. W. M. Neyland, a veteran grower of amaryllis, received blue ribbons for his entries of Apple Blossom, Ludwig Ace, and Peppermint, which made him eligible for the silver bowl award. He also received blue ribbons on unnamed varieties in the show.

Other entries in the Registered and named Ludwig varieties were 'Loves Desire', 'Fantastica', 'Picotee Petticoat', and 'Red Man' gracilis type.

The "Special Trophy" to a non-member was awarded to Mrs. Harvey Fry for her entry of 'Picotee Petticoat', which scored 95 points. The "Special Trophy" given to a club member in the "Breeder's Class" was awarded to Mr. Walter Hennig and also to Mrs. Levi Materne, for their entries in that class.

The "Award of Merit" given by the American Amaryllis Society, was given to Mr. W. M. Neyland for his entry of 'Apple Blossom,' which scored 96 points, and also to Mrs. Harvey Fry for her entry of 'Picotee Petticoat', which scored 95 points.

Thirty seven blue ribbons, 8 red ribbons, and 10 yellow ribbons were awarded by judges for entries in the exhibit. Judges for our exhibit were Mrs. E. T. Story, Mrs. R. H. Parkinson, and Mrs. D. A. Ingalls, National Accredited Amaryllis Judges from San Antonio, Texas.

1972 GREATER NEW ORLEANS OFFICIAL ALL-HORTICULTURE AMARYLLIS SHOW

Dr. Tim Calamari, Jr., *1016 Rosa Ave., Metairie, La. 70005*

The Men's Amaryllis Club of New Orleans sponsored their thirteenth annual all-horticulture Amaryllis show over the weekend of April 8 and 9, 1972 at the Lakeside Shopping Center Mall in Metairie, La. As always the members of the Club devoted their time, ideas, and energies toward the display of one of nature's most beautiful and stately flowers—the Amaryllis. Some outstanding aspects of this year's Show were the superb publicity spearheaded by Mr. Al Diermayer, and the superior overall planning and coordination of the Show by its General Chairman, Dr. W. N. Palmer, Jr.

The flowers were good and competition was tough. There were 312 entries by club members and 41 by non-members. It really took excellent flowers to find their way to the trophy table. There were more top prizes awarded this year than ever before. Ed Beckham, Dr. Tim Calamari, Jr., L. W. Mazzeno, and J. T. Schmidt divided top honors in the Show.

Mr. Beckham won the "Best in Show" rosette, the "Ludwig Chal-

lenge Cup'' and the ''Walter Latapie Trophy'' for an outstanding specimen of ''Picotee Red Lining.''

Dr. Calamari won the ''President's Cup'' for the most blue ribbons won by a member of Men's Club, the ''Amaryllis Inc., Trophy'' for the best species shown, an *Amaryllis evansiae,* and the Sweepstakes Ribbon for the most blue ribbons in the registered and named sections.

Mr. Mazzeno won the ''T.A.C. Construction Co. Trophy'' for the best unregistered and unnamed specimen in the Show, the ''James Mahan Trophy'' for the runner-up specimen in the registered section of the Show, the ''L. W. Mazzeno Trophy'' for the best registered miniature, and the Sweepstakes Ribbon for the most blue ribbons in the unregistered and unnamed sections.

Mr. Schmidt received the ''Robert Diermayer Memorial Trophy'' for the best breeder's seedling exhibited, the ''Lloyd Donahoe Trophy'' for the best two-floret specimen in the Show, and the ''Reuter Seed Co. Inc. Trophy'' for the best cut specimen shown.

Mr. Latapie won a ''Special Trophy'' for the best registered single floret, a 'Nostalgia'.

Mr. Robert won the ''Amaryllis Society of Baton Rouge Trophy'' for the best unnamed and unregistered single floret.

Finally, Mr. Diermayer won the ''Edward F. Authement Memorial Trophy'' for the runner-up specimen in the unregistered and unnamed section; and Mr. Crochet won the ''Southern Seed and Popcorn Co. Trophy'' for the runner-up specimen in the Breeder's Section.

With the memory of our 1972 Show fresh in their minds, all of our members have set their sights for next year's show so that we will have even a larger and prettier show than this year's with that exquisite flower—the Amaryllis.

THE AMARYLLIS SOCIETY OF ALABAMA SHOW, 1972

Dewey E. Hardy, *President, Rt. 9, Box 55, Eight Mile, Alabama 36613*

The Amaryllis Society of Alabama, Inc. held it's fifth annual spring show at the Chickasaw Civic Center on Grant Street in Chickasaw, Alabama on April 15th and 16th, 1972. The theme of the show was ''The Wonderful World of Amaryllis''. There was much interest shown in both the horticulture and artistic arrangements divisions. Mr. C. E. Tagert of Mobile was the show chairman this year.

Mrs. Claudine Pierce of Mt. Vernon, Alabama won the AMERICAN NATIONAL BANK Trophy for the best named Dutch Potted specimen in the show. In addition, Mrs. Pierce won the following trophies: CLAUDE H. MOORE MEMORIAL TROPHY—Awarded for the most outstanding horticultural specimen of potted Dutch Amaryllis in the show, Division III. Silver tray. THE WILMER SMITH TROPHY—Awarded for the most outstanding potted bulb specimen in the show. Silver pitcher. MARTHA BURDETTE MEMORIAL TROPHY—Awarded for the most blue ribbons in Divisions V and VI. Silver tray.

Mr. Dewey Hardy of Eight Mile, Alabama received the CECIL

BATES TROPHY for the Educational Display.

Mrs. Velma Thompson of Mt. Vernon, Alabama won the following trophies: CHAVIS FURNITURE COMPANY TROPHY—Awarded to the winner of the most blue ribbons in horticulture, Divisions I-VIII. Large silver tray with handles. MR. & MRS. H. P. WHEAT MEMORIAL TROPHY—Awarded to the winner of the most blue ribbons in the potted and cut seedling divisions, Divisions VII and VIII. Large silver tray with handles. EMILE SCHEUERMANN, SR. MEMORIAL TROPHY—Awarded to the winner of the most blue ribbons in combined horticulture and artistic arrangement divisions. Silver champagne cooler. FIRST NATIONAL BANK OF MOBILE TROPHY—Awarded to the best specimen in Division VII. Silver Paul Revere Bowl. MERCHANTS NATIONAL BANK OF MOBILE TROPHY—Awarded for the most blue ribbons in horticulture Divisions I through VII. Silver tray. THE T. J. SWETMAN TROPHY—Awarded for the most blue ribbons in Division III. Large ceramic tray. CLAUDINE PIERCE TROPHY—For the most outstanding collection of three (3) scapes in Division X. Ceramic pitcher.

Mr. C. E. Tagert of Mobile won the following trophies PRESIDENT'S AWARD—Awarded for the most outstanding Dutch seedling hybridized and brought into bloom by exhibitor and being shown for first time Division VIII. Large silver tray with handles. THE AMARYLLIS SOCIETY OF ALA., INC. TROPHY—Awarded to the winner of the most blue ribbons in the cut Dutch division, Division IV. Silver tray THE VINCENT KILBORN SR. MEMORIAL TROPHY—Awarded for the most blue ribbons in Division IV. Silver bowl. The C. E. TAGERT, SR. TROPHY—Awarded for the most blue ribbons in the single bloom un-named division. Small silver bowl. THE C. E. TAGERT, SR. TROPHY—Awarded for the most blue ribbons in the single bloom named division. Small silver bowl.

Mrs. Mae Brown of Mobile, Alabama won the following trophies: DEPOSIT NATIONAL BANK TROPHY—Awarded for the most blue ribbons in the American potted Amaryllis, Division I. Silver tray. THE BROWN TROPHY—Awarded for the most outstanding potted bulb specimen of named American Amaryllis. Silver trophy.

Mrs. Mae Allen of Chickasaw, Alabama won the following trophies: AMARYLLIS SOCIETY OF ALABAMA, INC. TROPHY—Awarded for the most outstanding potted miniature Dutch amaryllis. Silver dish. ALABAMA FURNITURE COMPANY TROPHY—Awarded for the most blue ribbons in the potted miniature named Dutch division. Silver dish.

Mrs. Irene Massingill of Chickasaw, Alabama won the following trophies: SULLY'S DRIVE-IN TROPHY—Awarded to the winner of the most blue ribbons in the artistic arrangement division. Silver bread tray. WEST DEPARTMENT STORE AWARD—Awarded for the most blue ribbons in artistic arrangements. Division XII. Canister set.

Mrs. Ora Wilson of Chickasaw, Alabama won the following trophies: MT. VERNON TROPHY—Awarded for the most outstanding artistic

arrangement in show. Relish dish. ELLEN "JACK" CROPP TROPHY—Awarded for the most artistic design of amaryllis with elements other than fresh plant material predominating. Silver award.

Mrs. Earl Conway of Grand Bay, Alabama won the MITTIE YOUNG TROPHY for the corsage.

In the non-member class, Mrs. Lois Koontz of Mobile, Alabama, won the AMARYLLIS SOCIETY OF ALABAMA, INC TROPHY for the most outstanding potted amaryllis, and also the AMARYLLIS SOCIETY OF ALABAMA, INC. TROPHY for the most outstanding cut amaryllis.

The horticulture judges, all from Hattiesburg, Mississippi, were: Mrs. Charlie Bell, Mrs. E. R. Trussell, Mrs. C. W. Woods and Mrs. A. M. Wilson.

Artistic arrangement judges, all from Pensacola, Florida, were: Mrs. J. T. Barfield, Mrs. E. O. Sanders and Mrs. T. C. Barfield.

After the judging of the show, the judges were guests of the Amaryllis Society of Alabama, Inc. at a luncheon at a Mobile restaurant.

1972 OFFICIAL HOUSTON AMARYLLIS SOCIETY SHOW

Mrs. A. C. Pickard, *Show Chairman, 1702 North Blvd., Houston, Texas 77006*

The 1972 Houston Amaryllis Society Educational Show, held at the Garden Center, Houston, Texas April 16th, goes down in history as the most popular Show staged in the sixteen years.

Abnormalties in the scape and florets due to the freakish spring weather canceled the judging. Since exhibits most worthy of judging would be pot grown, the Society felt this would not be a good representation. Amateur and serious Amaryllis breeders have long been interested in the opportunity of staging a complete Educational Show to encourage cultural experiments and the study of genetic factors such as color, form and time of bloom. Thus, a very successful Educational Show was staged.

The Houston Amaryllis Society has enjoyed a rather long span of productive years. The ingredients which went into the foundation of this Society account for much of its longevity and its accomplishments. Yearly Awards offered by the Society have done a great deal to stimulate the development of growing better plants and the list of those purchasing and growing named registered bulbs is increasing year by year.

Honors go to the Artistic section which has been a great boon to the use of Amaryllis blooms. We always have well known professional leadership in the Arrangement Division and all arrangements must contain some Amaryllis blooms. Many people come to the show just for this division.

An abundance of Amaryllids such as the *Clivia, Sprekelia* and *Hemerocallis* added interest and beauty to the show. Since hybridizing cannot be separated from *Amaryllis* growing, the show combined the one display covering the subject in general from the correct method of potting the bulb through different stages of growth to a mature blooming plant.

The results of cross pollination from seed pod, seeds, planting of seeds, and pots of 1st, 2nd, and 3rd year seedlings were shown. This table consisted of parent plants and the result.

A separate table with instructions on different methods of vegetative and asexual propagation were exhibited showing examples of the methods with pots of growing plants. Each exhibit showed clear identification of the subject and was the eye-catcher for young and old. Tables with samples of soil, fertilizers, mulch, bottles of insects and insect repellants created much interest.

Hostesses served in shifts in each division of the show. They gave demonstrations of hybridizing, answering questions and leading conversations to accomplish the real purpose—educating the people about *Amaryllis.*

The tables of Dutch seedlings continued to be a popular feature of the show. Two tables of named and registered cut specimens were well received by the public and assisted them in making their favorite selections of color. No one can come away from a show staged as this one without renewed enthusiasm for one of life's rewarding and enduring jobs—to help nature in the creation of beauty.

This first all educational show was viewed by hundreds of interested Amaryllis spectators. With more of these wonderful shows, I am sure that additional A. A. S. memberships will be forthcoming.

1972 BATON ROUGE AMARYLLIS SHOW

Joseph K. Mertzweiller
9266 N. Parkview Dr., Baton Rouge, La. 70815

Sunday, April 23 was the date of the 1972 Amaryllis Show sponsored by the Baton Rouge Amaryllis Society. The Nelson Memorial Center on the campus of Louisiana State University provided an ideal setting for the show. Mr. Ken Campbell served as Show Chairman and he was assisted by practically the entire membership in staging what we considered to be the best show in the brief history of our organization. More than 75 exhibits covering all of the principal Amaryllis Show classes, as well as some of the rare classes, were provided through the efforts of some 15 exhibitors. A very interesting educational exhibit on a new cuttage technique for rapid multiplication of amaryllis bulbs was staged by Dr. Ed O'Rourke and his graduate students from L.S.U. Eight prizes in silver provided the principal show awards. The estimated attendance at the show was over 300 persons during the single afternoon it was open to the public.

The Ludwig Challenge Cup was awarded to Mr. Jake Schmidt for

a beautiful specimen of 'Bridesmaid'. Mr. Ed Beckham was a quadruple winner. He won the Best Registered Flower award with 'Picotee Red Lining'. Ed also won the much sought after Hybridizer's Award for a picotee seedling No. 72-2, the best Unregistered Single Floret (white seedling No. 104), as well as the Potted Plant Sweepstakes. Mr. L. W. Mazzeno won the award for the Best Small Flower for 'Carina'. Mr. Ken Campbell won the award for the Best Intermediate Flower for his pink seedling No. 72-4. Dr. T. A. Calamari Jr. won the Fred J. Buchmann award which we give for "the most distinctive and unusal potted flower consisting of an amaryllis species or a species hybrid". Dr. Calamari's winning plant was a truly distinctive orchid flowering type derived from *A. evansiae* X *A. cybister*. The award for the Best Unregistered Single Floret went to Mr. Vincent Peuler for 'Nivalis' while the Cut Scape Sweepstakes was awarded to Dr. William Palmer. Several Preliminary Commendation Awards and Awards of Merit were also given.

Again we would like to express our sincere thanks to the Men's Amaryllis Club of New Orleans, to Louisiana State University and to Dr. Ed O'Rourke for helping to make our 1972 show the success it was.

1972 SOUTHERN CALIFORNIA OFFICIAL AMARYLLIS SHOW

HENRY W. MYERS, *Show Chairman,*
4709 W. 132nd St., Hawthorne, California 90250

The eighth annual Amaryllis Show of the Southern California Hemerocallis and Amaryllis Show was held on April 29 and 30, 1972, at the Los Angeles State and County Arboretum, 301 N. Baldwin Av., Arcadia, Calif. The Show was quite satisfactory even though we had an unseasonable and unreasonable spring. There were 14 exhibitors with 74 entries.

The Cecil Houdyshel Memorial Trophy for the Sweepstakes was won by Sterling Harshbarger. The Sweepstakes Runner Up was Leonard Doran who received a trophy from our Society.

The Ludwig Challenge Cup for the best registered Ludwig clone could not be awarded since no entry received 95 points or more. Dr. John Cage's 'El Toro', a beautiful orange-red was judged the best flower in the Show.

In the Hybridizer's Class where entries must be raised from seed by the exhibitor, the following awards were made: Best overall seedling was won by Sterling Harshbarger with a Leopoldii type rose-colored flower; the best Gracilis indoor grown was won by Mrs. S. Harshbarger; best small Leopoldii, 4½ to 6 inch diameter indoor grown was won by Mrs. S. Harshbarger; best Belladonna type hybrid, outdoor grown, was won by Kelly Spearman.

Additional ribbon awards were made to Kelly Spearman, Polly Anderson, D. Cothran, Ed Pencall and Henry Myers. Sylvia Beck received an award for excellence in flower arrangements.

Fig. 6. Southern California Amaryllis Show, 1972, **top:** from left, Mr. W. Quinn Buck, Herbert Medalist, Hemerocallis and Amaryllis hybridizer; Dr. John Cage, Amaryllis hybridizer; Mr. and Mrs. E. A. Angell, Amaryllis hybridizer and commercial grower; and Mr. Leonard Doran, Herbert Medalist and plant collector of South American species. Mr. Doran has probably the largest and finest collection of Amaryllis species.

Mr. E. A. Angell announced that 1972 would be his last year as a grower, and donated his entire crop of Amaryllis seeds (approximately three pounds) to the Amaryllis Society (see Fig. 7).

Middle, Mr. and Mrs. E. A. Angell and Dr. Thomas W. Whitaker discuss Mr. Angell's Amaryllis exhibit.

Bottom, Mr. John Leonard Doran, Dr. Thomas W. Whitaker and Mr. W. Quinn Buck looking over the 1972 Show, obviously pleased with what they see. Photos by I. K. Rosoff.

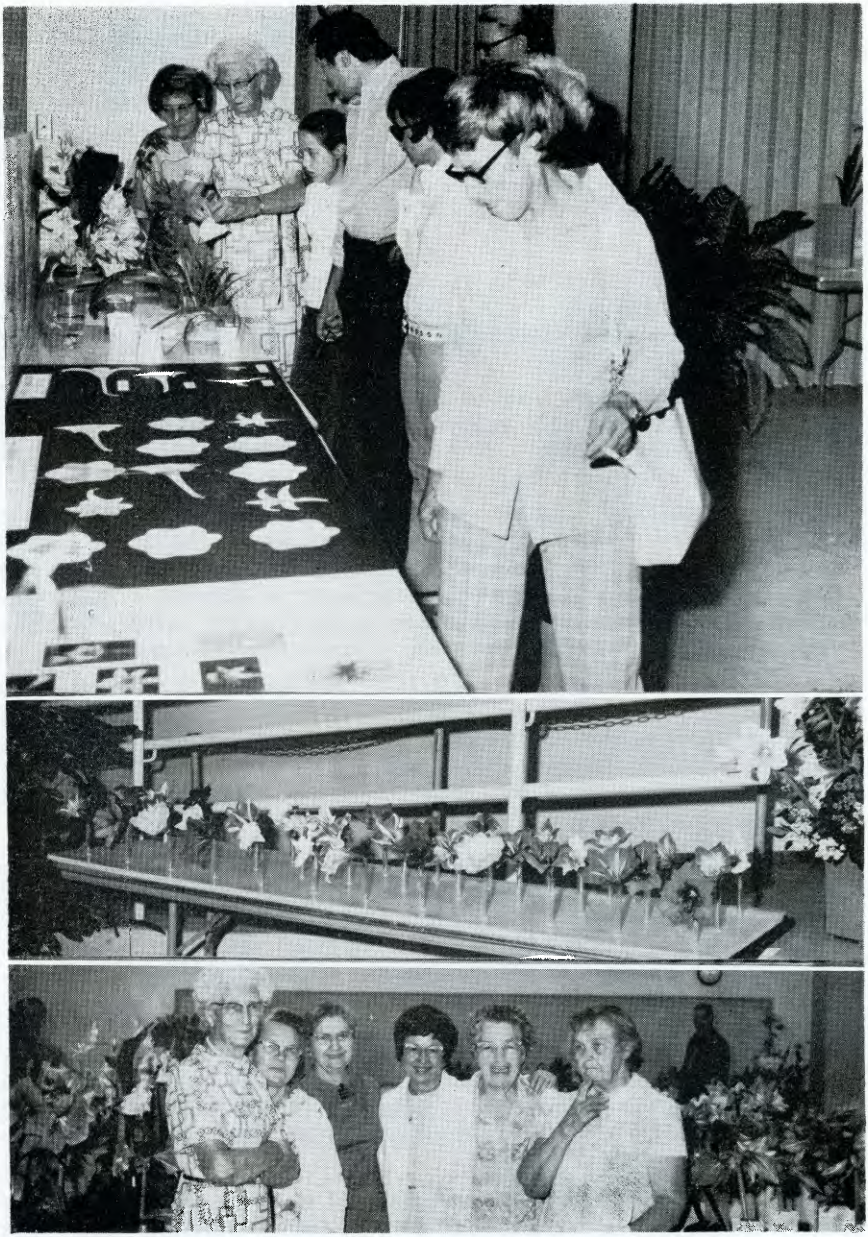


Fig. 7. Southern California Amaryllis Show, 1972, **top:** At one corner of the exhibit hall Mr. Leonard Doran assembled a striking display of various forms and colors of Amaryllids. Sort of looking into the future.

he guesses what the hybridizers will change in size, color and/or shape of the present Amaryllis hybrids. In the background Mrs. Cora Doran is offering, to all show visitors, envelopes containing a teaspoonful of the seeds which M. E. A. Angell donated to the Amaryllis Society.

Middle, Complimentary to Mr. Doran's educational display was the table display arranged by two high school students, Keith and Kenneth Weinstock. Their flowers were entirely home grown and no two alike. A total of 36 different Amaryllis clones.

Bottom, All shows must come to an end, and the clean-up chores are no small task. Photos by I. K. Rosoff.

When visitors entered the show, they were asked to deposit their votes for the Amaryllis flower they liked best. In two days 11,163 visitors entered the Aboretum, 3,739 visited our show, and 758 cast a vote for the best flower—it was grown by Sterling Harshbarger of Pasadena.

Mr. E. A. Angell of Loma Linda and Mr. Bruce Claflin of Upland exhibited hundreds of field grown cut Amaryllis blooms which added much color to the exhibits. A Special Award was made to Leonard Doran for the beautiful display of Amaryllis species in bloom.

The Educational Exhibit set up by Leonard Doran showed the various types of hybrid Amaryllis flowers, where the species came from, and how to grow Amaryllis from seeds. While working at this exhibit, Henry Myers was called the Johnny Appleseed of Amaryllis because of his unceasing demonstrations on growing Amaryllis from seeds; thousands of seeds were given to the many visitors.

ADDENDUM BY I. K. AND FAY ROSOFF, 5617 Natick, Van Nuys, Calif. 91401.—Pictures taken at the Flower Exhibits are of plants and flowers, and rightly so. The 1972 Show attracted a number of visitors who are also contributors to PLANT LIFE, and it is proper that a few pictures of these outstanding hybridizers and growers of Amaryllis would be of interest to the readers. See Figures 6 and 7.

Thankfully, in every organization there are the usual devoted workers, a mere handful, who remove the flowers, empty the vases, pack and store all equipment, clean tables, etc. And who does most of the work? Why, of course, the girls. And here they are from left: Mrs. Cora Doran, Mrs. Sterling Harshbarger, whose husband Sterling H. Harshbarger, gathers most of the trophies and prizes; Mrs. C. D. Cothran, whose husband Mr. C. D. Cothran is a consulting horticulturist to various African and South American countries, and also a hybridizer of Amaryllis and Camellias; Mrs. Phil Rosoff, secretary; Mrs. Eva Turnquist, home economist and a judge at various county fairs; and Mrs. C. H. Welborn, former secretary and a cultivator of a quarter acre of flowers. See bottom Fig. 7.

EDITORIAL NOTE.—We are indebted to Mr. I. K. Rosoff for the pictures of the flower exhibits and some of the outstanding hybridizers and growers of Amaryllis; and to Fay Rosoff, Secretary, of the Southern

SO. CALIF. AMARYLLIS SHOW—continued on page vi.

2. LINEAGICS

[BIOEVOLUTION, DESCRIPTION, DETERMINING RELATIONSHIPS, GROUPING INTO LINEAGES]

IN SEARCH OF **AMARYLLIS TRAUBII**

J. L. Doran, *1117 North Beachwood Drive, Burbank, California 91502*

Upon returning from Bolivia in 1967, we thought it would be worthwhile to try to recollect *Amaryllis traubii* because its characteristics seemed useful for the hybridist. My friend Dr. Gomez C., my mother and I flew up the coast to Trujillo; then across the Andes to Tarapoto. This trip proved interesting in that we were flying in a DC-4 which was unpressurized. The plane belonged to the Peruvian Air Force and was flying supplies to the interior. As we left Trujillo, they passed each person an oxygen tube, when we reached an altitude of about 12,000 feet the oxygen was turned on. We flew up a canyon with mountain peaks on each side of us, finally reaching an altitude of 16,500 feet. The trip across the Andes took about an hour and a half.

Tarapoto was a large Indian city when the Spanish first came to the area in the 16th Century. In 1967, it was a very primitive undeveloped small town by modern standards. Some streets were rain washed gullies just passable with a car. The city was not prosperous, nor were any of its inhabitants.

We went to the nearly new Brasila Hotel—said to be the best in town. One end of the room had a six foot high wall extending across the room making an area about 5 foot wide and ten foot long which contained a wash basin, toilet and the shower. When the water was run in the shower the area filled up with water about two inches deep. After several hours it would drain down to about an inch deep so that to use the toilet or basin one had to wade. Needless to say, it maintained an unpleasant odor.

We ordered chicken with rice that night. The chicken was selected from a pile of several, with wings and feet tied, at the end of the dining room. The chicken was butchered, "cooked", and served in about fifteen minutes. It was hot but nearly raw.

Across from my room was a community bathroom. The trap on the wash basin had a wooden plug which was removed so the water could drain into a bucket. When the kitchen needed water it was obtained from this source.

We criss-crossed the area south of Tarapoto several times to try to find *A. traubii* but in three days we were unable to find it. An occasional *A. belladonna* grew along the road.

In a canyon south of the dairy farm named Pucayaca—6 km. south of Tarapoto—we found #52. All the plants grew in a steep walled, narrow gully which was about 5 feet wide. They were scattered over

a length of less than fifty feet. This plant was identified as a form of *A. traubii* and has been named *A. traubii* forma *doraniana* Moldenke (Fig. 8). The gully was sparsely covered with brush about 20 feet high creating a light shade.

We went on down the Huallaga river to the confluence of the Maranon. On the return trip over the Andes, we landed at Trujillo for fuel. When we started to take off, just as the wheels left the ground the exhaust manifold blew off of one engine. The pilot put

Fig. 8. **Amaryllis traubii** forma **doraniana** Moldenke. Photo by David Knudson.

the wheels back on the ground and applied the brakes. The runway ends at the beach. We stopped right at the end. I thought surely we would go into the breakers. They unloaded the freight and our baggage and the baggage of the other two passengers, feathered the prop, and flew the ship on to Lima for repair. Another plane picked us up four hours later.

I still wanted *A. traubii.* In September 1971, Hugh Bush and I

went back to Tarapoto. We found many changes. When we were there in 1967, the *La Marginal* was just starting to be constructed. *La Marginal* is a road that the countries around the perimeter of the Amazon basin have pledged to build. It will allow colonization of the areas which it traverses and permit farm products to flow to market. Tarapoto started to grow beginning with the construction of *La Marginal* and today is enjoying prosperity. The streets have been graded, and five blocks of pavement have been put in. Most of the surrounding area is under cultivation. The principal crop is tobacco, all of which is flown to the coastal cities. As a result of man's encroachment upon nature there are practically no *Amaryllis* in the area of Pucayaca.

Before making the 1967 trip we discussed the area with Dr. Ferreyra, who found *A. traubii* in 1948. He gave us full details about the area. When we arrived we found considerable tobacco being grown and passable roads between Tarapoto, Juan Guerra and Shapaja. When we returned to Lima and told him about these changes he was amazed. Later, after he visited the area again in 1968, he told us that now he understood why we did not find *A. traubii.*

We visited the Lomos de Atacongo, where *Hymenocallis amancaes* used to grow without competition from other plants. Now it is smothered by European weeds. Dr. Ferreyra thinks that within a few years it will be completely killed out. The stocks of this fine species under cultivation should be carefully preserved so that it can be maintained at least under culture in the event that the native stands are crowded out by introduced weeds.

AMARYLLIS TRAUBII FORMA DORANIANA

HAROLD N. MOLDENKE

In 1950, Dr. Ramon Ferreyra, of Lima, Peru, collected plants of an *Amaryllis* species near Tarapoto, on the dairy farm Pucayaca, Dept. of San Martin, which he sent on to Dr. Harold N. Moldenke at the New York Botanical Garden. In 1952 this species was named *Amaryllis traubii* Moldk. This beautiful dwarf species unfortunately has been lost under cultivation.

Mr. J. L. Doran made attempts to recollect the species. However, the type locality had been plowed over and no trace of the species could be found there. Later, in 1967 Mr. Doran did find a dwarf *Amaryllis* near the type locality, which proved to be a form of the species. This plant with beautiful rose-colored flowers has been named for Mr. Doran whose perseverence brought it into cultivation.

Mr Doran, in a separate article appearing in this issue, discusses in detail the finding of this new form which makes a most fascinating account.

Amaryllis traubii forma *doraniana* Moldenke *forma nov.* (see Fig. 8)

Planta bulbosa, bulbo 4.5 cm. longo 5 cm. diametro; foliis 4 vel 5 sub linearibus 8—-12 cm. longis 1.9—2.2 cm. latis obtuse acutis; scapo

37 cm. longo; spatha 2-valvata; umbella biflora, floribus patentibus carminiroseis, fauce albido-viridescenti; pedicellis 1.5—3.3 cm. longis; ovario 7—8 mm. longo; tubo tepalorum usque ad 2.8 cm. longo; paraperigonio brevissime albo-piloso; segmentis tepalorum 7 cm. longis 1.5—3 cm. latis obtuse acutis; staminibus 3 cm. longis; stylo segmenta tepalorum aequanto; stigmate capitato, lobis 1 mm. longis.

HOLOTYPE: Doran s. n.; No. 1019 (TRA), July 5, 1972, grown from stock collected by J. L. Doran, in 1967, in Peru, 6 Km. south of Tarapoto, near the dairy farm of Pucayaca, Dept. of San Martin, near the confluence of the Rio Mayo and Rio Huallaga.

Bulb 4.5 cm. long, 5 cm. in diam., neck almost none, situated with neck of bulb even with the soil surface in nature; *leaves* 4—5, almost linear, narrowing somewhat toward the base, margins usually reddish, especially towards the base, grass green, somewhat sickle-shaped, up to 8—12 cm. long, 1.9—2.2 cm wide, apex very bluntly acute, *scape* hollow, only slightly compressed, glaucous, green, 37 cm. long, 7x10 mm. diam. (base), 4x6 mm. diam. (apex), *spathe-valves* 2, lanceolate, acute, scarious at anthesis, 4 cm. long; *umbel* 2-flowered, flowers wide open, carmine rose (HCC—621/1), throat pattern star-shaped, whitish, light greenish deeper in throat, flowers held more or less horizontally; *pedicels* green, 1.5—3.3 cm. long at anthesis; *ovary* oblong, green, 7—8 mm. long, 4—5 mm. in diam.; *tepaltube* greenish mottled reddish, up to 2.8 cm. long, widening toward the apex, 4 mm. wide (base), 7 mm. wide (apex); *paraperigone* of short, sparse, white hairs; *tepalsegs:* top, oblanceolate, 7 cm. long, 3 cm. wide; upper side segs, elliptic, 7 cm. long, 2 cm. wide; lower side segs, oblanceolate, 7 cm. long, 2.5 cm. wide; bottom seg, narrowly oblanceolate, 7 cm. long, 1.5 cm. wide; all segs with apex bluntly acute; *stamens* fascisculate, descending, recurved, whitish-greenish in lower half, light carmine rose above, subequalling the tepalsegs, but exserted; *style* as long as the tepalsegs, descending, recurved, whitish-greenish in lower ⅓, light carmine rose above; *stigma* trifid, deeper carmine rose, lobes about 1 mm. long.

AMARYLLIS CALYPTRATA KER-GAWLER

HARRY BLOSSFELD, *Rua Pedro 360,*
Tremembe 02371, Sao Paulo, Brasil

This brazilian species is little known and few people grow it, even if they have a good number of natural species in their collection. The reason may be, that it flowers out of the season, when most *Amaryllis* bloom and so enters but few exhibitions; its green flowers are anyhow more an oddity than a show piece. Moreover it requires a care somewhat different from other species, so that there may be difficulty in growing it successfully. Yet this species has a character of its own,

unforgettable and fascinating in colour, shape and even perfume, though the latter may not be approved by all nostrils.

The plant has it native haunts in the forest-clad dripping moist mountains of the Serra do Mar in southern Brazil, from Sao Paulo northwards to the Organ Mountains in the Rio de Janiero State and some mountain ranges of Espirito Santo. Almost anywhere it exists, it will grow as an epiphyte, on the mossy, gnarled trunks of trees, though rarely above ten feet from the ground. The thick, very succulent roots creep a long distance in the fissures of the bark, through a thin layer of dirt and moss, exploring occasional pockets of humus accumulations. It will bloom twice a year, first in January, that is

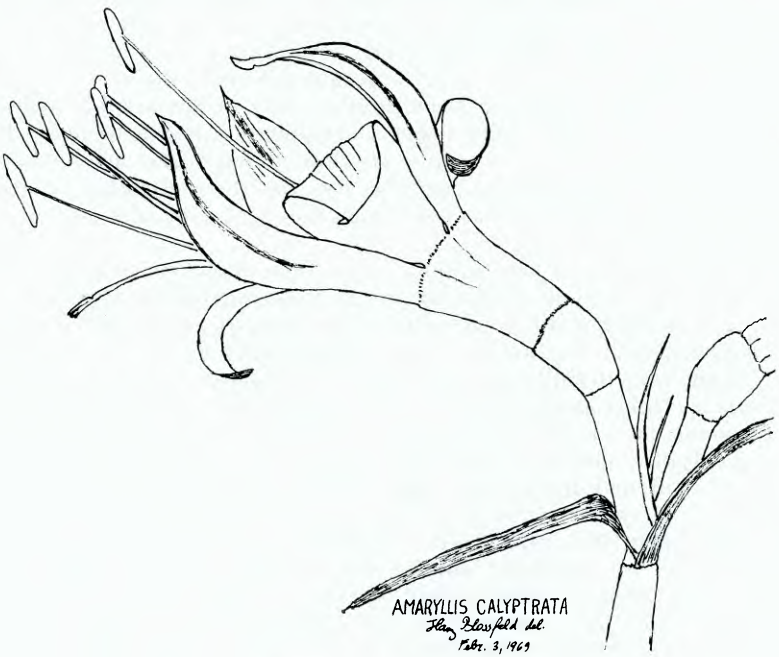


Fig. 9. Amaryllis calyptrata Ker-Gawler.

mid-summer according to local conditions, and again in June, that means early winter in Brazil. The plant is in leaf the year round, and has no visible dormancy period.

Though there are several, and correct, descriptions of *Amaryllis calyptrata,* I venture to give mine, based on habitat observations and on a good number of plants, I have been growing for several years.

Bulb rarely above 8 or 10 cm in diameter, pear-shaped, clothed by grey tunics and practically above the soil surface. Roots thick, mostly on the surface, covered by velvety hairs.

Leaves from 8 to 10, gutter-shaped, 50 to 60 cm long and at widest

place 5 cm wide, minutely fluted by 18 to 20 parallel veins. The lower side has a prominent, sharp keel along the center. Leaf colour is a deep green on both sides, some plants showing a pale crimson hue on the under side near the base. The leaf tip ends in a narrow point. Foliage is persistent through all seasons.

Peduncle 60 cm long, hollow, sub-cylindrical, 2.5 cm in diameter near the base, tapering to 1.5 cm at tip, green, somewhat glaucous.

Spathe 8 cm long, by 3 cm broad, two-valved, valves boat-shaped, withering, though still green at anthesis. Two bracteoles present, 5 cm long by 0.3 cm broad at base.

Pedicels 4 cm long and 1 cm across, when flowers start opening, but considerably longer when pods develop, cylindric, green.

Ovary inflated trigonous, 2 cm long by 1.3 cm in diameter, darker green, set at an angle, thus supporting flowers in a horizontal position.

Flowers generally two, in an opposite position, rarely three on a stem. Buds, when emerging from spathe, show a remarkable trigonal shape, with sharp edges. When they start opening, it can be noted that the extremely long stamens inside are folded back like fish-hooks; at anthesis they stretch straight and one can see their struggle to disentangle by spasmodical movements, until they get free and out of the bud.

Corolla soldered at base into a conical tube of 2.5 cm in length. On the inside, this tube is closed by a green paraperigone that has the shape of a bladder with a triangular slit, through which stamens and style connect with the ovary. The cartagilous rim of this paraperigone is somewhat undulated and where it is soldered to the tube, on the outside is a clearly marked ring of tiny depressions.

Perigone has a peculiar shape, to which the name "calyptrata" alludes; calyptra means a hood. As before stated, the three outer segments are stiffened by a thick and prominent ridge running lengthwise along the center, thus giving the bud its trigonal shape. When the flowers open, this reinforced "backbone" of the outside segments keeps them in an inwardly curved position and prevents the flower from opening wide. Consequently, the inner segments are unable to spread open and just pierce their tips through the clefts between the outer segments, rolling them finally to a spiral, in the vain effort to spread wider. The lowermost inner segment, being only 2.2 cm wide, has more room to spread and does so promptly, when the bud opens, curving back too, after a few days.

While this fantastic shape of a flower develops, the observer witnesses another exciting show. The stamens, hooked back while inside the bud, at first straighten and after a day, their enormous anthers, full 2 cm long and pale lilac, split lengthwise and tuck outside in, showing the greenish-yellow pollen, while they shrivel to a mere 0.8 cm length in two days. While this happens, the pale pink stamens stretch amazingly in length, until they protrude out of the flower to a full 15 cm (6″) length; but they do not just gow longer; at the same time, they bend and twist, reacting quickly to changes of light direc-

tion and incidence of the sun. Finally they end their dance by bending their tips upwards. The style remains bent downwards during the first three days, then stretches to full 18 cm in length and finally bends up near the tip, staying in front of the anthers. The trifid stigma unfolds reluctantly and spreads on the last days of life of the flower.

The most unusual colour of this flower is green, though some authors indulge in calling it yellowish-green or whitish-green, its general appearance is frankly green. On close inspection, one discovers, that the green colour is most decidedly present on the veinings, while what little space is left between these dense reticulations, is somewhat paler green and when the flower got past its best, some yellowish or whitish shades appear. A keen observer may even discover a tiny red rim along the edge of all flower segments, but it is so narrow, that one remains unsure about it, unless one uses a lens. A faint purplish hue is also present on the outside of the flower spathe and, as stated above, style and filaments are pink, except at their bases which are green.

This flower cannot be called a great beauty, but it is unusual and spectacular, it has a formal character and colour of its own and another feature is the strong perfume of exotic aroma, most active during the night. It possibly acts as an attraction for some big green bug, which has a similar smell and may be responsible for pollination. But the humming-birds too, are not quite innocent about the amorous life of this flower.

As to cultivation, it must be remembered, that the plant is evergreen, requiring light and water during the whole year. Furthermore it must be considered, that it comes from a rather cool mountain area (abt. 3000 feet altitude), with average temperatures of 65° F, with but little variations during the seasons (59° F to 70° F). It gets an immense rainfall of 160 inches per year and whenever it does not rain, dense fogs are sure to prevail each evening and morning. The permanent moisture is its epiphythic need; growing on trees, rains drain off immediately and there is no danger of the roots becoming asphyxiated in a waterlogged soil, because they are mostly superficial.

Traducing these facts into the practice of cultivation, it is first evident, that this species, contrary to most others, has no resting period and requires no dormancy. It requires high atmospheric humidity and a shady, cool place in the greenhouse. It should be potted high, that is, with the bulb entirely above the soil surface, and a very porous potting medium is advisable. This not only requires more frequent watering, but also implies regular fertilizing. Like most epiphythic plants, *Amaryllis calyptrata* is rather sensitive to high fertilizer concentrations and solutions above 1 : 1000 of any fertilizer formula, should be avoided. Very diluted fertilizer applicated frequently between plain water hosings is much better than strong solutions given two or three times per year, as other *Amaryllis* species of short growing cycle may take easily.

A curious fact may be remembered. The closest relative species is *Amaryllis fosteri* Traub, a species growing in one of the driest desert regions of Brazil, perfectly adapted to resist extreme drought conditions, tropical heat and very little shade.

NOTHOSCORDUM MAHUII SP. NOV.

Hamilton P. Traub

This tiny but very attractive plant flowered at La Jolla, Calif. in 1972. The flowers are long lasting, and relatively large for such a dwarf plant. A number of bulbs should be planted in a 3-inch pot in order to make a fine showing.

After flowering, the leaves die down, and the plant remains dormant until the next winter. Thus the dormant plants in pots should be stored with minimum watering during the rest of the year.

The plant has been named for Sr. Manuel Mahu, the plant scientist at the University of Chile, who is very active in collecting plants in Chile, and who shares some of his treasures with the writer.

Nothoscordum mahuii Traub, **sp. nov.**

Planta bulbose, bulbo parvo; folis 4 linearibus 8—10 cm. longis; scapo 5.5—6 cm. longa; spatha 2-valvata infra medium leviter connata; umbella triflora; floribus albis, segmentis tepalorum purpurascentibus; pedicellis 3.5 mm. longis; tubo tepalorum 1 mm. longo; staminibus 6 biseriatis 1.5—3 mm. longis; stylo 2 mm. longo; stigmate obtuse 3-lobato.

Holomenifer: Traub No. 1021 (TRA), grown at La Jolla, Calif. from stock collected Aug. 10, 1970 by Manuel Mahu at Cuesta Barriga, alt. 350 m., Prov. Santiago, Chile.

Plant winter-flowering, *bulb* small. *Leaves* 4, green, linear, very slightly channeled above, very slightly rounded on the back, 8—10 cm. long, 1—1.3 mm. wide, apex bluntly acute. *Scape* (two produced on nomenifer plant), green, very slightly flattened, 5.5—6 cm. long, 1x1.3 mm. in diam. *Spathe-valves* 2, lanceolate, 13 mm. long, united for 3 mm. at the base, purplish-greenish in lower part, striated purplish above. *Umbel* 3-flowered; flowers white, tepalsegs keeled purplish, the color showing through on the inside, each tepalseg marked, on both sides, for ¼ of its length from the base, with a very thin purplish line. *Pedicels* shorter than the spathe, 3.5 mm. long, 2.5 mm. in diam. *Ovary* globose, white, 3.5 mm. long, 2.5 in diam. *Tepaltube* funnel-shaped, 1 mm. long. Tepalsegs 6, oblong, 11.5 mm long, 5—6 mm. wide, bluntly acute. *Stamens* 6, attached at the mouth of the tepaltube, in 2 series, 3 sepaline 1.5 mm. long, 3 petaltine 3 mm. long; anthers 1 mm. long, pollen yellow. *Style* white, 2 mm. long, stigma bluntly 3-lobed.

THE "WINE-COLORED" HYBRID CRINUM 'ELIZABETH TRAUB'

HAMILTON P. TRAUB

The beautiful hybrid, *Crinum*, 'Elizabeth Traub' (Traub, 1947) was produced by the writer in the 1930's while resident in Florida by crossing the hybrid *Crinum* 'Ellen Bosanquet' (Bosanquet, 1935) on *Crinum scabrum* Herb (see Hannibal, 1947, 1972). Hayward (1935, 1948) has touched on the history of 'Ellen Bosanquet'. The merits of the hybrid 'Elizabeth Traub' have been discussed by Hannibal (1947, 1972) and Howard (1960). Recently the writer has observed this hybrid for a few years at his new home growing under similar conditions with the earlier hybrid 'Ellen Bosanquet' thus facilitating comparisons. The information has been assembled in the following table.

Character	'Ellen Bosanquet'	'Elizabeth Traub'
Parentage	Originated by Louis Percival Bosanquet, of Fruitland Park, Fla See Hayward, 1935, 1948	**Crinum scabrum** Herb ♀ x hybrid 'Ellen Bosanquet' ♂
Bulb	Medium sized, producing offsets sparingly	large, producing offsets freely
Plant size	similar to 'Elizabeth Traub' but smaller	similar to 'Ellen Bosanquet' but larger and more vigorous
Flowering habit	flowering once each season	flowering is recurrent
Flowers per umbel	up to 8	up to 14 or more
Flower color	Strong purplish red (Nickerson Color Fan); 7.5 RP 4/11 to 7.5 RP 5/11. Referred to in the literature as "wine-color"	similar to that of 'Ellen Bosanquet'
Stamen-filament and pollen color	filaments white; pollen creamy to gray	similar to that of 'Ellen Bosanquet

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BOLIVIAN AMARYLLIDS

Martin Cardenas, *F. M. L. S.*
P. O. Box 538, Cochabamba, Bolivia

Amaryllis leopoldii forma **Whitakeri** Card. **sp. nov.**

Bulbo globoso 5-7 cm long., 6-7 cm crasso. Pseudocollo 7-9 cm long. Folis loratis 40-50 cm long., atro viridis. Scapo subterete 25-35 cm long. Umbella 3 flora. Bracteis spathaceis lanceolatis 8 cm long., cremeis, purpura lineatis. Pedicellis 3-6 cm long. Perigonio 13-15 cm long., 15-17 cm lato. Ovario 16-20 mm long. Tubo 5 mm long. Setepalsegmentis 11-12 x 4 cm, extus a basim atro viridis, dein cremea rubro lineatis, intus inferne diluto viridis, superne rubi sanguineo lineatis, Petepalsegmentis similia coloribus tamquam setepalsegmentis. Paraperigonio dilutissimo viridis albo pilegerus. Staminibus 8-9 cm long. Filamentis inferne diluto viridis, superne rubro purpureo. Stylo 11.5 cm long. inferne temperato viridis, superne purpureo. Stigma trilobato diluta purpureo.

Patria:—Bolivia, Provincia Chapare, Departamento Cochabamba, prope Peñon de San Julian 2,000 m.

Bulb 5-7 cm long, 6-7 cm broad. *Neck* 7-9 cm long. *Leaves* lorate dark green 40-50 cm long, 4 cm wide narrowing at the base. *Scape* subterete 25-35 cm long, 1.5-2 cm thick, purplish below. *Umbel* 3 flowered. *Spathe* bracts lanceolate 8 cm long cream, purplish striped. *Pedicels* 3-6 cm long, light green. *Perigone* 13-15 cm long, 15-17 cm limb. *Ovary* 16-20 mm long hexagonous. *Tepaltube* 5 mm long. *Setepalsegments* 11-12 x 4 cm, dark green at base, cream red striped above with a green middle keel outside, light green at base and densely blood red striped inside. *Petepalsegments* quite of the same size and color of setepalsegments. Lower segment only 3 cm wide. There is a light green star 2.5 cm long inside. *Paraperigone* very light green, white haired. *Stamens* shorter than tepals. *Filaments* very light green below, purple red above. *Anthers* 5 mm long. *Style* 11.5 cm long, light green below, red purple above. *Stigma* trilobate, light purple.

Bolivia.—Province Chapare. Department Cochabamba, Peñón de San Julian, 2,000 m. July, 1971, M. Cárdenas, No. 6331 (Type in Herbarium Cardenasianum).

Obs. This species which grows at the same locality with *A. divi-Julianus* Cárd., differs from this by its striped tepal colour. This recalls also *A. lapacensis* dark coloured varieties, but differs by its larger flowers which are semierect and with slightly undulate tepals as in *A. aulica.* The red stripe lines in this new species are somewhat undulate and netted. Its 2 upper petepalsegments bear a solid red middle section. Differs also from *A. lapacensis* by its broader tepals, colour of filaments and style.

This new taxon with the largest flower in the genus and handsome appearance, is named after the well known geneticist and courageous botanical explorer Dr. Thomas W. Whitaker.

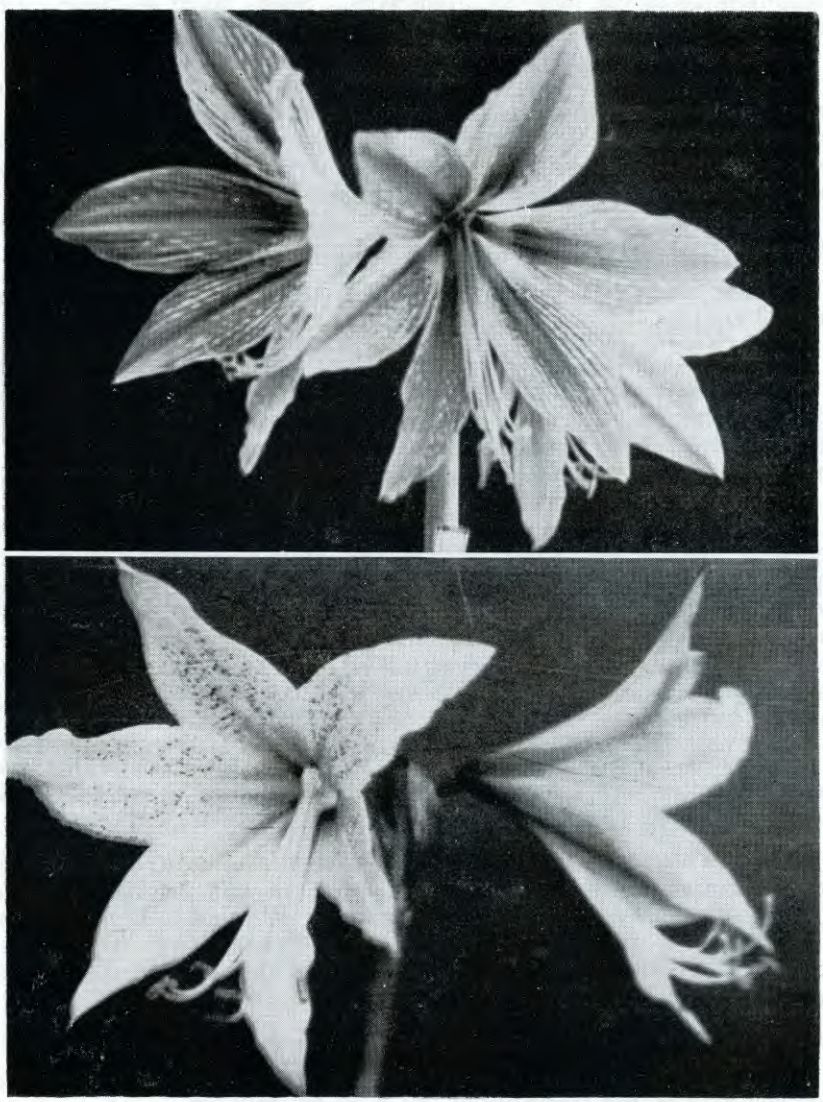

Fig. 10. Upper, **Amaryllis leopoldii forma whitakeri** Cardenas, sp. nov., and lower, **Amaryllis paquichana** Cardenas, **sp. nov.**

Amaryllis Paquichana Card. **sp. nov.**

Bulbo conico 5 cm long. 4 cm crasso. Pseudocollo 3 cm long. Folis lanceolatis 20-30 cm long. 2-2.5 cm latis. Scapo 25-35 cm long. Umbella 2 flora. Bracteis 4-6 cm long. purpureis. Pedicellis 3 cm long. Perigonio actinomorpho 9 cm long. 10-11 cm lato. Ovario 1-1.5 cm long. Tubo 3-5 mm long. Setepalsegmentis 7 x 3 cm, lanceolatis, margine parce undulatis, extus dilutissimo viridis a basim obscurioribus, intus a basim temperato viridis, dein minutissimo purpura punctatis. Petepalsegmentis 7.5 x 2 cm oblongo lanceolatis, margine crispus similia coloribus tamquam setepalsegmentis. Paraperigonio albo pilosus. Staminibus 6-7 cm long.; filamentis albis. Stylo 7.5 cm long., inferne albo, superne purpura punctato. Stigma purpura, capitata.

Patria:—Bolivia. Provincia Caupolican. Departamento La Paz, prope Paquicha, 1,000 m.

Bulb conic 5 cm long, 4 cm broad. *Neck* 3 cm long. *Leaves* lanceolate 20-30 cm long, 2-2.5 cm wide, acute, narrowing at base. *Scape* 25-35 cm long, terete, green, 15 mm thick at base, narrowing to 10 mm above. *Umbel* 2 flowered. *Spathe* bracts 4-6 cm long, lanceolate 1.5 cm wide, purplish. *Pedicels* 3 cm long. *Perigone* regularly actinomorphe 9 cm long, 10-11 cm limb. *Ovary* 1-1.5 cm long, green. *Tepaltube* 3-5 mm long. *Setepalsegments* 7 x 3 cm, lanceolate very light green to yellowish, dark green at base with a light green keel fading toward the tips outside, light green at base and very minutely purple spotted inside. *Petepalsegments* 7.5 x 2 cm, oblong lanceolate, same coloured as setepalsegments. All segments curled at margins. *Paraperigone* well developed, white haired. *Stamens* 6-7 cm long; filaments white. *Style* 7.5 cm long surpassing tepals, white below, purple spotted above. *Stigma* capitate, purple.

Bolivia.—Province Caupolican. Department La Paz, on the way down to Paquicha, Machariapu River Basin, 1,000 m. August 1971, E. Meneses No. 6332 (Type in Herbarium Cardenasianum).

Obs.—This pretty gracile flowered *Amaryllis,* comes from the northwestern region of the Province of Caupolican not far from Sandia. in Perú, the zone from where *A. fusca,* was collected. *A. paquichana* is characterized by its very clear green-yellowish flowers with finely purple spotted tepals. When collected in full blooming period it was leafless.

Zephyranthes Cutleri Card. **sp. nov.**

Bulbo globoso 4-5 cm long. 3-7 crasso, bracteis nigrescentis tecto. pseudocollo 3-15 cm long. nigrescente. Folis 16 cm long., 5 mm latis atro viridis. Scapo 25-30 cm subcylindrico, diluto viridis vel glaucus, superne angustato. Bractea spathacea 3-5 cm long., tenuissima. Ovario 10-15 mm long. Perigonio 7-9 cm long., 5 cm lato. Tubo 15-18 mm long., diluto aurantiaco. Setepalsegmentis 5 x 1 cm, lanceolatis, mu-

cronatis, aurantiaco viridis. Petepalsegmentis lanceolatis 55 x 8 mm, aurantiacus. Staminibus brevioribus 56 mm long., longioribus 58 mm long. diluto aurantiacus. Stylo 68 mm long., inferne aurantiaco, superne aurantiaco lilacino. Stigma lato trifida viridiscenti. Capsula 4 cm long., 1.5 cm crassa, trigona. Semina semiovata, membranacea brunescentia 8 mm long.

Patria:—Bolivia. Provincia Ayopaya. Departamento Cochabamba, prope Morochata, 2,900 m.

Bulb globose 4-5 cm long, 3-7 cm thick covered by blackish bracts. *Neck* 3-15 cm long, blackish. *Leaves* dark green 16-18 cm long, 5-8 mm wide somewhat striate beneath. *Scape* 25-30 cm long, subcylindric hollow, light green to glaucous, 6-8 mm thick, narrowing at apex. *Spathe* bract 3-5 cm long, very thin, white, membranaceous, opening above in two or three sections. *Ovary* sessile 10-15 mm long, light green subcylindric and covered by the spathe bract at anthesis. *Perigone* 7-9 cm long, 5-6 cm limb. *Tube* 15-18 mm long, light green 3-6 mm thick. Outer perigone segments 5-6 x 1 cm, lanceolate mucronate curved at its middle section, bright orange to red. Inner segments lanceolate 4 x 1 cm, orange red. *Stamens* three slightly longer than the other three 58 and 56 mm long, light orange, inserted to tepals 8 mm above ovary into the tube. *Style* 68 mm long, orange below, lilac orange above. *Stigma* trifid, orange, with 3 mm long, expanded green lobes. *Fruiting scape* 60-63 cm long dark green to glaucous, 11 mm thick at base. *Capsule* elliptic, 4 cm long, 1.5 cm thick, trigonous. *Seeds* flattened 5-6 mm long, black white winged.

Bolivia.—Province of Ayopaya. Department of Cochabamba. Above Morochata, 2,900 m. March 1971, M. Cárdenas No. 6333 (Type in Herbarium Cardenasianum).

Obs.—This new species was collected by us at different localities several years ago but always under the same ecological conditions. The localities of our collections, were Sivingany on the way to Vila Vila, 2,900 m, Prov. Mizque, Dep. Cochabamba, Km. 65 on the way to Sta. Cruz, 3,000 m, Prov. Arani and Morochata, Prov. Ayopaya, Dep. Cochabamba, the type locality. The three localities were on grassy mountain rather humid slopes.

Our duplicates were sent to the National Herbarium at Washington, D. C. and identified by Dr. L. B. Smith as *Zephyranthes tubiflora* (L'Hérit.) Schinz. Now, when we are better acquainted with the Bolivian Amaryllids, we can say that this identification is obviously erroneous, because of the color and structure of flowers and the geographical distribution of the species. This is named after the well known Bolivian flora explorer, Dr. Hugh C. Cutler.

Zephyranthes Albolilacinus Card. **sp. nov.**

Bulbo conico 4 cm long. tenui cataphylla tecto. Pseudocollo 3-4 cm long. Scapo 18-25 cm long. unifloro. Bractea spathacea 3-3.5 cm long. membranacea. Pedicelli 2 cm long. Ovario 8 mm long. Tubo

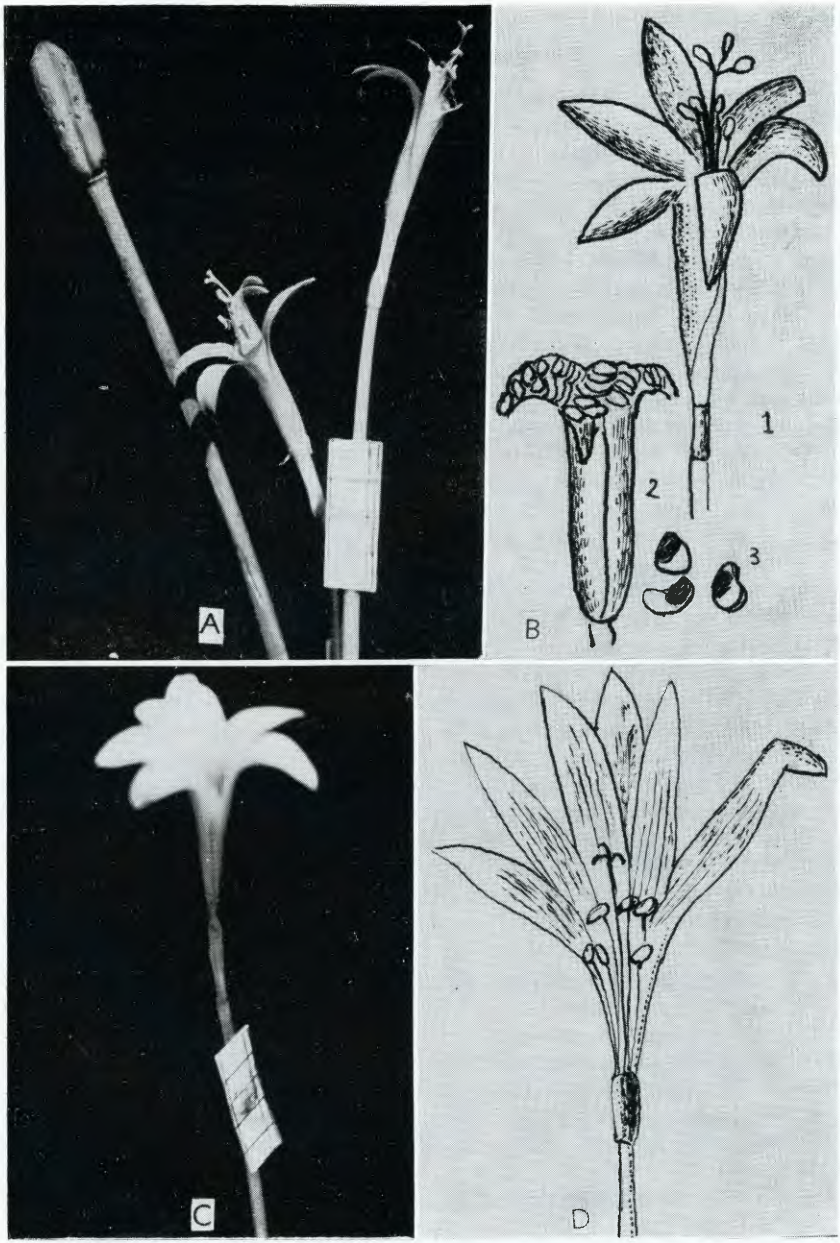

Fig. 11. Upper, **Zephyranthes cutleri** Cardenas, **sp. nov., A,** flowers and capsule; **B,** 1, flower; 2, opening capsule and 3, seeds, X .86 Lower, **Zephyranthes albolilacina** Cardenas, **sp. nov., C,** flower, and **D,** opened flower showing stamens, style and tepalsegs, X. 86.

infundibuliforme 2.5 cm long. viride purpureis. Perigonio 7-8 cm long. 6 cm lato. Tepali segmentis 6 cm long. 10-13 mm latis, albo lilacinis, fusi formibus. Staminibus minoribus 15 mm long., longioribus 18 mm long. Stylo 3.6 cm long. Stigma trifida.

Patria:—Bolivia. Provincia Cercado. Departamento Cochabamba. Monti Tunari, 3,500 m.

Bulb conic 4 cm long, 3.5 cm broad covered by thin brown cataphyls. *Leaves* not seen at anthesis. *Pseudostem* 3-4 cm long. *Scape* hollow, 18-20 cm long, 4 mm thick green above, purplish below, bearing a single flower. *Spathe* bract 3-3.5 cm long, membranaceous light brown, greenish tipped. *Pedicel* 2 cm long. *Ovary* covered by the spathe bract, 8 mm long, 4 mm thick. *Tepaltube* funnelform 2.5 cm long, green purplish. *Perigone* 7-8 cm long, 6 cm limb. *Tepals* equal, 6 cm long, 10-13 mm wide, white, finely lilac striped, fusiform. *Stamens* of two size, inserted 5 mm above tepals base; short ones 15 mm long, long ones 18 mm long. *Filaments* white; anthers 6 mm long. *Style* 3.6 cm long slightly longer than stamens. *Stigma* trifid with 3 mm long filiform lobes.

Bolivia:—Province El Cercado. Department of Cochabamba, above San Miguel on Mount Tunari, 3,500 m, September 1969, M. Cárdenas, No. 6334 (Type in Herbarium Cardenasianum).

Obs.—This pretty Amaryllid seems unlike any species of the genus we know from Bolivia. It is characterized by its regular gracile flowers which emerge from the grassy mountain slopes at anthesis at the beginning of spring.

THE GENUS **HAYLOCKIA** IN BOLIVIA

MARTIN CARDENAS. *F.M.L.S., P. O. Box 538, Cochabamba, Bolivia*

The Genus *Haylockia* is as yet not clearly defined. It was separated from *Zephyranthes* and also related to *Pyriolirion*. Robert C. Foster in his Catalogue of Ferns and Flowering Plants of Bolivia, includes in the genus the following species: *Haylockia andina* R. E. Fries from Argentina, *H. pseudocolchicum* (Kränz.) Hume from Bolivia and *H. pseudocrocus* Solms-Laubach from Bolivia.

Dr. H. P. Traub in his Genera of Ameryllidaceae, 1963, maintains the Genus *Haylockia,* as a valid entity giving its generic characters on the basis of the single species accepted, *H. pusilla* from Uruguay. These characters refer particularly to the scape hidden in the bulb, the umbel with a single erect flower which is regular, white, pale rose or yellow, the stamens inserted in the throat of the tepaltube, the stigma trifid and the seeds black, dorsally convex.

Prof. Kränzlin in describing *Zephyranthes pseudocolchicum* from Bolivia, includes it in the Section *Pyrolirion* and states that it can not be related to *Haylockia* since in this genus the stamens are inserted at two different levels.

For now, what is worthwhile is the knowledge of the species which are poorly represented in the herbaria and dubiously described in some

cases. In the future, when living material becomes available, we shall have more accurate taxonomic criteria on the basis of cytogenetic techniques.

In the following account we shall refer to the taxa collected by us in Bolivia during the last two years.

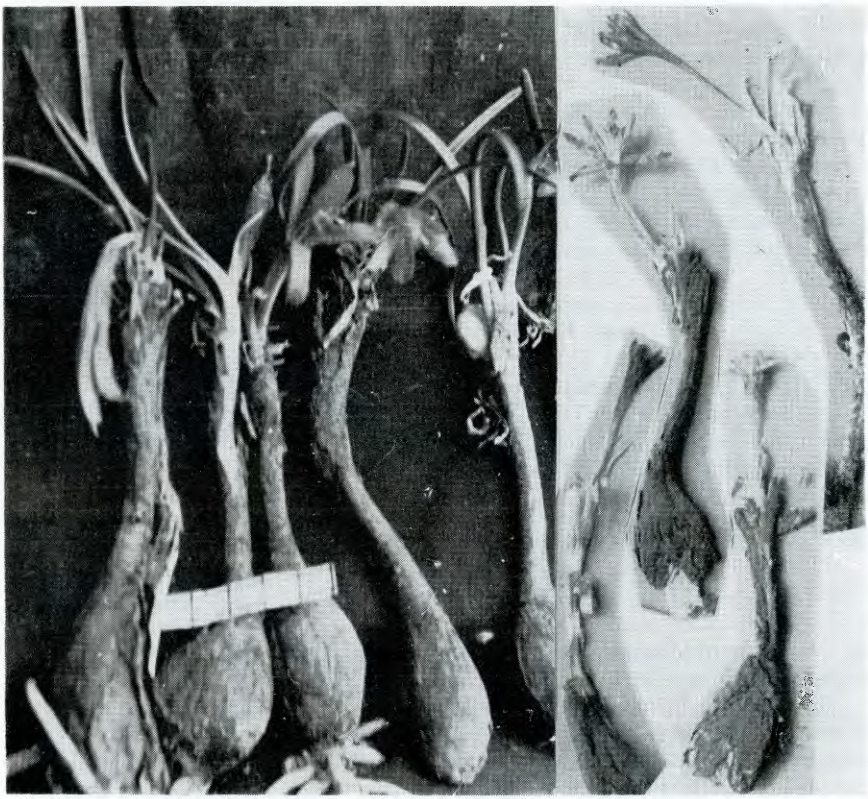

Fig. 12. Left, **Haylockia pseudocolchicum** Kraenzlin, X 0.30; right, **Haylockia chihuanhuayu** Cardenas, **sp. nov.** X 0.30.

Haylockia pseudocolchicum (Kraenzl.) Hume (see Figs. 12 & 13-C)

Proc. Fla. Acad. Sci. 2: 91. 1938, in obs.; Syn.—*Zephyranthes pseudocolchicum,* Fedde, Rep. Bd. 13: 118. 1914.

This rare plant was collected by Prof. Th. Herzog at Cerro de Oruro, Bolivia, 3,950 m. November 1911. Last year, we again collected the same species at its type locality in rocky crevices. Professor F. Kränzlin's Latin diagnosis is quite accurate. However we think that the following description from complete living specimens might be useful:

Bulb conic 6-7 cm long, 2.5 cm thick, covered by brown cataphylla. Roots about 6, white, 6-10 cm long, 3-4 mm thick. Pseudostem 9-15 cm long sheathed by bulb cataphylla. *Leaves* well developed at anthesis about 7, included in more than its half length into the neck sheaths, yellow in their hidden section, green at its free tips. *Scape* solid about 10 cm long, included into the pseudostem sheaths, white, 3 mm thick. *Ovary* sessile, 1 cm long, 7 mm thick trigonous, light green. *Spathe*

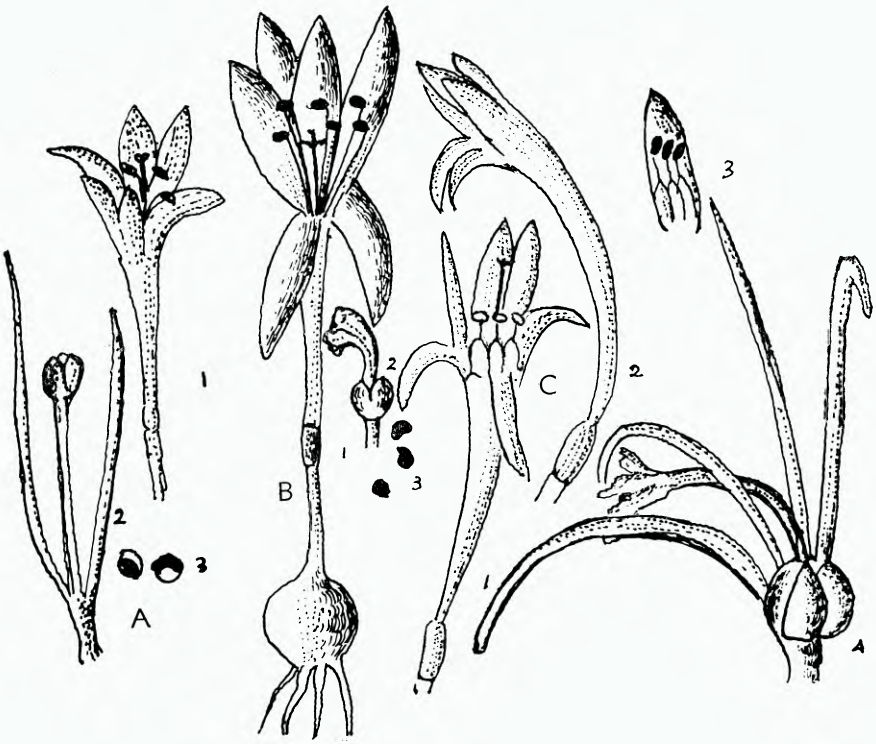

Fig. 13. **A.** Haylockia chihuanhuayu Card. sp. nov. 1, flower; 2, leaves; 3, seeds. X 0.90. **B. Haylockia cochabambensis** Card. sp. nov. 1, plant; 2, capsule; 3, seeds, X 0.90. C. **Haylockia pseudocolchicum** Kreanzlin, 1 & 2, flowers; 3. stamens; 4, fruit. X 0.90.

bract membranaceous, 5 cm long, covering the ovary, white, greenish tipped. *Tepaltube* funnel form 4.5 cm long, whitish below, brick red above. *Perigone* zygomorphic 7 cm long, 4 cm limb. Outer tepals lanceolate 23 x 5 mm. Inner lanceolate the two lower ones 2 cm long and the upper 2.3 cm long. *Stamens* inserted at the tepals base forming a tube with its expanded lower parts, 12 mm long. Free section of filaments 3 mm long. *Filaments* yellow reddish. *Anthers* 4 mm long, yellow. *Style* 7 cm long, white below, yellowish above, very thin. *Stig-*

ma trilobate greenish about 2 cm overtopping stamens which are inserted at the same level. *Fruit* globular trilocular 15 mm in diameter purplish. On fruiting specimens the leaves are 10-12 cm long. 3-4 mm wide, canaliculate, dark green. *Seeds* in one pile at each locule, elliptic to circular, black, 6-8 mm long.

Haylockia Chihuanhuayu Card. **sp. nov.** Fig. 12 & 13-A

Bulbo fusiformibus 3.5-4.5 cm long. 7-14 mm crasso. Pseudocollo 4-7 cm long. brunea cataphylla tecto. Scapo 3-7 cm long. solidus fere integer pseudocollo incluso. Folia sub anthesia nulla. Bractea spathacea tubulosa albo hyalina. Ovario subcylindrico, 1 cm long. sessilis. Tubo 4-5 cm long. 3 mm crasso. Perigonio 3 cm long. Tepals lanceolatis 2-2.5 cm long., 5 mm latis, aurantiacus, mucronis albis. Stamina ex basim petalis, aequantes. Stylo aliquid stamina superans. Stigma capitata. Fructo globulous 6 mm diam. Semina semilunaris 5 mm long. nigra.

Patria:—Bolivia, Provincia Fraias. Departamento Potosi, prope Laguna San Sebastian, 4,070 m.

Bulb fusiform, 3.5-4.5 cm long, 7-14 mm thick. Pseudoneck 4-7 cm long, 4-5 mm thick, covered by brown cataphylla. *Scape* solid 3-7 cm long covered by the cataphylla. *No normal leaves* at anthesis except some young linear ones. *Spathe* bract tubular, white hyaline, covering the ovary which is subcylindric, sessile 1 cm long and light yellow. *Tube* slender 4-5 cm long, 3 mm thick above ovary, whitish. *Perigone* 3 cm long, 2.5 cm limb. *Tepals* lanceolate 2-2.5 cm long, 5 mm wide orange with whitish mucrons. *Stamens* of the same size, inserted at the base of tepals, orange yellowish. Filaments expanded at its base and fusioned except at its top section. *Style* little longer than stamens, very thin, light yellow. *Stigma* capitate dark green, 1 mm diam. *Fruit* globular 5 mm high, 8 mm thick, green. *Seeds* semilunar, black, 5 mm long with a narrow membranaceous white wing.

Bolivia. Province Frias, Department of Potosi, Laguna de San Sebastian, 4,070 m. March 1972, M. Cárdenas, No. 6336 (Type in Herbarium Cardenasianum).

Obs.—At first, we thought that these plants so popular as a legendary element in our folklore, under the name "chihuanhuayu", might be identical with *Haylockia pseudocolchicum* (Kränz.) Hume. However, we now see it as a different species due to its smaller bulbs, shorter pseudoneck, leaves not well developed at anthesis, more regular perigone and the capitate stigma.

Haylockia Cochabambensis Card. **sp. nov.** Fig. 13-B

Bulbo globoso bruneo 2.5 cm long. 1.5 cm crasso. *Pseudocollo* 3-3.5 cm long. Folia linearia 10-20 cm long. 2-3 mm lata, atro viridia. Scapo solido 2-2.5 cm long. in pseudocollo incluso. Bractea spathacea tubulosa 2-3 cm long., membranacea alba, apice viridia. Ovario 5 mm long. Tubo 3.5 cm long. Tepals oblanceolatis 4 x 1 cm, albis, apice lilacina

viridis. Stamina ex basim tepalis. Stylo 15 mm long. non stamina superans, trifidus, Fructo trilobulato. Semina lunularia, nigra, 6 mm long.

Patria:—Bolivia, Provincia Cercado. Departamento Cochabamba, prope Cerro San Pablo, 2,800 m.

Bulb roundish, 2.5 cm long, 1.5 cm thick covered by a thin brownish cataphil. Roots fibrous, 4-5 cm long. Pseudoneck 3-3.5 cm long. Leaves linear 10-20 cm long, 2-3 mm wide grooved, dark green. Scape 2-2.5 cm long. solid, light green, 3 mm thick hidden into pseudoneck. Spathe bract tubular 2-3 cm long, white membranaceous green tipped. Ovary 5 mm long, light green, as thick as scape. Tepaltube 3.5 cm long, white greenish. Tepals oblanceolate 4 x 1 cm white greenish below, lilacine above. Stamens inserted at the base of tube, of two size 7 and 11 cm long. Filaments white; anthers yellow. Style 15 mm long, white. Stigma trifid, yellow much lower than stamens. The flowers turn purple lilac when dry. Fruit trilobular, green, 6 mm diam., septicidal. Seeds lunulate, black 6 mm long in two piles at each locule.

Bolivia. Province El Cercado. Department of Cochabamba. Cerro de San Pablo East Cochabamba, 2,800 m. M. Cárdenas, No. 6337 (Type in Herbarium Cardenaisianum).

Obs.—This species is quite different in the Genus *Haylockia* from the other two above described. However, considering its solid scape and other characters it can't be placed in *Zephyranthes*. It is also different from the *Pyrolirion* representatives we know from this country.

A VANISHING MEXICAN **HABRANTHUS?**

Mrs. Katherine L. Clint, *2005 Palm Boulevard, Brownsville, Texas 78520*

On July 30, 1955, growing with *Habranthus concolor* near San Luis Potosi, Mexico, we found a few bulbs (Clint 643) which were intensely intriguing to us. They were very distinctive in appearance, having masses of tall, stiffly upright, dull green, channeled leaves ¼″ or more wide. The tall, heavy scapes had a long pedicel and large red flushed seed capsules very similar to those of *Habranthus concolor*. Dried flowers were quite large, with a short tube, long style and deeply trified stigma. The bulbs were much smaller than those of *H. concolor*, but larger than the average *Zephyranthes* and somewhat elongated.

Upon our return home, three of these bulbs were sent to Dr. Traub and, much later, two to Dr. Walter Flory and Dr. Raymond Flagg.

For several years, the bulbs languished in a location which apparently did not suit them. The survivors were eventually moved to a better spot, but never really thrived. Unlike the vigorous growth noted in the wild, the bulbs sent up a few short-lived, weak leaves which usually lay flat in the ground. To our complete amazement, heavy and prolonged rains in late May 1963 produced several buds. When open, the flowers were a large and very beautiful bright yellow *Habranthus*,

different in appearance from *Habranthus concolor* or, in fact, from any other Mexican *Habranthus* we had seen. They were shaped a bit like *Zephyranthes bifolia,* but without the heavy stigma lobes of that species. Unfortunately, repeated showers prevented seed formation, although we selfed and made several crosses with other *Habranthus,* including a lovely pale yellow *Habranthus immaculatus.*

We were forced to speculate that perhaps this yellow *Habranthus* is one of the parents of *H. concolor.* Perhaps the other parent is the "large, beautiful, pure white Mayito" we were told about by a woman from Sabinas Hidalgo in May 1955. We never found this in that area, although we collected a glaucous leaved white *Habranthus* in the mountains along the Rio Verde Road.

In our many trips since 1955, No. 643 was never seen again. Since growth habit is rather striking, this poses some questions: Are they scarce and on the way out? Do they normally have a different blooming and growing season than *H. concolor?* Are they perhaps more numerous in another locality?

A few blossoms appeared on this small collection through 1965, but due to neglect during Morris' final illness, which began about that time, I am not sure there are any living bulbs left.

THE TERMS—RHIZOME AND STOLON

Hamilton P. Traub

There is much confusion about the meaning of the terms, *rhizome* and *stolon.* This is due to fuzzy thinking on the part of those offering definitions of terms in botany and plant science texts, and also in general language dictionaries. Usually the definitions of the two terms are overlapping which leads to confusion. It is worth while in this connection to consider the original linguistic roots upon which the terms are based.

Rhizome, from the Greek, *rhizoma,* root. The early workers may have confused the underground stems with roots, and thus based the term on an unsound linguistic background, or they may have used the word in the sense of root-like (underground) stems. Whatever the case may be, it is safe to say that they referred to underground parts only. Thus, it is evident that they were referring to underground stems.

Definition: A rhizome is any underground stem, short or longer, rooting under natural conditions, and sending up an aerial branch or branches, and thus serving to increase the volume of the parent plant, or to reproduce a new plant or plants when severed from the parent stock. As a general statement, a rhizome is a short, or longer underground stem, capable of sprouting an aerial branch or branches under natural conditions. There are various types of rhizomes. Examples: Peruvian (Irish) potato, peony, *Hemerocallis, Canna, Alstroemeria, Allium glandulosum* Link & Otto, etc.

Stolon, from the Latin, *stolo,* shoot (= branch of a plant). Here

it is plain that only above ground parts of the plant are involved.

Definition: A stolon is a short, or longer above ground (aërial) stem, usually growing near the ground, rooting at internodes and sending out a shoot or shoots under natural conditions, but also including tips of higher branches recurving, touching the ground, rooting and sending out a shoot or shoots, and thus in both cases serving to increase the volume of the parent plant, or to reproduce a new plant or plants when severed from the parent stock. There are various specialized types of the stolon. Examples: runners of crab-grass rooting at the internodes, strawberry runners, rooting of recurved black raspberry stem tips, etc.

Any intermediate examples between the rhizome and stolon should be indicated as such. For instance, the rootstock of the German *Iris* is apparently on the borderline.

Thus, there is no sense in having these two terms overlap to the confusion of the general public. It is hoped that phytologists (botanists or plants scientists), and dictionary makers will take note and avoid confusion in the future.

AMARYLLID NOTES, 1973

Hamilton P. Traub

Haylockia americana (Hoffgg.) Traub, *comb. nov.*, Syn.—*Sternbergia americana* Hoffgg., Verz. Pfl. 197. 1824-26; *Haylockia pusilla* Herb. Bot. Reg. 16. pl. 1371. 1830.

Brodiaea hooveri (Niehaus) Traub, *comb. nov.* Syn.—*Brodiaea elegans* ssp. *hooveri* Niehaus, in Univ. Calif. Publ. Bot. 60: 48. 1971.

X *Crinodonna traubii* Moldk. clone 'Elizabeth Graf' (Traub, 1972); similar to clone 'Alma Moldenke' (see PLANT LIFE 17: 73-74. 1961 for description). It is a cross between *Brunsvigia* x *parkeri alba* ♀ and *Crinum moorei roseum* ♂. The umbel is up to 18-flowered; flowers almost white, with only a very slight pinkish tinge in upper part of segs; turning very light pinkish on ageing. Delightfully fragrant. Autumn-flowering.

AMARYLLIS AND OTHER AMARYLLIDS

Alek Korsakoff

AMARYLLIS

Amaryllis clone 'Flores Foster'. In June 1968 my wife's friend, Mrs. Flores Foster, 1921 Silva St., Long Beach, Calif. sent seeds of her cross between *Amaryllis* clone 'Star of Bethlehem' and *A. petiolata* (syn.—A. argilagae). In April 1972 a neckless bulb, 4.5 cm. in diam., with gray tunics, growing in a 4-inch pot, bearing two keeled leaves 40 cm. long, 3 cm. wide, produced a two-flowered scape. The strikingly brilliant Indian Orange (HCC-713/1) colored flowers are 9 cm. across, 12 cm. long.

Tepaltube is 2 cm. long, segs 8.5 cm. long, 2, 3, 3.7 and 4.5 cm. wide. Stamens of four sets of lengths; style as long as the shorter stamens. Flower dark green in star shaped center to almost white, ending 4 cm. from the tips of the segs. Style greenish, stamen-filaments Indian Orange tinged at the stigma, and anther ends. Trilobate stigma pink; anthers yellow.

Spathe-valves 5.5 cm. long, 0.7 cm. wide, dry at anthesis; Ovary 1 cm. long; pedicels 4 cm. long, green; peduncle 43 cm. long, pinkish near the bulb; slightly compressed, 1.2 cm. diam. near the bulb, narrowing to 0.8 cm. near the umbel.

Named in honor of the Amaryllis fancier who made the cross.

Amaryllis clone 'Krasotka'. In Dec. of 1967, *Amaryllis reticulata* (emasculated) was pollinated with pollen from *A.* clone 'Mrs. Garfield'. The backcross was successful, producing a few seeds, which were planted. In March 1972, the seedlings started blooming.

One of them, with flowers described below, I consider worth keeping, and it is named as indicated above. It flowered in a 4-inch pot, the bulbs are less than 3.5 cm in diam., tunics light brown, almost neckless, carrying four dark green leaves, with lighter green striations in the middle, about 30 cm. long, 2 cm. wide. Umbel 3-flowered, scape cylindrical, glaucous, 34 cm. long, 1 cm. in diam. narrowing to 0.5 below the spathe valves which are 4 cm. long, 1 cm. wide, soon drying. Pedicels round, 3 cm. long; ovary dark green, 1 cm. long.

Tepaltube greenish on the outside, 3 cm. long; tepalsegs 8 cm. long, 2-3-4 cm. wide. At anthesis, the perigone flattens to 11 cm. across. with segs slightly crinkled at the edges in the upper ⅓; top seg and the two petsegs gracefully reflexed, lower segs are straight, tips recurved.

Color of the upper half of segs Azalea Pink (HCC-618) fading to 618/3 to meet the green center of the florets. Top setsegs and petsegs white, striated, 0.3 cm. wide., end about ⅓ length of the segs from the tips of the segs leaving them in solid color; lower setsegs striated, extending to the tips, the labium being only faintly lighter in the middle.

Stamen-filaments and style green in the tepaltube, whitish in the middle and 618/2 in the upper ⅓. Anthers gray; stigma trilobed, white.

ZEPHYRANTHES HYBRID

Zephyranthes x *nicetria* clone 'Meta Korsakoff'. Another interesting sibling of *Z* x *Nicetria* bloomed, and we (wife and I) decided it is good enough to be named.

My wife called it "loose-petaled but beautiful". It is not overlapping and the segments of the perigone curl like blades of a propeller; all of them are of about the same width. It will carry the name of my wife, who was very much impressed by its beauty.

Flower's basic color is Cyclamen Purple 30/3 (R.H.S. Chart), Segments have white keels outside and white strias in the middle of

about 2/3 of the lower part. Outer segs are white, clawed at the tips. Floret is ca. 8.5 cm. in diameter. Segments are ca. 6 cm. long and ca. 2 cm wide. Deep in the center there is a very light green spot.

Straight, centrally poised style; filaments of the stamens and the trifid, thickish forked stigma are white. Anthers are orange-yellow. Ca. 2.5 cm. long tepaltube is very light green. Ca. 0.5 cm. ovary is darker green than the tepaltube, and ca. 4.5 cm. long pedicel is incased in ca. 3 cm. long spathe. Peduncle is ca. 45 cm. long.

No foliage is present at anthesis.

HABRANTHUS VARIANT

Habranthus robustus clone 'Meta Korsakoff'. For about 15 years, since Mrs. Morris Clint of Brownsville, Texas, sent me a number of Rain Lilies, I am involved with these admirable little things. Watching them, I came to the conclusion that in *Zephyranthes, Z. atamasco* and in Habranthus, *H. robustus* are the most variable—the first in form only; the second in coloration as well. One morning this summer (1972), glancing toward the oak tree where my Rain Lilies are, I was startled by the sight of an unusual white flower. On closer examination it proved to be *H. robustus* variant, even lighter than the tint of Veronica Violet 639/3 (HCC Chart).

Clone's ca. 3.5 cm. in diameter bulb carries at anthesis two regularly dusky leaves ca. 30 cm. long as measured from the neck ca. 5 cm. long. Leaves are ca. 1.3 cm. wide. Both bulb and neck are covered with black tunics.

Ca. 40 cm. high scape has light green peduncle ca. 26.5 cm. long. Ca. 5 cm. long spathe of the same color as peduncle and the ca. 4.5 cm. long pedicel has dark green tips. Ovary is also dark green.

Perigone segments are a good ca. 7.3 cm. long, vividly light green outside in the lower ⅓. Within floret they are almost white in the middle, darkening to *almost* the shade of Veronica Violet 639/3 at tips. Outer top seg. is ca. 3 cm. wide; lower two ca. 2.2 cm. Inner two segs. are ca. 2 cm. wide and the labium is ca. 1.5 cm.

Style greenish at attachment and white in the upper part is surmounted with curling forks of the also white trifid stigma. Dark egg yellow anthers add contrast to the greenish center of the almost vertically pointing floret.

The name given to this lovely clone is that of my wife, who has Habranthi popping up all over the yard.

NEW SYDNEYAS

X *Sydneya easterlyi* R. E. Manning. These robust growing bright Rain Lilies will be a valuable addition to any Rain Lily nut collection.

The bulb covered with dark reddish brown tunics, ca. 4.5 cm. in diameter and ca. 5.5 cm. long, has ca. 7 cm. long neck.

Two leaves ca. 1.5 cm. wide produced from the neck and two flower scapes coming from the bulb on sides of the neck are ca. 55 cm. long measured (both) from the soil.

Florets favoring seed parent more than pollen parent open to ca. 10 cm. across and pleasingly colored Rose Purple 533/1 (HCC Chart) at the tips, fade to 533/3 and finally blend into the light green centers. Perigone segments are ca. 8 cm. long, outer top segment is ca. 2.7 cm. wide and lower two ca. 2.3 cm. Inner segments are ca. 2.2 cm. and the lobellum ca. 1.7 cm. wide.

Style bearing straight forked stigma is ca. 5.5 cm. long. Stamens are of two lengths—ca. 4 cm. and ca. 2 cm. Anthers are yellow.

Florets and very dark green ovary of ca. 1.2 cm. length are subtended by light green ca. 6.5 cm. long pedicels enclosed in greenish white spathe ca. 4 cm. long with dark green valve tips. Peduncle, ca. 40 cm. long, is in color lighter green than the leaves.

The description given is of the first flowering of a seedling from seed received from my friend Russell E. Manning, 717 Valley Avenue, Spring Valley, Minn. 55975, and duly bedded in August of 1969.

The name Easterly is according to the legend received with the seed: X *Sydneya* x *easterlyi* R. E. Manning, a cross of *Habranthus robustus* x *Zephyranthes grandiflora*. Should give a smoother pink color and larger size.

X *Sydneya easterlyi* clone 'Russell Manning'. My good friend who was generous to send me seeds of his cross, proved by this clone to be superb, deserves to have the clone named in his honor.

Leafless at anthesis, bulb covered by dark reddish brown tunics, ca. 4 cm. in diameter with a neck ca. 4 cm. long, have two scapes. Peduncles ca. 30 cm. high were topped by ca. 7 cm. long pedicels enclosed in a Rose Purple 533/2 spathe tube with ca. 5 cm. long valves.

Pedicels bear ca. 1 cm. long ovary surmounted by exquisitely formed floret with well overlapping segments ca. 10 cm. long and flaring ca. 13 cm. across and ca. 14 cm. vertically. The predominant color of florets is Rose Purple 533/1 fading to almost white towards the center and there blending into the light green.

Outer segments measure ca. 3.5 cm. in width, inner ca. 3 cm. Style with trified stigma overtops different in length stamens by ca. 1.5 cm. Pollen is yellow.

Will I ever see another Rain Lily of this size and form in addition to a very pleasing color? I doubt it.

CYRTANTHUS

Cyrtanthus clone 'Clarence Lantis' (A. Korsakoff). Another one of the batch of bulbs sent to me by Mr. Clarence Lantis, Bethel, Delaware, 19931, is in flower. Burnt Orange 014/1 (R. H. S. Chart) is the color of the florets, flaring to ca. 8 cm. across. The parentage of this clone again is unknown.

The ca. 3.5 cm. in diameter bulb, with ca. 5 cm. long neck, bears ca. 37 cm. long, light grayish green leaves, ca. 1.5 cm. wide. Scape is ca. 32 cm. high; spathe valves ca. 7.5 cm. and pedicels ca. 4.5 cm.

long cap the ca. 20 cm. long peduncle; ca. 1.5 cm. long ovaries support the ca. 10 cm. long florets.

My friend who is so generous with his bulbs and very often seeds, has to be and is honored and, I hope, sufficiently repaid for all the things he sent me, by the publication of the description and naming of this attractive plant in his honor,—*'Clarence Lantis'*, a clone that is enhancing my collection of *Cyrtanthus.*

REGISTRATION OF NEW AMARYLLID CLONES

Mr. W. D. Morton, Jr., *Emeritus Registrar*

----------, *Registrar*

Mr. Charles Hardman, *Associate Registrar*

This department has been included since 1934 to provide a place for the registration of names of cultivated **Amaryllis** and other amaryllids on an international basis. The procedure is in harmony with the International Code of Botanical Nomemclature (edition publ. 1961) and the International Code of Nomenclature for Cultivated Plants (edition publ. 1958). Catalogs of registered names, as well as unregistered validly published names, will be published from time to time as the need arises. The first one, **"Descriptive Catalog of Hemerocallis Clones, 1893-1948"** by Norton, Stuntz and Ballard was published in 1949. This may be obtained at $5.00 prepaid from: Dr. Thomas W. Whitaker, Executive Secy., The American Plant Life Society, Box 150, La Jolla, Calif. 92037. Additional catalogs of cultivars have been published since 1949: **Catalog of Brunsvigia Cultivars, 1837-1959,** by Hamilton P. Traub and L. S. Hannibal, PLANT LIFE 16: 36-62, 1960; Addendum. PLANT LIFE 17: 63-64. 1961; **Catalog of Hybrid Nerine Clones, 1882-1958,** by Emma D. Menninger, PLANT LIFE 16: 63-74. 1960; Addendum, PLANT LIFE 17: 61-62. 1961; **The Genus X Crinadonna,** by Hamilton P. Traub, PLANT LIFE 17: 65-74. 1961; **Catalog of Hybrid Amaryllis Cultivars,** 1799-1963, by Hamilton P. Traub, W. R. Ballard, La Forest Morton and E. Authement, PLANT LIFE. **Appendix** i-ii + 1-42. 1964. Other catalogs of cultivated amaryllids are scheduled for publication in future issues.

The registration activity of the American Plant Life Society was recognized when at the XVIth International Horticultural Congress, Brussels, 1962, the Council of the International Society for Horticultural Science designated the American Plant Life Society as the Official International Registration Authority for the cultivars of **Nerine;** and this was extended to include all the **Amaryllidaceae** cultivars, excepting **Narcissus** and **Hemerocallis,** at the XVIIth International Horticultural Congress, 1966.

Only registered named clones of **Amaryllis** and other amaryllids are eligible for awards and honors of the American Amaryllis Society at Official Amaryllis Shows.

Correspondence regarding registration of all amaryllids such as **Amaryllis, Lycoris, Brunsvigia, Clivia, Crinum, Hymenocallis,** and so on, should be addressed to Dr. Hamilton P. Traub, Editor, 2678 Prestwick Court, La Jolla, Calif. 92037. The registration fee is $2.00 for each clone to be registered. Make checks payable to American Plant Life Society.

REGISTRATION OF NEW AMARYLLIS CLONES, 1972

Registered by Mrs. Russell Whipp, 530 Red Cliff, San Antonio, Tex. 78216.

Amaryllis clone **'Cream Puff'** (Whipp, 1972) R; A-991; D-5b; U—3-fld; 22½″ h; fl. 4″ long; 5¾″ across face; spr.; creamy white, underlaid with green, faint red stripes in upper pqrt. 'White Giant' parentage, in 6th generation.

Registered by Mrs. Dorothy J. Ettensperger, 438 Jeffries, Monrovia, Calif. 91016.

Amaryllis clone **'Mary's Pride'** (Ettensperger, 1972) R; A-992; D-5a; U—4-fld; 26″ h; 9—11″ in diam. dark bronzy red.

Registered by Mrs. Sam Forbert, 1910 Evergreen Lane, Hattiesburg, Miss. 39401.

Amaryllis clone **'Sam Forbert'** (Forbert, 1972), R; A-993; D-5a; U—4-fld; 23″ h; 3″ long, 9″ across face. Flower color orange red (Hort. Colour Chart).

Registered by Mrs. Frank J. Pahls, 3035 S. W. 15th St., Miami, Fla. 33145.

Amaryllis clone **'Alek Korsakoff'** (Pahls, 1972) R; A-994; D-4b; U—3-fld; 47″ h; Spr.; 2½″ long, 7½″ across face; flowers light green with roseate blush suffusions, streaked and spotted like **A. pardina.** Parentage: **A. pardina** ♀ x **A. evansiae** ♂.

Registered by Alek Korsakoff, 7634 Oriole St., Jacksonville, Fla. 32208.

Amaryllis clone **'Lydia Pahls'** (Korsakoff, 1972) R; A-995; D-3; 13″ h; U—2-fld; Spr.; Els. 5″ long, 4″ across face; fls. pastel peach to lightest greens. Parentage: **A. belladonna** ♀ x **A. evansiae** ♂.

Amaryllis clone **'Teddie Buhler'** (Korsakoff, 1972) R; A-996; D-3; 9½″ h; U—2-fld; Spr.; fls. 3½″ long, 3″ across face; flowers yellow ochre. Parentage: **A. starkii** ♀ x **A. evansiae flavescens** ♂.

Amaryllis clone **'Miami Scarlet'** (Korsakoff, 1972) R; A-667; D-3; Fls. carrot red, 4″ long, 3¼″ across face. Parentage: **A. belladonna** ♀ x **A. evansiae flavensens** ♂.

Amaryllis clone **'Frieda'** (Korsakoff, 1972) R; A-997; D-3; Spr.; fls. 4½″ long, 4″ across face; fls. shrimp red shading to poppy red, and melting into the green central star. Parentage: **A. belladonna** ♀ x **A. evansiae flavescens** ♂.

PLANT LIFE LIBRARY—continued from page 148.

caring for shrubs; (3) six ways to multiply your plants, and (4) an illustrated encyclopedia of flowering shrubs. Highly recommended.

10. TREES. 1972. Pp. 160. Illus. $6.95. 1972. The subject matter is grouped under the following headings: (1) the right tree in the right place; (2) choosing, buying and planting; (3) feeding, pruning and spraying; (4) expert tips from professionals, and (5) an illustrated encyclopedia of deciduous trees. Highly recommended.

11. EVERGREENS. 1972. Pp. 160. Illus. $6.95. The subject matter is grouped under the following headings: (1) an evergreen for every use; (2) the first steps: choosing and planting; (3) caring for conifers; (4) growing, the broad-leaved species; and (5) an illustrated encyclopedia for evergreens. Highly recommended.

HEALTH OF THE NATION CONFERENCE PROCEEDINGS, March 21—Apr. 8, 1971. This report appears in a special issue of the journal, "Hamdard", published by the Institute of Health and Tibbi (Medical) Research, Pakistan, under auspices of the Hamdard National Foundation, Pakistan. Edited by Hakin Mohammed Said. Pp. 505. Illus. $26.50. Part I is concerned with general papers on national health. In Part II appear reports on health services in the various States from Austria to Viet-Nam. In Part III appear special reports on environmental pollution, drug addiction, tobacco smoking, etc. Recommended to all interested in national health, environmental pollution, drug addiction, etc.

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3. GENETICS AND BREEDING

HYBRID AMARYLLIS: TO BREED IN, OR OUT, OR BOTH?

JOHN M. CAGE, *740 Arroyo Road, Los Altos, California 94022*

The writer wishes to suggest a general approach to amateur (and professional) amaryllis breeding that seems much more effective and satisfying than the methods commonly used. Of course if you like to gamble against great odds for the elegant exception, or if you can raise 25,000 seedlings every year for 50 years, I do not resent your fun. Seriously, I have no argument with the plant raiser who has no objective except to observe the infinitely variable and sometimes beautiful combination of random genetic factors. Also, it is not sensible to expect many of us to acquire the very scientific methods of the geneticists who are now creating superior strains of rice, but perhaps a little method in our madness will be satisfying.

According to my informants in Holland, the splendid Dutch Amaryllis hybrids have been produced almost exclusively by crossing superior clones without much regard to ancestry and any previous inbreeding. My informants, who are qualified geneticists, do not believe that promiscuous out-crossing is the most effective way to produce uniform, vigorous seedlings. They believe instead, that the superior individual Dutch clones result from fantastically large populations and the laws of probability. I argue that, in addition, the Dutch have practiced a slow, gradual form of inbreeding in spite of their intentions.

For convenience, one can list three methods for the production of superior plants of agricultural importance, as follows:

1. *The selection and propagation of the best seedlings of random crosses.* Whether this method is practiced by nature or intelligent man, it is interesting to note that usually the plant population gradually becomes more inbred. In an isolated region, the random crossing *eventually* produces distinct species, but many, many generations of seedlings are required.

2. *Continued inbreeding for uniformity and the selection of the best mutations.* The marglobe tomato is a result of this method. There are superior highly-inbred strains of peas, petunias, dogs, mice, and many other species in many genera.

3. *The crossing of highly inbred strains having carefully selected characters.* This cross produces the F:1 hybrid with great vigor and reproductible characteristics. Nearly all of the commercially grown corn in the United States is produced by this method, and the use of F:1 hybrid flower seeds and vegetable seeds has increased enormously during the past 20 years.

What does all this discussion mean for you? You, trying to create

new forms of *Amaryllis?*

If you can grow 20,000 *Amaryllis* seedlings every year, and especially if you can persuade your grandchildren to carry on your work, method 1 is feasible. However, I think it is *not* the most efficient method, even for the large grower.

If you already have your desired plant form, continued inbreeding may preserve and gradually improve it. You may find sterility problems, especially if you try to inbreed very closely by selfing particular plants, but a uniform strain of *A. belladonna,* for instance, can be carried on forever by breeding only within the species.

I have proposed the third method, and plant breeders in other genera generally approve. Traub suggested the feasibility in his Amaryllis Handbook. The results of my own breeding are very encouraging, even with relatively small populations.

Let us suppose that you wish to develop a large, evenly spotted, wide-open long-lasting flower that blooms on a vigorous plant in 18 months from seed. You can cross all flowers with any dots on them and wait a lifetime for failure or accidental success, or you can carefully inbreed first and wait only part of a lifetime. Consider the practical problem: pretend that each of the following characters is determined by one dominant gene in the chromosomes:

1. Large flower
2. Evenly spotted
3. Wide-open
4. Long-lasting
5. Early blooming
6. Vigor

If you could find six bulbs, each containing a pair of one kind of the above genes, you would probably have to grow at least 1059 seedlings over a period of ten years to obtain all six characters in one plant. Since you would grow a dozen or so seedlings of each cross, the total seedling count would be well over 10,000.

The above example is an imaginary one that never occurs in *Amaryllis.* It appears that any one character is usually determined by a specific combination of many genes, some dominant, some recessive, and some intermediates. And the probability of getting a number of desired genes (say 10) transferred from a parent bulb to a seedling depends drastically upon whether the parent is homozygous or heterozygous for each particular gene or trait. To explain: if the trait, *pure white,* can be determined by the right combination of perfect *twin* pairs of certain genes, then a plant containing such twin pairs is said to be homozygous for that trait. More likely, a certain trait depends upon having gene pairs that have dissimilar genes in some individual pairs. Now, even if the desired trait is uniquely determined by the existing combination of genes, there is no possibility whatever of transmitting the trait to a different plant type by simply crossing and selecting, and then crossing the siblings forever. That is, if the genes *a* and *b* must be paired to yield "pure white", one obviously cannot introduce the trait into another strain in one generation by crossing *a*:*b* on a

plant with genes *c*:*d* in the corresponding chromosome position—one can get only *a*:*c*, *a*:*d*, *b*:*c*, *and b*:*d*.

How often we see a beautiful big red Amaryllis and say, "I must cross many things on that plant!" Very sad. If the big red is a product of much random crossing, the chance of transmitting its loveliness to offspring from random pollenation is negligible. After the Dutch have grown fantastic populations of more-or-less random crosses for many generations, look how much variation occurs in their seeds. Actually, their crosses have not been random; much inbreeding has occurred, but inbreeding apparently has not been done systematically. The traits in their strains are still not homozygous.

I think the formula for efficient breeding toward desired types of plants is to inbreed for maximum homozygosity, so that gene each tends to be paired with an identical gene. Then, when you cross plants, the number of possible combinations is greatly reduced.

In addition, you get a bonus when you cross two inbred bulbs—heterosis or hybrid vigor. It is the writer's observation that even one generation of selfing in two parent bulbs gives improvement in uniformity, predictability, and vigor that is easy to see. Of course, greater inbreeding before crossing is preferable.

The crossing of any two bulbs with a family relationship produces some measure of inbreeding, but selfing a bulb upon itself is by far the best way to inbreed fast—if you are not defeated by sterility. The next best course is to cross siblings. Inbred sterility usually becomes less bothersome after much inbreeding, in my experience. My inbred red line that has been selfed for about six generations is almost completely uniform, and it imparts great hybrid vigor to other inbred lines. And yet it contains species blood.

Inbreeding is frustrating in the early stages, and sometimes new blood *must* be introduced, but when you finally have some uniform inbred strains, you can begin to predict the results of your crosses.

A final word: if you can *start* with material that is already stabilized to some extent by inbreeding, you will save much time. One such form of material is species, but you will probably not limit yourself entirely to species. You can also look for seeds and bulbs with known inbred parentage.

It should be obvious that the breeding method proposed here is useless unless you keep good records of your experiments. Also, I advocate cooperation among groups of amateurs to obtain a desired result most quickly and to ensure continuity in case one breeder drops out of the game.

BREEDING FOR YELLOW AMARYLLIS HYBRIDS

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Some people believe, that a violet should be violet and consider a white or a pink violet a freak of bad taste; a blue rose or a yellow amaryllis then would be adominable. Yet many hybridizers have tried to raise them and as long as amateurs, plant lovers and horticulturists exists, there will be the tendency to create unusual colour shades.

The writer has been experimenting for some years to obtain a large-blooming *Amaryllis* hybrid with pure yellow flowers. This colour is apparently not present in any natural *Amaryllis* species, except in a very diluted or concealed shade.

Our first trial started by crossing an orange flowering species—*A. striata* var. *crocata*—with a pure white blooming unnamed Ludwig hybrid. The idea was, to take advantage of the easy growing habit and recurrent flowering of the species, hoping to combine it with the large size and good shape of the hybrid partner. We hoped, that among the descendants might be some yellows, to be used for further improvement.

The F_1 hybrid resulting from this cross showed about uniform medium-sized flowers of various rather disappointing colours varying from pale brownish orange to a faint pastel pink, none of which had brilliancy. We therefore abandoned further experiments, as there were no prospects of yellows.

We had sent a few of our F_1 seeds to Mr. Fechner in Germany, who at that time experimented with *Amaryllis* hybridization. He selected some of his seedlings, which he believed to be the most promising and crossed them among each other. According to his report, the resulting F_2 generation showed surprisiingly all white flowers.

The writer fails to find a plausible explication for this; the white colour in flowers is really due to lack of colouring matter in the flower. White blooming plants lack the capacity of producing pigment, but when they are hybridized with another plant having this capacity, the offspring ordinarily should show only coloured flowers. Geneticists consider therefore the white blooming character as recessive, because it tends to disappear in progeny, except in pure lines.

Readers interested in studying this matter, should read the book "Experiments in Genetics" by prof. C. C. Hurst, edited in Cambridge, England, 1925, which contains several long chapters dealing on genetics of albino (white) orchids, which are applicable on *Amaryllis* breeding.

Mr. Fechner decided to pollinate a few of the best of these white blooming plants mutually, creating thus the F_3 generation. When these seedlings flowered, all were again white, except one plant, that had nice, pale orange flowers. The grower named this 'Blossfeld's Orange' but apparently, did not register this name. Discontinuing his hybridizing with *Amaryllis*, he sent a few seeds, obtained by self-pollination of this plant, back to the writer.

From the seed received, we raised a few plants of this "Blossfeld's Orange" hybrid and found that its flowers, though not so large as many new hybrids, had an acceptable size and shape. The colour of the flower is basically a cream white, being so densely criss-crossed by a tiny and narrow network of orange reticulation, that the general appearance of colour is a yellowish orange.

A couple of years ago, we crossed this hybrid on *Amaryllis Blossfeldiae,* a brilliant orange blooming species then just discovered. Our seedlings are not yet in flower, but as we shared some seed with several American friends, there may be some plants available in the United States, when this article appears in print.

Though possibly new shades of orange hybrids may result from this cross, the writer believes that this breeding program offers little promise to produce a good, pure yellow blooming hybrid. Because of the different basic nature of yellow pigment in most flowers, which is distinct from colours derived from red, crimson, violet and rose, there is little chance to obtain a pure yellow *Amaryllis* in any breeding program involving species or hybrids bearing any of the mentioned colours.

A fresh start should be made by using some of the "trumpet" Amaryllis species, which have greenish-white or greenish yellow, or even pure green flowers. These include: *A. immaculata—A. elegans* and *A. viridiflora.* Special attention is called to the fact, that there have been found in nature varieties of *A. elegans* with a largely yellow perigone, showing green only at the elongated tube. The writer is presently trying to obtain bulbs or seeds of such a variety, that had been found originally by Dr. Gardner during his famous travel in Brazil, about 1837. The locality is, unfortunately, still of difficult access and it is uncertain, that we can obtain this material.

The ideal partner for hybrids from these "trumpet" species would be *A. aglaiae,* which is stated to have butter-yellow flowers. This, however, seems not to be a precise identification; according to the writer's observation, the flower is really milk white, having fine reticulated veinings of pink and a broad central streak of yellow on each segment, on the inner face of the perigone. Anyhow, this species is the closest approach to a yellow Amaryllis flower. An alternative would be the yellowish-green flowering *A. calyptrata.*

Among the few hybrids already existant of *A. aglaiae,* one raised by Mr. J. L. Doran using *A. evensiae,* showed a decided approach to yellow flowers. Such experiments are of course pioneer work, but they are valuable indications of the possibilities. *A evansiae* has flowers of variable colour, from green to yellow. [Editors Note.—The editor flowered one plant of *Amaryllis aglaiae;* the flowers were of a uniform very, very light yellow.]

Crosses between these various species, which are only distant relatives, may not produce seeds; or if pods form, they may abort before

they get ripe. It may be necessary to repeat pollination on many different plants, before one or the other pod succeeds to full ripeness. Even if a cross fails persistently, by abortion of the immature pod, it is possible to withdraw the seeds in their embryonic stage by an aseptical operation—in the way of the caesarian operation—and sow them on a nutritional medium, where they continue to develop, until they produce roots and may then be planted out. This system is quite a normal operation with orchid seedlings, so there is a practical technique available, though a laboratory equipment is required.

It must be admitted, that this first step of the program, aiming specially a pure yellow flower, certainly will produce many unsatisfactory shades, some acceptable and very few good ones. The choice should be made regarding fine pure yellow colour as first requirement for future genetic improvement. Size and shape of flowers comes second.

After this selection has been made, a second step will be necessary, to improve size and shape. This may be done by crossing the best yellow flowers on a pure white blooming *Amaryllis* hybrid of excellent shape and size. Also for this second step, many crosses should be made, because some may fail to set seeds, others may produce undesirable progeny and only a few of the white hybrids may prove to be good breeders for this special program. There are some white *Amaryllis* hybrids on the market, that are not true albinos (though their flowers are perfectly white), and will produce reddish or crimson blooming progeny. True albinos will not introduce any other colour into the hybrid offspring, but they may cause a dilution of the yellow colour, in variable degree. Of the progeny, the less desirable must be culled out, and only those with the purest yellow colour, the largest size and best shape should be used for the third step.

This third step is finally the crossing of the various lines obtained from the different species, to combine their best selected individuals, considering improvement of other factors, beyond size, colour and shape. Such factors as position of flowers, their durability, perfume and number per stem, also season of blooming, recurrent blooming habit and easy growth should be considered. These factors may be combined by selective breeding in this last step.

As can be seen, there is a wide field of hybridizing open for those who like to do pioneer work. And after the first yellow *Amaryllis* has appeared, there will be still much improvement necessary, until these come to a quality level with the modern red, crimson and white hybrids, which too required many decades to come into being.

THE ROLE OF TRIPLOIDS IN **AMARYLLIS** HYBRIDIZATION

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Most of the large, showy *Amaryllis,* hybrids are tetraploids. Characteristics of large plant size and the heavy substance and maximum diameter of the flowers of tetraploid plants have generally been favored over those of the diploid species. Native tetraploid species such as *A. blossfeldiae* and some varieties of *A. striata* occur, but most species found in natural habitats appear to be diploid. *A. evansiae, A. starkii, A. aglaiae, A. cybister, A. belladonna* and *A. yungacensis* appear to be among the diploid species from the freely produced hybrids and the ease of making reciprocal or backcrosses. Diploid hybrids tend to maintain the smaller stature of their parentage and have led to an almost independent breeding program for *Amaryllis* miniatures. At the same time, recently discovered diploids seem to contribute a disproportionately small share to the familiar tetraploid hybrids although many distinct and desirable traits are present only in the diploids.

Triploid hybrids are readily produced by pollinating diploids with tetraploids, either species or hybrids. A modern example of triploids is found in some of the 'Senorita' hybrids when *A. evansiae* is pollinated with a tetraploid *A. striata.* Reciprocal crosses with the diploid as pollen parent are rarely successful, perhaps because of pollen-tube growth rate or a lack of endosperm development.* Triploids tend to be self and intersterile. Nevertheless, many triploids have contributed to the development of modern tetraploid hybrids. Scant but reliable seed set is often encountered when a known triploid is pollinated with a fully fertile tetraploid. It has been my experience that about ten viable seeds can be produced in a successful triploid x tetraploid cross. The resulting progeny tend to be more fertile than the triploid parent, an observation which may be explained by the fact that the most fertile progeny are usually normal or nearly normal tetraploids. This may also be the case in successful crosses using the pollen of triploids on tetraploids.

Triploids pollinated with diploids are less likely to produce viable seeds. However, I have produced through techniques of embryo culture (Bell, 1972) four plants of the cross (*A. evansiae* x tetraploid) x *evansiae.* Hybrids of triploid-diploid origin have certain interesting possibilities not found in the triploid-tetraploid combination. In the case of the *A. evansiae* backcross mentioned here, the progeny will be statistically carrying 2/3 *A. evansiae* germ plasm. In the case of the same triploid pollinated with a tetraploid, the contribution of *A. evansiae* germ plasm is reduced to 1/7.

An analysis of the chromosomal composition of diploid, triploid and tetraploid *Amaryllis* sheds some light on the role of the triploid

* Endosperm ploidy level would depend on the direction of a cross.

in hybridization. Diploids contribute one set of chromosomes (11) to the progeny through each gamete; tetraploids contribute two sets (22). Triploids (33) thus receive double the chromosomal compliment from the tetraploid pollen parent than is provided by the egg of the diploid. Triploids do not have evenly paired chromosomes and in many genera are completely sterile. Fortunately, in the genus *Amaryllis,* some viable gametes are formed by many triploids, presumably through a random distribution of the third set of chromosomes. Thus, if we assume a completely random assortment after pairing of the other two sets, a gamete formed by a triploid may have anywhere from 11 to 22 chromosomes. However, it is likely that only those which are close to 11 or 22 will act as functional gametes. Chromosomal translocations, inversions or other aberrations may further reduce gamete viability in some species hybrids but are beyond the scope of this discussion. Macroscopically, triploids can tentatively be identified by the apparent paucity of pollen; microscopically, only a small percentage of pollen grains of triploid plants appear fully filled with cellular material.

Balance among the different chromosomes in the set of 11 in the genus *Amaryllis* seems to be an important factor in determining the viability of a gamete. The fully paired chromosomes of a diploid or tetraploid are the most fertile combinations. Additions or deletions of chromosomes reduce viability. On the other hand, plants which are almost diploid may exist with an additional non-paired chromosome. In other words, the plant would have ten pairs plus one chromosome in the triploid condition and would be termed a trisomic. Trisomic plants often display unusual morphological traits; the genus *Datura* is still the best example (Avery, *et al.,* 1959). Two extra chromosomes may also exist, but that is a rarer viable combination. A tetraploid with a single extra chromosome is more nearly balanced than a diploid with the same extra chromosome. If the genetic information were equally distributed among the chromosomes, the 45th chromosome would be 1/45 of the total compliment whereas the extra chromosome of the diploid trisomic would be 1/23.

Let us make a further assumption and consider a viable gamete with 21 chromosomes produced by a triploid, one less chromosome than a gamete produced by a normal tetraploid. Combined with a gamete of a normal tetraploid, a plant would result with 43 chromosomes. Such plants exist (Traub, 1958) and this may well be one source of their origin. The plant with 43 chromosomes may be expected to breed with normal tetraploids but with a slightly reduced fertility. Selection for viable seeds favors those plants which are most fertile with the normal genetic compliment, in the case of *Amaryllis* tetraploids, 44 chromosomes. Again, there is natural selection pressure against the progeny of a triploid unless a conscious effort is made to choose the progeny on the basis of a known pedigree.

Diploid germ plasm, therefore tends to enter the makeup of tetraploid hybrids by way of triploid intermediates. And, as noted earlier,

the genetic contribution of a particular diploid is rapidly diluted in as few as two generations. Thus, using conventional breeding techniques, many years and many plant generations have been required to select in tetraploid hybrids desirable traits of the diploid species. More expeditious means for producing tetraploids directly from diploids must be sought. Preliminary unpublished evidence suggests that treatment with colchicine under aseptic conditions may allow tetraploid tissue to recover from colchicine shock sufficiently that the suggested overgrowth of diploid tissue (Manning, 1969) can be circumvented.

The triploid should not be considered merely as a rarity or an intermediate in the historical development of modern tetraploid hybrids. Nor, should we be limited to the few available known triploids such as 'Senorita' hybrids. There is a distinct and positive advantage for the landscapist and amateur hobbyist in having plants which do not readily self pollinate. At the same time, such plants are not necessarily sterile mules for the serious breeder. A conscious effort must be made to identify triploids and to choose diploid-tetraploid combinations which result in desirable triploid hybrids. Careful records of successful interspecific crosses will aid in this delightful venture.

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AMARYLLIS BREEDING—1972 REPORT

JOSEPH K. MERTZWEILLER, *9266 N. Parkview Dr., Baton Rouge, La. 70815*

I am recording these notes, not because there is enough new and significant material to term it an "article", but rather in the hope this information will offer some slight help to others struggling with growing and hybridizing the *Amaryllis* species .

After at least five years of trying I am finally reaching a rather painful conclusion: namely, that it is simply not feasible to grow certain *Amaryllis* outdoors in the ground in the Baton Rouge area. By "certain" *Amaryllis* I include (1) some of the registered Dutch hybrids and (2) most of my own hybrids having *Amaryllis* species as one or both parents or grandparents. I have had a great deal of hope through the years that I would be able to grow most of my hybrids outdoors and thus retain my precious and very limited greenhouse space for the

species, seed flats and a few other plants. But after this past spring and summer I have four or five moderate size beds which, at this writing in very early fall, seem to present a picture of almost ultimate desolation. We had a very hot and dry summer; not only high temperatures, but quite low humidities as well, a combination unusual for us. It was simply impossible to keep the bulbs from drying out. Not only did they make very poor leaf growth, but also lost most of their roots. Some have no roots at all and are literally laying on top of the ground. I do not mean to imply that one cannot grow some of the Leopoldii (Dutch) hybrids in this area and grow them well outdoors year around. That is, provided one has an ideal location. I have done this; so has Mr. E. M. Beckham, Mrs. T. K. McKnight, the late Prof. Claude Davis and the late Fred Buchmann. Mrs. McKnight grows literally thousands of them. But few of these are interspecies hybrids or represent an *Amaryllis* species as one parent. The great challenge for me in *Amaryllis* is to use the newest species to create new and different hybrids. So my problem is now well defined and the only answer appears to resort to pot culture, either in the greenhouse or indoors. This will certainly limit the extent to which I shall be able to pursue this activity in the future.

I do not want to imply that my *Amaryllis* picture is entirely unfavorable. Last spring I had the best greenhouse bloom I have yet experienced. Many blooms were old standbys, but there were some new things too, and I will describe a few of these.

HYBRIDS OF AMARYLLIS VIRIDIFLORA

My story of *A. viridiflora* continues to unfold. I described earlier (PLANT LIFE, 1969) how I bloomed what appeared to be an authentic but rather juvenile or stunted plant of this interesting species, froze the pollen for 10 months and then the following spring obtained seedlings from a hybrid of SA 63—20 X (*A. evansiae* x *A. aglaiae*). The SA 63—20 was originally collected for Mr. Robert Goedert and appears to be an orange-pink form of *A. belladonna*. I have about 10 seedlings from this cross and all are very slow growers except one which has made a bulb about 1½ inches in diameter. I repotted all of these bulbs this past spring and some were making a few offsets.

When I used the stored, frozen pollen of *A. viridiflora* in 1969 I used it on several different pod parents, and in some cases mixed with other pollens. One mixture was *A. viridiflora* plus *A. evansiae* on *A. evansiae* and a few seedlings were obtained. Three of these bloomed in 1972. Alhough I had not observed the foliage sufficiently well to note any differences, it soon became apparent that one bloom was distinctly different from the other two. The latter were typical *A. evansiaes.* The other plant also bloomed in mid February, one 16″ scape with two florets. But it was the form and color which were the real distinguishing features. The form of *A. evansiae* was almost completely lacking and the floral segments were more regular than *A. evansiae*. The bloom was more star shaped and the edges of the segments were distinctly and regularly

ruffled or fluted. From the side the flower was definitely not *A. evansiae* in form, but neither did it have a very long tube. More trumpet shaped without too long a tube is perhaps the best description of the side view. The overall color pattern was more greenish than *A. evansiae* although the color at the outer periphery of the segments was that of *A. evansiae*. Darker green striations along the centerline of the segments also distinguishes the color pattern from that of *A. evansiae*. The stigma was capitate, minutely trilobed. I have little doubt that this is a true hybrid of *A. evansiae* X *A. viridiflora*. Unfortunately I was unable to set seed with this hybrid in 1972, either as a pod parent or a pollen parent.

I had stated (PLANT LIFE, 1972) that my unidentified *Amaryllis* species No. 1 obtained from Dr. Cardenas in 1969 might also be *A. viridiflora*. I attributed this to a very similar leaf structure showing a pronounced light green but very narrow midrib. The earlier specimen of *A. viridiflora* I also obtained from Dr. Cardenas through the late Prof. Claude Davis. Most of my seedlings from SA 63—20 X(*A. evansiae* x *A. aglaiae*) with *A. viridiflora* also show the green midrib to various extents on their leaves. Unfortunately, I shall be unable to make more observations on the unidentified species No. 1 because I lost my bulb this past summer. It had begun to make leaf growth in late spring so I decided to give it the same watering schedule (two or three times weekly) that I give all my other species and potted hybrids. When I returned home from a trip late in June there was only a hole in the potting medium where the bulb had been. This is indeed unfortunate, but certainly confirms my feelings that the culture of *A. viridiflora* is extremely difficult, if not impossible in this part of the country. I guess I should consider myself very lucky with the hybrids I have from this species. I shall try to distribute these as widely as possible as soon as sufficient stock becomes available.

STATUS OF DR. CARDENAS' UNIDENTIFIED SPECIES

It is appropriate to bring the readers up to date on the status of the unidentified *Amaryllis* species I received from Dr. Cardenas in 1969. I gave a brief status report in the 1970 PLANT LIFE and a fairly lengthy report on the three species which bloomed, including photographs, in the 1971 PLANT LIFE.

Since my unidentified species No. 1 has succumbed, we need not discuss this any more.

Unidentified species No. 2 remained dormant from the fall of 1971 through the spring of 1972 and did not bloom in 1972. It was definitely reluctant to start growing and at this writing is mixed with a large number of species and hybrids. I have not observed it for the past several months, but I think it survives and I will separate all of these into groups when it is time to put them in the greenhouse in November. Since this species appears to behave differently from the others, I have hopes it will prove to be a different or new species.

The unidentified species No. 3 bloomed in the spring of 1972 and as far as I could tell was identical with species No. 6 which also bloomed

this spring as well as in the spring of 1971 (and was pictured in Figure 26, PLANT LIFE, 1972). Despite the fact that these two species appear to be identical, there were some slight differences in the bulbs. The No. 3 bulb was slightly larger and had a definitely longer neck than the No. 6 bulb (even though the No. 6 bulb was one year older). But I am willing to accept these as cultural differences or even differences in stability of the species itself. I also observed Mr. Ed Beckham's No. 3 species in bloom and I consider it identical to my No. 3 and No. 6 species. All of these I believe may well be the new species *A. neoleopoldii,* described by Dr. Cardenas and pictured in Figure 17-B, PLANT LIFE, 1972. But there are certain points of doubt in my mind. My greatest doubt is in regard to the size of the flowers and floral segments. Dr. Cardenas describes *A. neoleopoldii* as being 15—18 cm. (6-7½″) wide with upper tepalsegments 5 cm. (2″) wide and the lowest tepalseg 3.5 cm. (1½″) wide. The corresponding dimensions, in centimeters, of my 1971 bloom were 13.5-14 cm., 3.5-4.5 cm. for the upper tepalsegs and 2.8 cm. for the lowest tepalseg. My 1971 bloom was at least 20% smaller in all its dimensions. Unfortunately I did not take measurements of the 1972 blooms, but my guess is they were not appreciably larger. Such differences could conceivably result from lack of stability among separate clones of a comparatively recently originated species or might be due to simply growing the same identical species under widely different cultural conditions, e.g., in Bolivia and in Baton Rouge, La.

It is easy to conclude that my No. 6 species differs from the true *A. pardina* Hook. (Figure 17-C) and that the *Amaryllis* I pictured as *A. pardina* Hook. in Figure 26 is a descendant of the *Amaryllis* species collected by the late Prof. Ira Nelson in Bolivia in 1954 and 1958 and now considered a new species and named *A. lapacensis* by Dr. Cardenas. Does anyone have the true *A. pardina* Hook.?

I would like to raise one other question which may be pertinent. This is the possibility that some of the new *Amaryllis* species currently being named may be natural hybrids. The general similarity of some of these new species and apparent "variability" of others may be a clue along this line. I would like to hear some comments along these lines, particularly from those who have visited and collected and are familiar with the growing conditions there and with the possibility that natural hybridization could occur. In my own experience I am familiar with the story of our native Louisiana Irises (Series Hexagonae of Subsection Apogon). Some 70 or so "species" of Louisiana Irises were discovered and named by the late Dr. John K. Small of the New York Botanical Gardens in the late 1920's. Most of these "species" later turned out to be natural hybrids and we now recognize only four (or five) species of Louisiana Irises. This is intended in no way to diminish the contributions of Dr. Small who was really the one who put the Louisiana Irises "on the horticultural map." But I am interested that a similar possibility could exist in certain areas of Bolivia or other South American

countries. Presumably this would require certain insect vectors to carry the pollen at least over distances of several miles. The insect vector for the Louisiana Iris is known to be the bumblebee and these are known to be effective over areas of at least one or two miles.

Back to *Amaryllis* now, my unidentified species Nos. 4 and 5 bloomed in 1971 and are pictured in Figure 26 (PLANT LIFE, 1972). I concluded that species No. 5 was definitely *A. nelsonii,* but that No. 4 could be a different species. I understand that Dr. Cardenas considers No. 4 also to be *A. nelsonii* and therefore *A. nelsonii* must be quite variable and of comparatively recent vintage. Not only are the markings and certain other features of these two amaryllis quite different, but the growth patterns also differ to some extent. My No. 5 *(A. nelsonii)* bloomed also in 1972 after which I repotted the main bulb and three small offsets. The 1972 bloom was not quite as large and spectacular as the 1971 bloom. The No. 4 species did not bloom in 1972 and the main bulb deteriorated and eventually rotted. But three small offsets were repotted and appear to be growing well.

By far the most interesting and gratifying result I achieved in 1972 was the hybridizing success I had with *A. nelsonii* and *A. neoleopoldii* (?, species No. 6). No less than six seed pods, all having germinated to some extent, were obtained from *A. nelsonii.* The number of seedlings are quite variable but among the pod parents are such fine species as *A. belladonna, A. escobaruriae, A. starkii,* species No. 6 and possibly *A. evansiae* (I lost the label of this group of seedlings). With species No. 6 as either pod or pollen parent I have seedlings with *A. evansiae, A. starkii* and the old standby SA 63—20. It is quite fitting and encouraging that two of the *Amaryllis* species for which the late Prof. Ira Nelson was at least partially responsible for discovery have figured prominently in these hybrids.

PROGRESS IN BREEDING FOR LARGE YELLOW HYBRIDS

This section could appropriately be termed lack of progress in breeding for large yellow hybrids. There was absolutely no progress in my work along these lines in 1972, despite the fact I had several potentially promising plants bloom for the first time. Foremost were two having the parentage 'White Crane' X *A. aglaiae.* I received these from Dr. Traub several years ago. Both were beautiful amaryllis, pure white flowers, about 5 inches across with no trace of red or pink detectable. Bloom of rather small bulbs, and on short scapes (12-14″) leave no doubt in my mind that these have truly the parentage indicated. But I had absolutely no success in setting seed by selfing, sib-crossing or crossing (pod or pollen parents) with other parents representative of *(A. evansiae* x *A. aglaiae)* X white Dutch hybrids. I believe we are up against a genetic barrier here. I speculate that 'White Crane' and quite possibly most of the named white Dutch hybrids are tetraploids as are 'White Christmas' and 'Maria Goretti' (PLANT LIFE, 1971 pg. 91). Thus crossing with diploids such as *A. evansiae* and *A. aglaiae* would be difficult and success would most likely give triploids.

The triploids would tend to be sterile and this appears to be the pattern we have found. But much more effort needs to be made along these lines. The late Prof. Nelson pointed out (AMARYLLIS YEAR BOOK, 1960 pg. 97) that the progeny of his *A. evansiae* X white Dutch original crosses "were reasonably fertile and no great difficulty was encountered in obtaining seed from either self or sib pollinations." Could it be that Prof. Nelson was working with a diploid white Dutch hybrid? I believe this white Dutch *Amaryllis* still exists in the U. S. L. collection and I plan to assist in any way I can in unraveling this mystery.

ASEPTIC CULTURE OF **AMARYLLIS** OVULES AND TISSUES

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Immature *Amaryllis* embryos have been relatively easy to culture aseptically. Over 200 plants have now been produced from crosses where the capsule had begun to abort before any seeds had developed sufficiently for normal germination. In as few as 7 days after pollination, ovules in which no embryo was evident at a magnification of 40X developed on the culture medium and eventually gave rise to green, photosynthetic plants. Details for culturing immature embryos were reported in Plant Life in 1972. Under these conditions, light appeared to be a requirement, but exhaustive tests were not made on vitamin or growth-regulator additives which might overcome or diminish this requirement.

Attempts to culture ovules and immature seeds were usually made on tetraploid x diploid crosses because some of these crosses appeared successful for about 10 days or so but suddenly aborted. Successful cultures were derived from those capsules which had assumed a more vertical position after flowering. Elongation of the pedicel gave further encouragement. Preliminary tests on plants grown by this method indicate that diploid as well as triploid plants may result. Perhaps the stimulus of pollination and the cultural conditions allowed development of some embryos through parthenogenesis. Controlled, limited pollinations of tetraploid x tetraploid plants yielded capsules in which only a part of the ovules had enlarged by the stage 10 days after pollination. Neither the unenlarged ovules from the latter capsules nor the ovules from unfertilized flowers developed into plantlets in several tests.

Dry *Amaryllis* seeds were cultured aseptically with almost as much success as those removed from a surface-sterilized capsule. Treatment with hypochlorite was reduced from 5 to 2 or 3 minutes. Distribution to individual tubes or limiting the number of seeds to only a few per culture flask appeared to reduce loss since occasional seeds were apparently contaminated internally. Small seedlings grown hydroponically

in vermiculite resulted in 30-50% aseptic cultures when the sterilization procedure was performed in two steps. Defoliated and de-rooted seedlings were first placed in the hypochlorite for 5 minutes. An additional cut was made at each end of the tiny bulb including one through the basal plate and the hypochlorite treatment was continued for another 2 minutes. A final equilibration with sterile distilled water was always included in the procedure.

Aseptic tissue from soil-grown bulbs presented more problems but an interesting challenge. Sterile explants were made from portions of bulb scales which did not include the basal plate but these failed to develop further although greening occurred in light. Explants of bulb scales with a portion of the basal plate were almost always overgrown within 48 hours by an organism tentatively identified as a yeast. The organism appeared somewhat rod-shaped but was clearly visible at a magnification of 100X. Re-sterilization of contaminated explants using the procedures above did not yield aseptic cultures when this organism was present.

Fig. 14. Virus particles X 30,000, isolated from an infected **Amaryllis** leaf, by Dr. F. W. Zettler & Associates, Plant Virus Laboratory, University of Florida, Gainesville.

Virus symptoms or leaf mosaic on a clone of *A. belladonna* prompted further attempts to achieve aseptic cultures from soil-grown plants. The bulb was surface-sterilized and the lower half quartered. Quarters placed on the mineral-agar medium containing 2% sucrose were accompanied by a rapid growth of the yeast-like organism and one or two other contaminants. Similar quarters placed on a carbohydrate-free aseptic medium began to develop buds among the bulb scales in about 2 weeks. Such buds when excised and surface-sterilized resulted in a high percentage of aseptic plantlets on the medium containing sucrose. No buds smaller than 3 mm in length were excised but the technique could probably be improved. However, once aseptic, plantlets could be propagated vegetatively with ease and further bud de-

velopment was induced. In fact, buds formed more rapidly with sucrose present after visible contaminants had been eliminated. Where bulb cuttage is not effective, this method might be considered for propagation.

Some of the aseptic plantlets grown from the plant displaying virus mosaic symptoms in the foliage do not show the mosaic in the culture vessels. However, we may not conclude that the virus has been completely eliminated. These plants will be grown to see if symptoms appear later. Another method for virus detection is that employed by Dr. F. W. Zettler of the Plant Virus Laboratory, University of Florida, Gainesville. Dr. Zettler and his associates isolated flexous-rod-shaped virus particles from infected leaves of *Amaryllis*. One of their electron photomicrographs is shown in Figure 14 with the negatively stained particles magnified 30,000X. Extracts of *Amaryllis* leaves from the initial virus-infected plant and of explants grown from buds of that plant would provide further evidence for the effectiveness of bud culture in attempts to restore an infected clone to a virus-free state.

FOOTNOTE.—Under date of Nov. 8, 1972, Dr. Bell writes that "One of Dr. Zettler's graduate students checked out my preliminary attempts to culture meristems from virus-infected *Amaryllis* bulbs. Virus particles were found in all samples tested. Thus, this attempt has proved to be unsuccessful. However, the methods reported here seem to have merit on their own. I believe that others have already adopted the two-stage procedure for producing aseptic cultures."

BREEDERS NEED DESCRIPTIONS OF **ALSTROEMERIA** SPECIES

Hamilton P. Traub

With the renewed interest in the genus *Alstroemeria,* there is an urgent need for easy access to the descriptions of the species. Herbert (1837) recognized 29 species. In the review by Uphof (1952), he considered that Baker (1888) had critically considered the 89 recognized species included in Volume 1. 1895, Index Kewensis which is not the case. Thus, his treatment includes only 44 species recognized by Baker and published before 1888, and does not account for 45 species included in the 89 species listed in Index Kewensis (1895). Uphof (1952) also lists 18 species described from 1890 through 1915. Uphof's treatment although valuable for what it does contain is incomplete. This makes it very urgent that a lineagicist (taxonomist) undertake a complete revision of the genus *Alstroemeria* without delay, and which is to be published as soon as possible.

Species and hybrids listed in the literature since 1915 include the following:

Alstroemeria soukupii Standley ex Soukup, in Biota *1*: 126. 1955.—Peru.

A. edulis Tussac. Fl. Fl. Antill. *1*: 109. 1808.—West Indies.

A. x *raciniae* Traub, in Plant Life *8*: 85. 1952, *anglice; 28:* 67. 1972.
A. x *orpetiae* Traub, in Plant Life *28:* 67. 1972.

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Index Kewensis, Vol. 1. 1895. pp. 93—94.

Herbert, William. Amaryllidaceae; and a Treatise of Cross-Bred Vegetables. London. 1837. Now available in 1970 Reprint Edition, with introduction by H. P. Traub. Verlag von Cramer, 3301 Lehre, Germany. Genus *Alstroemeria* (29 species) pp. 88—103.

Uphof, J. C. Th. A Review of the Genus *Alstroemeria.* Plant Life *8*: 36-53. 1952.

BREEDING WHITE NERINES

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Because of the dearth of white Nerines, both species and hybrids, for some years I have attempted to hybridize the few white cultivars in our collection to secure white hybrids. In the duplicate collection of the Exbury Nerines which we received from England from Mr. Edmund de Rothschild, we flowered several beautiful white hybrids as follows: *N.* 'Best White' (sometimes shows a pink suffusion), 'Snow', 'Snowflake', 'Solent Swan', 'Vestal' and 'White'. These varieties were used as seed parents which produced some white hybrids.

There are reported to be at least three white sports of Nerine species, *N. bowdenii, N. sarniensis* and *N. flexuosa.* The *N. bowdenii* var. *alba* received an Award of Merit from the Royal Horticultural Society for the Veitch Nursery on September 26, 1911. The *N. sarniensis* (white variety) was reported by Mrs. Sima Eliovson in "South African Flowers for the Garden" as a pure white form found on Table Mountain. Having an opportunity to consult Mrs. Eliovson at the time of her lecture at the Los Angeles State and County Arboretum, I was informed that as far as she knew this white form was no longer available in South Africa. There is reported to be a white form of *N. flexuosa,* but those I have flowered under this label were pink, but three plants of supposedly pure white *N. flexuosa* had to be destroyed before flowering, because of serious virus infection. There is a good illustration of *N. pudica* in the Botanical Magazine, t. 5901, which appears white with pink median lines.

In my Catalog of Hybrid Nerine Clones published in the Amaryllis Yearbook for 1960, there are listed three white cultivars, namely 'Candida', 'Snowdrift' and 'White Knight', the last named having pink median lines. 'Alice', the parent of 'Inchmery Kate', was said to be white with rose suffusion. After considerable research in England and elsewhere, I have been unable to trace a living specimen of 'Alice', nor any of the three aforementioned white species as well. It is interesting

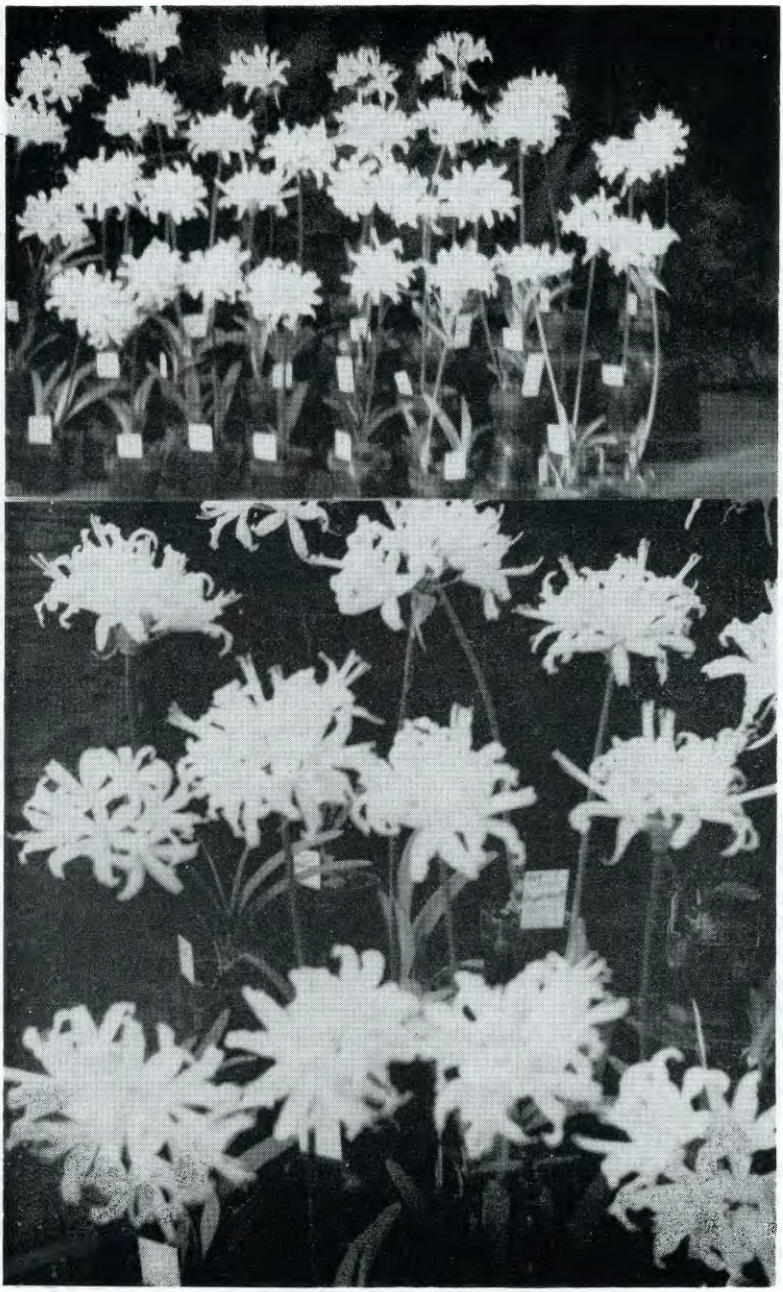

Fig. 15. Nerine hybrid clones, Greenoaks collection, 1971, Arcadia, Calif. Top, collection of white clones. Bottom, portion of above at closer range.

to speculate if some of the white hybrids have *N. pudica* in their ancestry for we have a number of white hybrids of unknown parents with pink median lines in their tepals. These latter have not been included with the white parental clones in this project.

Up to and including the fall of 1970, I had flowered twenty-four white seedlings. These were given the following epithets: 'Albion', 'Alabaster', 'Angel Wings', 'Arctic Snow', 'Carrara', 'Casablanca', 'Crystal Palace', 'Cumulus', 'Denali' (the Indian name of Mt. McKinley), 'Flying Cloud', 'Galaxy', 'Glacier', 'Iceberg', 'Innocense', 'Jack Frost', 'Milky Way', 'Sleighbells', 'Snow Maiden', 'Snow White', 'Snowbird', 'Star White', 'Taj Mahal', 'White Swan', and 'Winter's Tale'. Six new seedlings, also white, were flowered in 1971 and were given the cultivar names (with seed parent indicated): 'Halo' ('Snowflake' ♀), 'Marble Arch' ('Iceberg' ♀), 'Sierra Madre', 'Snowcap', 'Snowman', and 'Whitecap'; the four last names had 'Crystal Palace' as the seed parent. 'Crystal Palace' appears to be the most fertile of my white parents with twelve white progeny to its credit, while 'White', which sometimes shows some pink suffusion, produced ten apparently pure white progeny. So far, I have many divisions of 'Vestal' which appears very infertile having produced no white offspring among its few seedlings. As yet unflowered, there is a large progeny from the white parents. Hopefully some of these will produce white flowers. An early cultivar 'Star White' did not survive, but not before two of its progeny gave white flowers, 'Arctic Snow' and 'Carrara'.

The appearance of the few white cultivars in my collection when I first started growing Nerines, was probably the incentive for following this line of breeding. Because of the brilliance of colored Nerines—red, orange, pink, coral, fuchsia, even blue, the white flowers attracted attention by their rarity and purity. On the other hand, such is human nature, that had most of the species and hybrids been white, one would prize the few gorgeous colored ones and try to breed more of them.

After deciding on a program of breeding white nerines, the white-flowered plants were isolated as well as possible in a small greenhouse when in flower, although colored ones were blooming not very far away and no doubt bees and other insects were free to deposit pollen from them on the white flowers. From time to time when the stigmas of the white flowers appeared receptive, they were dusted with pollen from other white flowers. This rather unscientific method was necessary because of the demands of other work, several spells of illness, extensive travel and the fact that we were involved for several years because part of our land was condemned for a flood control channel and the Foothill Freeway. This required rebuilding our home and greenhouses.

In 1971 the white varieties of which there are duplicates of each cultivar, produced 44 umbels. From these a quantity of seed was harvested. A total of 28 four inch plastic community pots were sown and now in the summer of 1972, the seedlings with leaves up to seven inches high have been transplanted to three inch pots. Before the seedlings

Fig. 16. Nerine hybrid clones, Greenoaks collection, Arcadia, Calif. **Top,** colored Nerine hybrid clones **(reproduced from color photo and rather indistinct)**; middle, collection of white Nerine hybrid clones, 1970; **and bottom, (reproduced from color photo and rather indistinct),** tall scape in left background, clone 'Skyrocket', tall clone bred from **N. bowdenii,** 1971; and in foreground, note indistinct irregular flowers, clone 'Alma Moldenke', Dr. Traub's **N. filifolia x** 'Rosalba' hybrid.

make offsets, they must be potted to individual pots so as to keep the individual clones separate.

Owing to the number of light pinks that have flowered from the white phenotypes, I suspect that at least some white hybrids have recessive pink genes in their genotypes. After an extremely hot summer in 1971, a few apparently white clones developed a pink suffusion. Perhaps the pink genes were activated by the unusual conditions.

In 1970, an attempt to photograph the white flowers outdoors was interrupted because of sudden gusts of wind. This required that the plants be taken to the greenhouse, where because of the benches, it was not possible to get a proper camera distance. In 1971, other photographs were taken and it is hoped that these will give some idea of the collection.

A brief summary of my method of growing Nerine seedlings may be of interest. Shortly after the flower is pollinated, a capsule forms which contains a few to many succulent seeds. These are somewhat smaller than peas but generally of an oblong shape. The seeds should be harvested when the capsule shows signs of splitting, so as not to be lost or to fall and sprout on the mother plant. These bulb-like seeds are not allowed to dry and are sown as soon as possible on the surface of damp soil composed of about equal parts of sand, leaf mold and soil. They are not covered but are placed in slight depressions so as to be easily observed. After a few weeks, or even sooner, the seeds will start to germinate and thereafter grow rather slowly. A piece of glass or jar placed over the pot will help to maintain humidity. A label with the date and seed parent's name (both parents' if the complete cross is known) is made for each pot.

Although most of the mature Nerines become dormant about April or May until growth starts about September, the young seedlings remain green about two years and can be watered during the summer. Weak fertilizer may be applied during active growth. Last year at planting time the seeds were sprayed with Morsodren which seemed to do no harm and prevented all damping off. Since Morsodren is a mercury compound, it is no longer available and other products such as Consan may need to be substituted.

Seedlings flower in four to seven years. As to the hardiness of nerines, much depends on the species from which they are derived. *N. bowdenii* and its hybrids appear very hardy here in Southern California and usually, if watered are evergreen. It is believed, however, that all our species *N. filifolia* succumbed to the severe frost of December 21, 1968. The temperature was reported to have fallen under 20 degrees fahrenheit.

Some attempt was made to compare the relative quality and size of the white Nerines and 'Glacier' and 'Halo' were outstanding. During the very hot July of 1972, five Nerines flowered, two colored and three white, the latter all *N.* 'Glacier'.

This project has been a rewarding but trying experience requiring

much work and permitting no time for projected chromosome counts. I am not sure that since the death of my husband who encouraged me in my horticultural work that I shall have time to continue the project of breeding white Nerines, being otherwise occupied hybridizing and growing Cymbidium orchids.

As a footnote to this article, I would like to mention two outstanding colored Nerines that flowered in the fall of 1971. One is my third-time flowering hybrid 'Skyrocket' bred from *N. bowdenii.* It is evergreen, typically *bowdenii* pink with very large flowers on a three foot tall scape. The other hybrid was produced by Dr. Hamilton P. Traub at La Jolla. It is one of the progeny resulting from crossing *N. filifolia* ♀ and various named Nerine hybrids ♂ ; the pollen being furnished from the Greenoaks Collection. The progeny from these crosses were named collectively *Nerine* x *traubianthe* Moldenke (see Plant Life 23: 61, and page 32, supplement, Review of the Genus Nerine, 1967). The clone shown in Fig 16 is 'Alma Moldenke'. It had deep crimson flowers on a one foot tall scape. Another, stouter similar clone is the result of crossing *N. filifolia* with the clone 'Inchmery Kate'.

Both of these colored Nerines failed to produce offsets until this year (1972) 'Skyrocket' produced one new bulblet.

Nerines are a joy because of their beauty and because they are among the few bulbous plants that flower in the fall.

BREEDING AND GROWING ALSTROEMERIAS IN EUROPE

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Although the first *Alstroemeria* species were introduced into Europe as long ago as two centuries, never have hybrids of this attractive genus been as popular as in recent years. And in fact they are becoming increasingly popular.

I. VAN HOUTTE HYBRIDS

Going back in European *Alstroemeria* history, one will find that hybrids of this genus were first raised by Louis Van Houtte of Ghent, Belgium between 1870 and 1890. He offered several named clones in his catalogs. These hybrids have now been lost as far as I know. Severe winters that we have had to face in some years kill what one collects in a life time. These hybrids have at least not been fully frost hardy. They seem, judging from old color plates, to be related to our present day *A. ligtu* hybrids. Van Houtte himself claims that they were derived from *A. chilensis* and *A. hookeri,* but which *chilensis* and which *hookeri?*—No one knows.

Fig. 17. **Alstroemeria** hybrid, 'Walter Fleming'; parentage: **Alstroemeria aurantiaca lutea** x **A. violacea.** Close up—flowers white with a bright yellow center, streaked with chocolate brown; individual florets are relatively large, up to 4½ inches (12 cm.) across.

II. RECENT ALSTROEMERIA BREEDING AND CULTURE

The start of the recent *Alstroemeria* boom was certainly due to the appearance of a hybrid derived from a cross between *A. aurantiaca lutea* and *A. violacea,* now named for the raiser, 'Walter Fleming' (Figure 17). Although obtained during the 1930's, it was not until the 1950's that a Dutchman, Mr. Jan Jan Goemans discovered the hybrid at Borde Hill, the English Estate where the hybrid originated. Mr. Goemans purchased the stock from the owner, Sir Ralph Clarke, and started growing cut flowers under glass from it on a wholesale basis in his English nursery.

The hybrid clone, 'Walter Fleming', turned out to be a heavy cropper for most of the year, giving an endless supply of long lasting, long-stemmed flowers. The individual florets are big, measuring up to 4½″ (12 cm.) across. The flowers are white with a bright yellow center streaked with chocolate brown. There are faint lilac shadings at the back of the petal tips. If cut in the bud stage, the umbels will fully develop, and it may take as long as three weeks before the last petals are shed. The cut flowers are easily packed and transported over long distances.

Breeding attempts have failed with 'Walter Fleming' because of sterility. Mr. Goemans, who is interested in increasing the color variety in such hybrids, utilized species. Within an unusually short time, he succeeded in raising an almost endless range of quality, color and vigor in his new hybrid clones. However, all are sterile. It seems that Mr. Goemans has made these various successful crosses, giving a truly pleasing variety of colors, and certainly, apart from 'Walter Fleming' and the 'Walter Fleming' mutants, which are undoubtedly the best of all, these Goemans hybrids are still without rivals.

The public was so much in favor of these attractive newcomers that the flowers brought high prices and other growers started breeding projects; research institutes began breeding operations, and amateurs started breeding them. All without significant results, although some have been working day and night on this problem for a dozen years, including the best breeders in the country and with the help of all the modern techniques. Indeed, this is a most mysterious subject in my opinion, one man doing in just a few years what many others cannot do in over ten years with apparently the same material.

But at least something has been achieved—several mutations through the application of radiation. Some of these 'Walter Fleming' sports have now been named: 'White Wings', which is purer white and less yellow, with the same dark markings; 'Yellow Tiger', which is pale yellow, with a deeper yellow center and purplish brown markings in the center. 'Canaria', which is a bit deeper yellow than the preceding. Other sports include very large-flowered clones, purplish-pink ones, and mutants with exceptionally long-flowered spikes. These others are yet to be named.

Another fine and promising new selection is an exceptionally large-flowered form of *Alstroemeria aurantiaca aurea*. This form flowers well all through the winter, while in most years 'Walter Fleming' has difficulties due to the lack of light. This new form was selected from material (that probably originated in New Zealand) by the new Chairman

Fig. 18. Holland **Alstroemeria** cut flower industry. UPPER: a perpetual growing mutant of **Alstroemeria** hybrid 'Walter Fleming' caused by the application of radiation. LOWER: Greenhouse with **Alstroemeria**, clone 'Walter Fleming' for cut flower production.

of the ALSTROEMERID COMMITTEE, Mr. A. M. Koenst of Nieuwveen, Netherlands.

Other breeders in Holland include Mr. Van Der Zwet and Mr. Van Staaveren, and also several Government researchers who now, but so far in vain, concentrate on the development of good new *Alstroemeria* hybrids suitable for the year-round production of cut flowers under glass.

It is merely a guess, but I believe it is not far from the truth,

Fig. 19. Holland **Alstroemeria** cut flower industry. UPPER: **in background,** new greenhouse under construction for **Alstroemeria** cut flower production; **in foreground,** field of young stock of hybrid clone 'Walter Fleming' for propagation.

LOWER: greenhouse propagation stock of 'Walter Fleming' ready for planting out for greenhouse cut flowers.

that there are now some 75 acres of heated greenhouses in Europe planted to new *Alstromeria* hybrids, of which at least 60% are planted to 'Walter Fleming'.

It is understandable, that with the new plant breeding methods now coming into force, *Alstromeria* breeding is bound to become even more wide-spread, especially on the Continent, in the years to come.

Here we come to one of the major problems with *Alstroemeria* breeding which is the nomenclature of the species. This is, at least so on the Continent of Europe, where knowledge seems to be lacking. Thus, no one knows exactly what species he is using in making crosses, or which species are now available.

In order to open up new avenues for breeding, there is urgent need to import new species from the wild. In this respect, I have been able with the help of the American Plant Life Society to obtain several fine contacts in South America. And I myself will be making a collecting trip for Alstroemerias in Chile and Argentina during October 1972 in company with Dr. Ruppel. I anticipate that we will fine several interesting species, mostly introduced into cultivation previously but now lost in culture.

It is hoped that the present European interest in Alstroemerias will before long also spread throughout the United States where before the First World War there had been a revival of interest in commercial growing and cultivation by commercial growers and amateurs.

I cordially invite anyone interested in Alstroemerias to contact me. I am quite interested in exchanging material, experiences and information.

III. ALSTROEMERIA SPECIES CULTIVATED IN EUROPE

1. *A. aurantiaca* D. Don
   A. aurantiaca aurea
   A. aurantiaca 'Dover Orange'
   A. aurantiaca lutea
   A. aurantiaca 'Magestica Lutea'
   A. aurantiaca 'Moerheims Orange'
   A. aruantiaca 'Orange King'
   A. aurantiaca splendens
2. *A. braziliensis* spreng.
3. *A. chilensis* Lem.
4. *A. hookeri* Lodd.
5. *A. ligtu* L.
6. *A. nana* A. B. Rendle
7. *A. pelegrina* L.
   A. pelegrina alba
8. *A. psittacina* Lehm. (syn. of *A. pulchella* L. f.) ?
9. *A. pulchella* L. f.
10. *A. pygmaea* Herb.
11. *A. revoluta* Ruiz et Pavon
12. *A. violacea* R. A. Phil.

IV. ALSTROEMERIA HYBRIDS CULTIVATED IN EUROPE

'Beauty' (Van Staaveren) Apparently a hybrid between *A. braziliensis* and *A. violacea.* Height 3 to 5 feet. Flowering March-June and again September-October. The flowers are lilac in colour spotted with deep purple.

'Canaria' (Van Staaveren-Könst) A mutation caused by radiation of 'Walter Fleming'. Height 5 to 6 feet. Flowering March-June and

September-October. The flowers are soft yellow, with deeper centre and dark stripes.

'Harmony' (Van Staaveren) This lilac-flowered hybrid is of the same origin as 'Beauty', and not so tall. The height from 2 to 3 feet. Flowering from March until June and from September until late October.

A. x orpetiae (Traub) The seedlings are small at the time of writing this. Flowering is not anticipated until next year. I have not heard of the experiences of others in Europe with this hybrid. These are segregates from the original cross.

'Regina' (Van Staaveren) Seems to be a hybrid between *A. pelegrina* and *A. braziliensis.* The flowers are of a fine pink, with yellow blotches at the centre and with narrow chocolate brown stripes. Height 3 to 5 feet. Flowering during April and May and from September until October.

'Starosa' (Van Staaveren) Seems to be a radiation mutant of the preceding. The flowers are a bit smaller but much deeper in colour, without any yellow in the centre and for which there is a small white blotch instead. The plant grows 4 to 5 feet tall and blooms from April until June and seldom during the Autumn.

'Walter Fleming' (Walter Fleming, Head Gardener to Sir Ralph Clarke) A hybrid between *A. violacea* and *A. aurantiaca lutea,* raised before the second World War. The flowers are yellow and white. A very strong grower easily reaching 6 feet or more. Flowering from February right through to December. One of the best for cut-flowers.

'Fleming Sibling' (Walter Fleming) A sister seedling of 'Walter Fleming' with only minor differences. Mostly cultivated mixed and hard to separate. It is in fact slightly more violet tinged on the reverse of the outer petals.

'White Wings' (Van Staaveren-Könst) A radiation mutant of 'Walter Fleming' that is purer white, with only two yellow coloured inner petals. Growing 4 to 6 feet tall. Flowering March until June and from September until October.

'Yellow Tiger' (Van Staaveren-Könst) Another radiation mutant of 'Walter Fleming'. The flowers are deeper yellow than 'Canaria' and the inner petals are more heavily streaked with chocolate. Grows 5 to 6 feet in height. Very vigorous. This variety flowers from March until June and from September until November. It is very difficult to propagate for unknown reasons.

In addition a large number of Goemans Hybrids are unknown to the author.

4. AMARYLLIS CULTURE

[ECOLOGY, REGIONAL ADAPTATION, SOILS, FERTILIZATION, IRRIGATION, USE IN LANDSCAPE, DISEASE AND INSECT CONTROL, ETC.]

1972 ZEPHYRANTHEAE REPORT

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As a first composite report on the Zephyrantheae, some of the notes collected might seem a little out of the ordinary. However, Zephyrantheae is a very unusual, useful and often unpredictable tribe. It is also recognized as being entirely American in origin. *Zephyranthes candida* is said to have been discovered by Juan de Solis at Buenos Aires in 1515. The genus *Zephyranthes* was designated *Atamasco* by Adanson in 1763 and named and described by Herbert in 1821. Dr. Herbert * in subsequent years established *Cooperia, Habranthus, Haylockia, Pyrolirion* and *Sprekelia. Sprekelia formosissima* had been introduced from Mexico in 1593 and was first described as an *Amaryllis. Rhodophiala* was established by Presl in 1844. Much shifting and confusion followed the early work with various Amaryllidaceae and some of the older names still persist.

Modern progress in all areas has speeded recent study of both old and newly collected Amaryllidaceae. In addition to other important work, Dr. Traub rescued *Rhodophiala* from *Hippeastrum* and again gave it independent status in 1956. He placed *Cooperia* and *Haylockia* as subgenera under *Zephyranthes* in 1951 However, in 1963, *Haylockia* was again listed as a separate genus.

Prof. Ravenna (1971), in a continuing study of South American Amaryllidaceae, supported Dr. Traub's original placement of *Haylockia* as a subgenus under *Zephyranthes* and added another subgenus, *Argyropsis.* Dr. Herbert (1837) originally suggested the separate genus name *Argyropsis* for *Z. candida* because it differed in parts from both *Zephyranthes* and *Cooperia.* The name was given in allusion to the silvering effect of the many white *candida* blossoms on the banks of the river La Plata, Argentina. This river was probably named earlier for the same reason. Roemer (1847) accepted Herbert's 1837 classification of *Zephyranthes* and his genus *Argyropsis.*

Dr. Walter S. Flory was kind enough to help me with certain early historical data on this tribe. On *Argyropsis* he remarked: "Personally, I have always thought that *candida* perhaps deserves to be put over into a new genus; its chromosome number is 38 and unknown in any other *Zephyranthes,* while it has the unusual ridged leaves and perhaps some other characteristics not common to the other members of

* Herbert received the degree of Doctor of Civil Law (D. C. L.) from Oxford University; he became Dean of Manchester in 1847, the year he died.

Fig. 20. **X Sydneya morrisii** Traub, bigeneric hybrids of **Habranthus immaculatus** Traub and **Zephyranthes bifolia** (Aublet) Roemer, produced by Katherine L. Clint. Note **Zephyranthes bifolia** in lower left corner.

the *Zephyranthes* genus."

Prof. Ravenna (1972) has proposed a new genus in the tribe Zephyrantheae: *Famatina.* For this genus, Prof. Ravenna described two new species and reclassified *Phycella herbertiana Lindley.* "The generic name commemorates the Famatina mountain system, in the province of La Rioja, where the type-species is found."

The one *Haylockia* species and the three *Famatina* species are illustrated in Prof. Ravenna's articles—see Literature Cited.

BIGENERIC HYBRIDS

X *Sydneya (Zephyranthes* x *Habranthus)*—This group was named by Dr. Traub in 1954, but more fully discussed by him in 1958.

X *Rhodobranthus (Rhodophiala* x *Habranthus)*—This was also named and discussed by Dr. Traub in 1958.

X *Sprekanthus (Sprekelia* x *Habranthus)*—This latest bigeneric "genus" was named by Dr. Traub in 1969.

X *Sydneya morrisii (H. immaculatus* x *Z. bifolia)*—Reported by Katherine L. Clint in 1964 (see picture in current report), the beauty of these hybrids is surpassed only by its poor survival rate. A number of bulbs were originally distributed, but only a handful are still around in a few collections. Cultural requirements are as exact (or more so) as for the pollen parent. All attempts at selfing or use of pollen have been negative.

X *Sydneya* 'Teddy Buhler' *(Z. albiella* x *H. martinezii)*—This was introduced by Mr. Alex Korsakoff in October 1970. "The name is given to honor a 'Floragoof' friend with whom many horticulturally profitable hours were spent in hunting and collecting new and interesting plants in the long, long ago." Because of the *Z. albiella* parent, this cross may be tender; however, it has grown well in the ground for me for a complete season (no frost or freeze during winter). It flowers at least as frequently as both parents and offsets like *H. martinezii.* Initial fertility reports are negative.

A Bigeneric, 4-Species Hybrid—Dr. Flory reported on this unusual hybrid of Mr. Korsakoff's in 1968. He found some interesting results with 2n chromosome numbers:

H. robustus (12) x *H. brachyandrus* (24)=*H.* x *floryi* (18)
H. x *floryi* (18) x *H. a. texanus* (24)= *H.* x *(3-species)* (22)
H. x *(3-species)* (22) x *Rh. bifida* (18)=4 seedlings (17)

Dr. Flory noted that the triple interspecific hybrid had 2n=22 instead of expected 21. Also, the final four seedlings studied showed 2n=17 rather than the expected 20. In his summary and conclusions, Dr. Flory states: "Among certain of the hybrids, particularly in X *Rhodobranthus,* and in the bigeneric, 4-species hybrid, new chromosome types are clearly evident. These hybrids offer promising material in which to study the possible effects of hybrid cytoplasm on the evolution of new chromosome types, and hence of new karyotypes."

X *Sprekanthus cagei (Sprekelia formosissima superba* x *H. robustus)*—This was named for its hybridizer, Dr. John M. Cage in 1969. Dr. Cage's follow-up report in 1972 should be read by all with special interest. All things considered, *H. robustus* is probably one of the easiest, most versatile of all *Habranthus* species.

CULTURAL PRACTICES

Most of the information collected for this report is about *Habranthus* and *Zephyranthes*, but each genus of the tribe is unique in its own way. *Pyrolirion* is the most exotic in color, having large well formed flowers for size of bulb, and also tend to be "prima donnas." They are sensitive to over-watering when growth slows with cool weather, require a long winter rest and are probably best suited to glass house culture except in the warmest areas. *Rhodophiala* is a bright garden treat for the fall, easy to grow and is generally a more dependable late summer-early fall bloomer in climates too mild to bloom *Lycoris* satisfactorily. They also prefer part shade, which lends versatility. *Sprekelia* has long been popular and some of the more vigorous forms have a repeat bloom. They can stand partial shade and enjoy humus and moisture if very well drained.

General—With generous help from my mother, Mrs. Clint, here are some basic rules for growing *Zephyranthes* and *Habranthus*. Almost all of these bulbs like plenty of light—full sun for at least half a day. A few will tolerate more shade (*H. robustus, H. brachyandrus, Z. grandiflora, Z. insularum, Z. macrosiphon,* etc.). With the possible exception of *Z. atamasco* and the two other Florida natives, most like a neutral or alkaline soil. Where soil and water are both acid, use some form of lime (oyster shell, limestone, etc.) in soil mix and treat water also. Lack of drainage is another cause of failure and a tight, heavy soil can be lightened with sand and well rotted peat or manure. An elevated bed may help. A very sandy soil needs boosting in nutrients, which can be handled by top dressing with bone meal and manure (half and half) and/or fertilizer. Both are better.

It has been suggested that many *Habranthus* and *Zephyranthes* would profit from annual repotting; however, this would be quite a task without help. When bulbs, particularly seedlings, pull themselves down to the bottom of the pot, it is usually to seek more moisture or food. With some species *(C. pedunculata=Z. drummondii)* it is their nature, perhaps for the same moisture reason. A top dressing of half manure and half bone meal helps stave off repotting and gives a usable form of humus and food. Unless bulbs are too crowded, an additional method may be employed to postpone complete repotting: lift soil and growing bulbs, remove some soil from top and sides and replace with fresh soil mix on *bottom* and sides.

Once, Mr. Loren Smoyer wrote that the Florida native *Zephyranthes atamasca, treatiae* and *simpsonii* did not prosper for him at all, while *Z. rosea* and *insularum* grew like weeds. (He lives in southern

Florida.) Reporting some small success with changing potting mix or soil in beds in open, he concluded: "Some *Zephyranthes* just behave like *Habranthus* and that is not a compliment!" Mr. Korsakoff reports no special problems in blooming Florida natives in his greenhouse in northern Florida; however, he has always grown his varoius *Zephyranthes* and *Habranthus* in pots only.

Many *Habranthus* and *Zephyranthes* require a dormant period during the winter. This probably corresponds to a dry winter cycle in their native habitat. Here are two methods to help promote bloom on some difficult bulbs that need this rest:

Korsakoff's Bifolia Treatment—"For *Z. bifolia,* I use only a 4" clay pot and a rich loose soil with ¼ to ⅓ part of crushed coral rock or egg shell in the mixture. In winter it can be dried up for about three to five months. Feed them slightly once-in-a-while. Temperature in greenhouse never goes below 50° F." This method has worked well for me, even without a greenhouse. From another source: "*Z. bifolia* seems to need special care. In addition to a very rich humusy soil mix, very well drained, we grew them in the greenhouse in pots with a lot of light and water during the growing season. These bulbs were kept on the dry side during the rest period. If soil stays too damp, drainage is not adequate or roots are not active enough."

Howard's Sprekelia Treatment—"Dig in late fall and store in a warm dry place. If the embryo flower buds are formed, they should be in evidence at the neck of the bulb in late winter or spring. This method is recommended only for the most stubborn *Sprekelias*, such as 'supurba.' It only works if the bulbs are mature and healthy." I have had limited success with some of the difficult Mexican *Habranthus* by following this practice. This is particularly convenient for handling bulbs grown in the ground for the approximate season April-December. Two of the most difficult bulbs to bloom are *Habranthus concolor* and *immaculatus.* The final answer to their stubbornness is not yet known. It may also have to do with the presence of special trace elements and/or enzymes in the soil of native habitat.

Naturalizing—In 1972 Plant Life, p. 97, I mentioned my difficulties in trying to establish certain *Zephyranthes* in the lawn by discarding ripe seed capsules. Mr. Fred Jones probably has the best solution. "I planted quite a number of *C. smallii* (large-flowered forms from Brownsville) in our back yard—these look nice after summer rains on a lawn." So, one must choose his favorite species for the locale and plant mature bulbs.

HYBRIDIZING

Apomixis—This is possibly the most important difficulty encountered by persons attempting both interspecific and bigeneric hybrids with Zephyranthes. Diploid parthenogenesis is apparently the type of apomixis most usually encountered in Zephyrantheae. (See Dr. Walter S. Flory's "Parthenogenesis in Zephyrantheae", 1939.) In contacting

people very active in hybridizing attempts, all reported this as a major handicap. If viable seeds are obtained in a cross, the bulbs must be raised to maturity to check "maternal" or otherwise. Some of the more experienced may be able to check by foliage of seedlings and thus save room for better prospects. It is not easy to generalize, for what will succeed under one set of circumstances, will fail the next Here are some interesting notes from Dr. Howard:

"Parthenogenesis is a bad problem with many Zephyrantheae. I try to avoid the ones that have this tendency, at least as seed parents. I generally use a species on hybrids (or species) that I know do not often do this, such as *Z. rosea, Z.* x 'Ruth Page', 'Texas', 'Kitty Clint', 'Carmen Jones', 'Grace Primo', and most pink or red ones. I think the yellow *Zephyranthes* (including *Z. citrina*) are most apt to tend toward parthenogenesis. Why the pink ones are more innocent I don't know. Some hybrids are notorious too: 'Apricot Queen', 'Prairie Sunset', 'San Antone', 'Fireball', etc. The really odd thing about it is that many of those that are more or less parthenogenic when used as a seed parent in a cross are inclined to throw a small number of interesting variations when selfed, as one would expect in a species when observed in the field. These variations are common within any given species observed in large populations over a wide geographical area. Intraspecific hybrids are to be expected. Thus, a *Zephyranthes* hybrid exhibiting the phenomenon of parthenogenesis is in effect, a "species" of sorts in its own behavior, even though it may throw some variations in its maternal seedlings. Since a good species and a hybrid apomict both may show slight variations in a large planting of seedlings, the results are similar, within limitations."

Mr. Korsakoff has had great success in both interspecific and bigeneric crosses. While the vast majority of his successful seed parents have been pink, white or hybrids, he has managed to include some yellow ones: *Z. howardii, Z. refugiensis, Z. citrina,* Z. Clint 449 (Jacala yellow), Z. Howard 53-1 (Valles yellow), *H. andersonii var. cupreus* and *H. concolor* are a few.

Color—Dr. Howard is still working on a large red *Zephyranthes* hybrid and has produced an improved one, 'Red Witch'. "The red shades don't all come true when red is bred to red—I get about fifty percent pinks. Red is very recessive; so far the reds tend to smallish flowers for the most part and they are not as free flowering as other hybrids. Actually, color is hard to predict. Pink and rose seem to be dominant to yellow in the first generation. If the yellow comes through at all, it may be in the throat and perhaps in some mottling or streaking. The red color of *Z.* X 'Carmen Jones' puzzles me. I have no record of the cross that yielded it and I certainly used no hybrid or species at that time that was so dark in color. This hybrid has very pale pollen, indicating that perhaps a *Cooperia (Z. smallii?)* was a grandparent, perhaps on both sides. Nearly all *Zephyranthes* and *Habranthus* turn pink, rose or purple as they wither. Even yellow ones

like *Z. smallii.* In fact, they seem to change color from the bud stage right on through the withering process—from dark to light, then dark again."

Mr. Fred Jones produced a *Zephyranthes* hybrid that is a real chameleon. The first day it is one of the apricot shades, but the second day it is pure pink with no hint of yellow overtones. This effect is more pronounced in very hot weather. "This is a cross made in the fifties between our local *Z. pulchella* and *Z. rosea.* I really don't care much for it because it is so tall and changeable in color, but it has its merits too." I have found it to be very vigorous and one of the most ever-blooming hybrids I have grown. Actually, all colors fade, particularly in very warm weather, and the worst are probably pink, rose-pink and the various yellows. In these categories, *Z. rosea* (for rose-pink) and *Z. pulchella* (for bright yellow) possibly have most non-fading pigment as species. When some of the bright yellow South American *Zephyranthes* become more available, they may add a new source of "non-fading" pigment.

Seed Set—While many factors are involved in seed set, some remarks in Dr. Flory's 1939 article caught my eye: "Pollen is known to be comparatively very high in plant hormone content. It is possible that emasculation removes the source of hormones necessary for high percentage of seed set." These remarks, while general, were made with some experiments involving *Habranthus andersonii var. texanus* in mind. After hearing many reports of skimpy seed set in hybridizing attempts (some as few as 1-3), I asked my mother to check her records on various *Habranthus* x *Z. bifolia* cross attempts. She did not emasculate in her first *H. immaculatus* x *Z. bifolia* attempt, but did with others, including *H. concolor* and *H.* x *floryi.* The first cross produced 90 good seeds, with 65 bulbs being transplated one year later. Later crosses yielded 80, 88 and two with about 50 good seeds. The smallest number of seeds secured was 27. She pollinated very early and *very heavily,* but did not bag in making crosses among Zephyrantheae taxa. She also used an anther instead of a brush, which gives more pollen. I once used *Z. howardii* in connection with a demonstration for a school project. For me, this bulb rarely opens before noon; so I de-anthered early and pollinated. It was pollinated again at noon, a third time in the late afternoon, and produced a seed capsule about 90 percent full. Seeds were not planted for ten months, but after planting germination started within five days and later appeared complete. In another experiment I de-anthered nine Zephyrantheae flowers. This group included five different *Zephyranthes* and *Habranthus* species that readily set seed when left undisturbed. Seed set was negative. My assumption is that very heavy pollination with a "foreign" pollen may furnish the type and amount of hormone necessary for good seed set, even if de-anthered parent plants produce only maternal offspring.

From Dr. Flory: "In certain taxa unreduced eggs occur which will not develop into maternal seedlings unless the flower is pollinated

and the pollination results in fertilization of the endosperm nucleus. In some cases such plants may be self-pollinated or they may be cross-pollinated with the pollen of various other species. But unless the endosperm is successfully fertilized so that it will develop and furnish nutrition for the eggs, these unreduced eggs will not develop into embryos and seedlings. This is the case with *H. andersonii var texanus.*''

CURIOSITIES

The *Habranthus* and *Zephyranthes* are individuals in every respect. They are cooperative and obstinate, predictable one year and then the opposite—but always fascinating to the grower. Hybrids seem to have their own peculiarities too. There is one trait common to most all growers of small bulbs: they are observant.

Double Flowers—The keen eyed Dr. Herbert (1837) was probably the first person to report on this strange habit. He grew a special form of *Z. candida* ''which flowers year after year with eight segments to the flower, eight stamens, four lobes to the style, and four cells to the capsule. . . this is the only instance I have observed of a seedling with such a variation permanent.''

In 1961, Mr. Alek Korsakoff reported on doubleness of *Habranthus brachyandrus* and *H.* x *floryi.* He still has bulbs grown from seeds of his original double *brachyandrus:* ''They sometimes bloom normally. Several times I have had blooms with 11-17 segments, but never as double as that bulb. *Zephyranthes rosea* very often has 8 segs. and *H. robustus* has had as many as 9.'' His bulb of Howard's *Z.* x 'Big Shot' (which has *Z. rosea* in background) is equally strange. Before 1969 it had 8 segs. five times. In 1969 it bloomed *eight* times— four times with 8 segs. and four with 6, but no special pattern. In 1971 it bloomed with 6, 8 and 6.

From Dr. Thad Howard: ''Most individual scapes produced in a single season from one bulb are *9.* This happened on a single specimen of *Z.* x 'Fireball'.'' (This has *Z. rosea, Z. citrina* and *Z. smallii* minor in background.) ''The only reason I took note of this was because it first flowered with twin flowers (two in an umbel). Naturally this caught my eye and I marked the bulb with a label to see if it would do this again. It did, but it alternated from a single flower to twins. The ninth effort was a three flowered umbel! The flowers did not open at once, but in succession, with only two open at one time. I once had a small form of *Z. smallii* flower in a twin umbel and I know Kitty Clint found a pink *Zephyranthes* from Mexico doing the same.'' This was one or the *Z. clintiae* group flowering under cultivation (see picture in 1957 Plant Life, p. 20). ''I also found a double flowered *Z. smallii* with twelve segs. It looked like a little rose. Doubleness is common in hybrids from *Z. smallii,* regardless of which forms. My own *Z.* x 'Twinkle' runs to doubleness and its seedlings (parthenogenic?) are similar, including the doubleness feature. The trouble is, these things are rarely consistent. Whatever goes haywire in producing these freaks does not last and the same bulb reverts back to doing the

normal thing. At least this has been my experience."

From Mrs. Katherine Clint: "Along this same line, I have observed quite a few twin flowered *Z. smallii* in the fields (and one or two under cultivation); also double flowers, particularly in the larger form. I have also noted the habit of both twin flowers and doubling of segments in *H. robustus* and *H. brachyandrus.* To a lesser extent the doubling shows up in *Z. grandiflora, H. immaculatus, H. concolor* and some of the Mexican *Zephyranthes.* These phenomena are rarely repeated and the trait is apparently not often passed down to seedlings. Or, perhaps I wasn't persistent enough in my seed planting."

One weird experience I had with a volunteer bulb of *H. brachyandrus* occurred in early spring of 1971. The leaves came up triple in size, then an enormous scape appeared and three individuals bloomed simultaneously. In 1972, the first bloom of the season from this bulb was one normal scape and one twin flowered scape. Both twin flowers had extra segments. In addition, one flower contained seven stamens and the other only four.

From Mr. Loren Smoyer: "*Habranthus robustus* often flowers double or sometimes triple for me, but only during the months of December, January and February. So, it has to do with low humidity (?), low temperatures (?), or what?"

Dr. Howard suggested that the "or what?" could be a tendency toward mutation, even though it is not permanent. After reading about Dr. Herbert's *Z. candida* with the permanent variation, who knows what might show up in the future?

Records—Because of their ability to bloom repeatedly in a given year, the *Habranthus* and *Zephyranthes* are an easy target for a little bragging. Dr. Howard's *Z.* x 'Fireball' mentioned earlier is bound to top them all, with nine scapes from one bulb in a season. This included four twin and one triple flowered scape out of the nine. Count the flowers! Mr. Korsakoff's single specimen of *Z.* X 'Big Shot' is just right behind with eight scapes in 1969. Mr. Korsakoff also has a clone of a pink Mexican *Zephyranthes* (K-484) received a number of years ago from Mr. Wyndham Hayward that is peculiar in a different way. "If well cared for, it will bloom each month of the year." While my care of offsets from this clone is not the very best, K-484 is liable to bloom during any winter month, hot summer month, and spring and fall. While managing all of this, it also offsets rather rapidly!

Howard's 53-1 *Z.* sp. (Valles yellow), with a somewhat low chromosome number of 28, is known to be very floriferous when well established in the ground. Under cultivation in Brownsville, Texas, I have seen several individual bulbs bloom with two to three scapes at one time. Back in 1955, Dr. Howard bloomed a solitary bulb of "Valles yellow" with *five* individual scapes which opened simultaneously. Now that is quite a bouquet! *Zephyranthes smallii* is another heavy bloomer when conditions are right, but I don't think it has ever out-bloomed the "Valles yellow" *Zephyranthes.*

When I first started planting a few Zephyrantheae seeds, I was told that some blooms might occur within a year if the seedlings were forced, but that most would bloom by the second year. Since the time it takes my seedlings to bloom is more like two to three years, I was very impressed to hear that Thad Howard once bloomed Z. x 'Apricot Queen' in *nine* months. "These had the benefit of being kept in active growth the first winter in a greenhouse."

Mr. Richard Tisch has a reverse record of sorts. He flowered two seedling *Z. drummondii (C. pedunculata)* in late November, 1971. This timing of bloom is unusual enough, but the seed capsules took *seventy-four* days to mature. Depending on weather conditions and clone, this is generally achieved within three to four weeks.

NOTICE: Mrs. R. V. Mutton, 28 Burran Ave., Mosman, New South Wales, Australia 2088, writes that she is interested in the small amaryllids and would like to be contacted by Australian members of this Society. Other Australian members who wish to give their addresses may write directly to me and this information will be included in each annual report.

Editorial Note.—Additional requests from Australia for seeds of *Amaryllis* and the Zephyrantheae have been received:

Mr. V. T. Vail, 93 South Terrace, Como, Western Australia 6152 (Amaryllis).

Mr. B. York, 24 Mulgowie St., Sunnybank, Brisbane, Queensland, Australia (Amaryllis).

Mr. Lindsay J. Forbes, 59 Union Road, Surrey Hills, Victoria 3127, Australia (Zephyrantheae).

Mrs. W. J. Brooks, 347 Kissing Point Road, Ermington, N. S. W., 2115, Australia (Zephyrantheae).

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IN QUEST OF MINIATURE AMARYLLIDS

LINDSAY J. FORBES, *59 Union Road, Surrey Hills, 3127, Victoria, Australia*

Australia is well known for its kangaroos, aboriginals and large areas of dry barren ground. We also have a white population who find that our supply of rare bulbs is just as barren as large tracts of our land.

This is, at times, a frustrating situation as Australia's coastal belt from North Queensland to Southern Tasmania and in parts along our southern coastline has the possibility of giving almost natural growing conditions to a wide range of plants from orchids in tropical Queensland to the rarest of cold climate alpines in the mountainous areas of Victoria and Tasmania.

Our difficulty here is to establish in the Southern Hemisphere plants which grow naturally in the Northern Hemisphere. The acclimatization of green material or bulbs presents many problems, not the least of which are our Quarantine regulations. A safer method is to obtain fresh seed but few gardeners have the time or patience to wait, in some instances, nearly a decade to admire the fruits of their labours.

There is an ardent band of professional growers who do their best to import new material into Australia, but they frequently suffer large losses of stock. This results in rare material not being available until stocks have been built up by natural increase.

The ardour of the professional is often surpassed by the amateur who is impatient to find that elusive bulb he has admired in his favourite bulb book. This results in the amateur turning to the importing of his own material.

Over the past few years I have imported much material from Europe. I have enjoyed considerable success in importing Crocus, *Chionodoxa, Scilla* and Nerines, moderate success with Cyclamen and *Narcissus* but poor results with *Tulipa* and *Fritellaria* species.

Looking now at the situation with Rain Lilies, the same scarcity of supply pertains. A few misnamed species are available from growers

in Victoria. *Zephyranthes candida* is about the only variety available in chain stores, provided one is able to identify it under the names of "Autumn Snowflake" or "White Crocus." *Z. grandiflora* can be obtained in small supply while one may also find on occasions *Z. macrosiphon, Habranthus robustus* and *H. andersonii.*

My interest in Rain Lilies started some years ago when I read in one of my bulb books that Dr. Thad M. Howard of Texas had developed a number of more brightly coloured *Zephyranthes* and that a great variety of new colours and types have appeared.

Supplies were not available in Victoria, but I was delighted to hear from a correspondent who has one of the largest collections of small amaryllids in the U.S.A.

I have now reached the present day and have received recently four consignments of bulbs, all of which were grown in our Quarantine Nursery.

There are Quarantine Nurseries in the capital city of each state. While the authorities like importers to have material addressed c/o the Quarantine Nursery, this is not always practical. Any overseas correspondent is likely, at any time, to post one a present and advice of dispatch is not known in time to tell the sender the address to use.

The "Q" Department will accept health certificates from overseas provided the certificates state that the material has been subjected to cyanide fumigation or the hot water treatment; i.e., 1½ hours immersion at 110° F. Without certification, methyl bromide is used as a fumigant by our authorities at the rate of three pounds per 1000 cubic feet for four hours at 70° F. Particular attention is given to bulbs coming from areas known to have Narcissus Fly or the bulbs likely to be prone to Narcissus Fly, whether or not they are from an area known to have it. Plants or bulbs are then grown until declared free of virus by a government plant pathologist. More attention is devoted to new growth than to old. Charges are extremely low. Fee for inspection and fumigation (per consignment) is 25c, and $1.00 per square foot for space occupied at nursery is charged (no time factor). Release depends on how soon new growth is made. My first consignment of dwarf amaryllids was released after just two months in "solitary confinement." *Narcissus* don't start growing so quickly and may be there six months. There is no rule for release. It is just as soon as the material has been growing for say two months.

Rare rhododendron, daphne scions or green alpine plant material is often damaged through fumigation and they have little chance of survival. Bulbs or dormant rootstocks, strangely, do not react unfavourably.

The "Q" authorities are quite receptive to special growing instructions. If there are not any special requirement, they use as a basic mix one part sterilized loam, one part peat moss and one part coarse sand. All material is grown in pots and the proportions of the mix may be varied according to the importer's wishes.

A minor crisis arose when one of my consignments arrived containing *Zephyranthes bifolia.* Planting instructions were that the mix should contain crushed coral rock or crushed egg shells. No, they didn't have either!! Egg shells were quickly organized from a local poultry farm and much to the amusement of all concerned, I ceremoniously presented them with a bucket full!

It is pleasing to see how well small amaryllids adapt themselves to the opposite season. This is probably on account of their short, if any, period of dormancy and they do not have to remain planted for long periods in a dormant state and in an opposite season. Melbourne has a very moderate climate and heavy frosts are rare, so I am looking forward to successful transplants and sharing here in Australia the pleasures of the Rain Lily fan club.

COJOMARIA, PARAMONGAIA WEBERBAUERI

MARVIN ELLENBECKER, *Wisconsin*

The Amaryllis Family has given us many fine ornamentals for conservatory and outdoor gardening. Some of them, such as the *Clivia, Amaryllis, Nerine* and *Haemanthus,* have been grown and prized by horticulturalists for many years. Recently a new amaryllid, *Paramongaia weberbaueri* Velarde, has been introduced into cultivation. I am confident that it too will become a much desired ornamental in the near future. This paper will begin with the history of this lovely amaryllid's introduction into cultivation followed by a botanical description of the plant. Next the cultural requirements will be presented and the paper will conclude with a discussion of its potential breeding possibilities.

The plant explorer is responsible for introducing a plant into civilization from the wild. The first introduction of *P. weberbaueri* Velarde into the United States occured in 1949 when Dr. Ramon Ferreyra, of the Universidad Nacional Mayor de San Marcos, Lima, Peru, sent bulbs collected from the coastal region near Huarmey, Peru, to Dr. Hamilton P. Traub for identification purposes (7,10). Traub, who is considered the authority of the *Amaryllidaceae,* grew and flowered the bulbs. He confirmed it as *Paramongaia weberbaueri* Velarde, and was able to set seed on the first plant to flower(7). The seed was distributed to ten amaryllid enthusiasts and one of the recipients was Longwood Gardens(8). At Longwood Gardens the seed was placed under accession number 572124 and the seedlings first flowered in 1966(6).

The second introduction occured quite unexpectedly in January of 1965 when Dr. Russell J. Seibert, Director, Longwood Gardens, Mrs. Seibert, and a friend, Betty Collins, were traveling through Peru on the Huaráz-Casma Road. They met an Andean Amerindian on horseback who was carrying a large bouquet of lovely yellow flowers. They inquired about the flowers and the man replied, "Cojomaria", pointing in the direction from which he had come. They proceeded and soon came upon three children by the roadside selling the same bouquets. Dr. Seibert re-

calls that the flowers were remarkable. The blooms were somewhat like large daffodils with flowers 8″ in diameter and of a butter yellow color. The flowers also had a distinct fragrance. They purchased a bouquet and continued on their way. A short distance later they came upon a slope near the roadside that was covered with the identical blooms. This slope was above the village of Pariacoto, Department of Ancash, at an elevation of 10,000 feet. Dr. Seibert estimates that the blooms covered an area of perhaps a thousand acres on a steep slope made of weathered granite with little other vegetation. He did not have any tools for collecting some of the bulbs but soon discovered that a tire jack handle works fairly well for digging bulbs (as well as for changing tires). The bulbs were at a depth of a foot making their removal from the steep slope a difficult undertaking. However, with the aid of the tire instrument and words of encouragement and caution from Mrs. Seibert, he was able to collect seven bulbs, two of which were in flower and measured 2½″ in diameter. The bulbs were taken to Lima where a local botanist later identified them as *Paramongaia weberbaueri.* Six bulbs were sent to the United States Department of Agriculture at Coconut Grove, Florida, and later five of them were forwarded to Longwood Gardens in April of 1965 and placed under accession number 65522(5,6).

The debut of this amaryllid occured only twenty-three years ago and we are deeply indebted to Velarde and Dr. Seibert for bringing us the "Cojomaria" from its native habitat, Peru.

Botanically *P. weberbaueri* is unique enough to be placed in its own genus with one species. It was named after Dr. Weberbauer who specialized in the flora of Peru(7). As mentioned previously, it belong to the Amaryllis Family taxonomically because of the following characteristics common to amaryllids.

(1) the scape or flower stalk is entirely devoid of leaves.
(2) the inflorescene is an umbel or in this case a modified umbel.
(3) the ovary of the flower is inferior (borne below the perianth) whereas with true lilies the ovary is superior (borne above the perianth)(3).

Traub places it in Tribe 21(Stenomesseae) of the Amaryllis Family which is between the *Hymenocallis* and *Pancratium* groups(7,9).

Paramongaia weberbaueri Velarde is native to Peru and is found in two geographical areas of that country. One location is in the mountains on the slopes of Lomas above Paramonga and on the coast near the city of Huarmey(9). The other location is in the mountain region where Dr. Seibert collected his bulbs. There is speculation that the ancient Incas cultivated this bulb and may have brought it from the mountains to the coastal plain(5).

In horticulture we are constantly searching for new and unique plants that can be cultivated. A plant's cultural requirements are important to us and for *P. weberbaueri* we want to know the conditions under which to grow it and what potential it has as an ornamental.

The culture of this amaryllid is still not fully known. However, Longwood Gardens has done a great deal of work pertaining to the cul-

Fig. 21. Reproduced from painting by Betty Collins, by permission, showing contrast between man and nature: virile Andean Amerindian man cast against an equally virile background of the majestic Andean Mountains of Peru; and holding a delicate bouquet of flowers **(Paramongaia weberbaueri)**, showing harmony with his natural domain.

ture of this bulb and its potential as a conservatory ornamental. The credit for this work goes to the people in the experimental greenhouses located at Longwood Gardens.

Fig. 22. Flower of Cojomaria, **Paramongaia weberbaueri** Velarde, native to the Andes of Peru. Photo Longwood Gardens.

Paramongaia weberbaueri has attractive strap-like leaves of a medium green color. It is similar to most other amaryllids in that it flowers best when potbound. The flowers are borne on 2' scapes above the leaves and resemble giant daffodils. Individual blooms are 7″ in diameter, of a bright sulphur yellow color and fragrant. Each flower lasts 8-10 days

but only 2-3 days if used as a cut flower. Normally each scape has one flower.

The information given above and following was obtained from an interview with Jesse Grantham who works on the research program on *P. weberbaueri* at Longwood Gardens. The bulbs are grown in a medium consisting of equal parts soil, sand, peat, turface, charcoal, leafmould and a pinch of lime. This mixture is well-drained with a pH of 6.0-6.5.

The bulbs start into active growth in October and each bulb produces 6-7 leaves. The recommended temperature is 70-75 F. during the day and 65 F. at night. The humidity is held at 65% with a constant circulation of air. Water is given freely and the plants are grown in full sun.

The blooming period varies for the two accessions. Those bulbs from the coastal region of Peru (Acc. 572124) flower the last two weeks of October and first two weeks of November. The bulbs from the mountain region (Acc. 65522) flower later (late November to early January) and their foliage, unlike that from the coastal region, is still undeveloped when the plants are in bloom. The goal at Longwood Gardens is to develop a suitable culture for *P. weberbaueri* that would enable the bulbs to be displayed in the conservatory when in bloom (October-November). To do this a breeding program is being conducted where the two accessions are being crossed in hopes of a more vigorous plant that will have a definite flowering period for display purposes. At present bulbs under Accession 572124 have the better display qualities (2). Whether this is due to the bulbs being native to an area where there is a milder climate and longer growing season which favors a longer growth cycle or if there are definite morphological differences between the two accessions has not been determined though it certainly is a point of interest.

Cold hardiness tests on the "Cojomaria" have also been done at Longwood Gardens experimental greenhouses. Bulbs were potted on October 13, 1970, in a 1:1:1 soil mixture of peat, soil and perlite with lime and superphosphate added. The pots were placed in a rooting room at 50 F. to determine cold tolerance and whether the bulbs could be forced in a manner similar to that of daffodils. One group was subjected to a temperature of 38-40 F. and then the temperature was gradually raised. On April 7, 1971, the flower scapes had appeared but it was evident that the flower buds had blasted. The other group was kept at 50 F. until January 10, 1971, and then the bulbs were given a temperature of 35-38 F. until February 26, 1971. On April 7, 1971, the bulbs were inspected and were found to have rotted in the pots. These tests would indicate that forcing *P. weberbaueri* is not feasible (2). It is a tender amaryllid requiring treatment similar to that for *Hymenocallis* or *Pamianthe peruviana.*

After the plants finish blooming they soon give an indication of going dormant. The bulbs should be gradually dried off and stored at a temperature of 65-75 F. and a humidity factor of 20-40%. The

bulbs may be kept in the same pots or stored in vermiculite(2). This dormancy occurs approximately six months from the time when active growth begins. With such a growth cycle a culture similar to that of the *Gladiolus* might be possible provided the cycle for *P. weberbaueri* could be reversed to coincide with our growing season in the temperate zone of the Northern Hemisphere.

A definite advantage that *P. weberbaueri* possesses is the ability to propagate readily from offsets and seeds. Mature bulbs usually produce two offsets each season and these offsets will reach maturity in 2-3 years. Propagation by seed, of course, takes longer. Each seed pod produces between 125-150 seeds and the seeds reach maturity about 6-8 weeks after pollination. When sown, the seeds germinate in 15-18 days and the seedlings are transplanted to pots two months later. They remain in active growth for two years after which a dormant period occurs and a pattern is established similar to that of mature bulbs. However, at Longwood Gardens dormancy has occurred three months after the seedlings had germinated. These seedlings are a cross between the two previously mentioned accessions. The change to an active-dormant cycle does not necessarily mean that the plants will bloom the next season.

Paramongaia weberbaueri appears to be relatively free from diseases and pests. The bulbs grown at Longwood Gardens have shown that red spider could be a problem though this has not been of any significance(2).

The plant breeder cannot help but to look upon the fine qualities that *P. weberbaueri* exhibits without desiring to improve them. This is what Longwood Gardens is doing in crosses between the two accessions. Likewise, the possibility of an intergeneric cross becomes a challenge to the plant breeder. A cross between *P. weberbaueri* and closely related genera *(Pamianthe peruviana, Hymenocallis* or *Pancratium* sp. to name a few) still requires documentation. Genetic factors that still are unknown are its chromosome number, isolation of the species, compatibility with the above mentioned genera and, in addition, possible morphological differences(4).

Paramongaia weberbaueri is also known outside the realm of horticulture. Betty Collins, who accompanied Dr. and Mrs. Seibert on their trip through Peru when they discovered the "Cojomaria", has made it the subject of one of her paintings. This work of art depicts a beautiful contrast between man and nature. The Andean Indian is a virile-looking man cast against an equally virile background of the majestic Andean Mountains of Peru. Yet in all of these strong features a delicate bouquet of flowers *(paramongaia weberbaueri)* softens the masculine tones and gives beauty to a scene in which man is in harmony with his natural domain(1). Mrs. Collins has very generously given me a print of her painting of which a copy appears at the beginning of this paper.

Paramongaia weberbaueri is in my estimation a fine amaryllid worthy of more attention in the world of bulbous plants. It is hoped

that this overall view has shown the possibilities that it has as a fine ornamental. I am indebted to the many people who have so graciously shared their experiences concerning *P. weberbaueri* with me.

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3. Huttleston, Donald. Taxonomist, Longwood Gardens. Personal interview on taxonomy of the amaryllis family.

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EXPERIENCES WITH AMARYLLIDS, 1971-1972

Richard E. Tisch,
Woodland Hills, California

General. The outstanding feature of this area's growing year was the abnormally low rainfall from early winter to late spring. Its first apparent effect was on the *Narcissus* crop outdoors. There was not enough deep ground moisture for the bulbs to absorb during the late winter leaf growth period, and they could not sustain that growth against the dessication of our periodic hot dry "Santa Anna" winds from the inland desert. Daffodil leaves and flowers were not as robust as usual and were short-lived. Seed set was disappointingly scattered. This low moisture level will affect next year's *Amaryllis* flowers by not providing good growing conditions through the spring-summer leaf production period. Supplementary watering with medicated city water via the garden hose cannot compare to deep soakings with fresh, clean rain water which normally occur from October to April.

Amaryllis hybrids. The planned program for breeding hybrid

Amaryllis for vigor plus flower quality was continued unchanged in its basic format of three steps. Firstly, following protected and accelerated leaf and bulb growth in plastic dish pans during the seedling stage, the plants are flowered in individual plastic pots, and additions to the breeding stock are selected. From plants with outstanding flowering characteristics, pollen is taken and refrigerated for use on existing stock plants and on next year's flower crop. Such plants are set out into beds to check their outdoor growing habits. Plants with undersireable scapes or flowers are discarded, unless their growth is exceptional, in which case they are also set out into beds.

Secondly, following a summer's leaf growth and a winter's exposure to wet and cold, plants which grow poorly are discarded, unless their flowers continue to be exceptional. Plants with especially desireable flowers, for general or specific features, are used as both pollen and seed parents. Only plants with vigorous growth are used as seed parents. Thirdly, seedling records are kept and evaluated, and parent plants which have not produced offspring with desireable characteristics are discarded. The evaluations involve gradings for both quality and quantity in that a plant which produces only one or two excellent seedlings, and a plant which produces many better-than-average seedlings probably both warrant being kept. In some cases a plant is carried over in order to review its performance during its second or third outdoor season, which is its repeat-flowering time. It is known to most breeders that some perennials take a certain time to stabilize, and that this period is variable from seedling to seedling. Such stabilization may include adjustments to exposure, soil condition, planting depth, drainage. A plant which had a good first flowering may react adversely to being set outdoors and have a poor second season, then come back with an excellent third season. The exact symptoms of this are difficult to describe. Discernment comes with experience, observation, thorough record keeping, and patience.

In my stock there are several plants which have been carried along for several years because they continued to perform creditably. However, each year some of the holdovers lose favor. Last spring, for example, of those which had been retained as breeding stock since flowering in 1964, 17 were finally discarded. Further, the criteria for being saved for use have gradually become more restrictive; of those which flowered for the first time in 1972, only five were kept. Of these five, three represented the start of a series of successes which resulted from a violation of one of the program's rules: a plant with exceptional growth habits was used as a pollen parent.

The plant used, previously described in this publication, is unusually large and strong, resembling a *Crinum* in its large tapered bulb, generous production of bulblets, abundant leaf growth constantly produced all year (even in the cold of winter!) and its voracious appetite for water and supplementary fertilizer. Its flowers, although a huge glowing orange-red, flaring out boldly four at a time from atop strong towering scapes several times during the year, must be

graded as "only fair." They tend to tilt sideways, to recurve excessively, to look "snaggle toothed" because of separated segs, and they have green striping in the throat. Normally this would be more than enough to obviate its being used as a pollen parent. But its coloration, which is especially vibrant and glowing in the morning and late afternoon sunlight, has an exciting quality which elicits exclamations from viewers.

For use as a seed parent, one of my favorites, *A. striata*, was selected. Its rating as tender and not a desireable candidate for participation in a breeding program by many of my colleagues has given me a feeling of sympathy for this floral Cinderella. As I ruminated grumpily over material from books and conversations about species, I decided to try to use its grace and gentle beauty in spite of the warnings. Even though my own experiences have confirmed that it is indeed tender in this climate and tends to deteriorate outdoors, I like its prolific production of offsets and its habit of trying to make a come-back each summer. It seems to have a strong will, to want to grow and flower in the face of adverse conditions. In short, it seems to me to be more than "just another pretty face".

This year the flowers from a cross made in 1968 of the above-described big red-flowered plant onto a small *A. striata* flower on a slender 22 centimeter long scape have justified my faith in the so-called "Apricot Lily" as a good mother. The first blossom was a doublet or radiant tangerine carried aloft by a tall, graceful scape rising alongside and above wide, strong, bright green leaves. In the partial shade of a Silk Oak tree's spreading branches, the nodding flower's color glowed in the early evening light as the scape swayed in the soft breeze.

To permit maximum bulb development, no crosses were made. I needn't have been concerned. When the plant was lifted, there were six large healthy bulbs to send to a friend in Texas for trial in that climate. There were also 21 medium sized to small bulblets to go back into the bed for future stock. Since then, four other of these crosses have flowered, each with different color tones from light buff to bright orange-red. The blossoms are held horizontal, with the face tilted slightly to show the flower's interior from above. It's form is near lily-shape, much as the classical *Amaryllis belladonna*. The plant's overall appearance is such that I think of it as my 'Pelegrina' type. All the plants in that bed retained strong leaves all winter. All have many offsets. All have moved upward in the soil so that the larger bulbs, which are flat and bright green and almost devoid of loose brown outer scales, sit atop the surface of the bed.

Inasmuch as it has been reported that *A. striata* has "naturalized" in Florida and Hawaii, if readers in those two areas who are willing to test these plants outdoors and report on results will write for bulbs, I will be pleased to send them some as extras become available. Meanwhile, there are other crosses involving *A. striata* coming along. These

used plants with better flowers than the one described above. On advice from other hybridizers, back-crosses have already been made using later flowers. In succeeding years there will be additional information about this series of crosses.

A. petiolata (syn.—*A. argilagae*). This plant still resists attempts to make it flower. Now six years old, one of the original bulbs has produced many offsets for a total well into the hundreds, many of which have been distributed to local plant fanciers and breeders. A review of its descriptions in the 1966 and 1967 issues of Plant Life inclines me to believe that in its native state it relies more on bulblet production than on seed production for survival. The way that the bulblets harden off and work their way to the surface and float around when the plant is heavily watered leads me to imagine that seasonal floods carry the loose bulblets downstream where they eventually lodge in muddy pockets as the water recedes, there to sink roots and put up leaves—and produce more bulblets. So far I have tried relatively long periods of alternate soaking and drying out, coupled with positioning the plant in dense shade and bright sunlight. When in the shade and kept wet it produces leaves and more bulblets. When dry and in the sun it goes semi-dormant as if waiting for the return of the shade and water. This summer I set all but the largest offset plants out in a bed in the shade of a Birch, where they will get only morning sun and will be kept damp and cool most of the time. This will be an attempt to let the plants decide for themselves when to grow and when, if ever, to flower. I am anxious for flowers because I want to combine the prodigious bulblet production with the ready flowering and hardiness of our local hybrid *Amaryllis*.

Amaryllis from Colchicine-treated seeds. One group of hybrid *Amaryllis* seeds which had been soaked in a colchicine solution prior to being planted in 1964 resulted in beautifully shaped flowers with no green in the throats. Most were pink toned. One was a solid rose pink of excellent form; flowers carried on a strong scape, flowering along with strong, upright leaves. Another was a pure white, also of excellent form. Now, two years after their first flowering, only the rose-pink remains strong and unaltered; but it has made no bulblets. All the others exhibit deformities of root growth, bulb formation, platelet shape, along with hesitant and incomplete leaf and scape formation. Having grown slowly since seed germination, with very high mortality as small seedlings, and requiring five or six years to mature to first flowering, they now are retrogressing to a state of bare existence. Most of them displayed extra-large, spectacular flowers. The colors tended to be solid, with beautiful shadings, no strips or pencilling. One which showed up with a quatri-part flower last year has had no growth this year beyond a cluster of small leaf tips which die in succession and are replaced by new leaflets when about 15 centimeters high. When they flowered they were best used as pollen parents. When used as seed parents they had seedlings with a high mortality rate, with the survivors maturing very slowly. When used as pollen parents they

had seedlings with no signs of abnormalities, healthy and strong, maturing at a normal rate. There has been no sign of dwarfing in either type of seedlings.

Lycoris. Until last year *Lycoris aurea* refused to set seed. Being a cautious old greybeard by now, I gathered the firm round seeds with skepticism. That lack of enthusiasm was apparently justified because they haven't yet germinated, seven months later. Other species also steadily refuse to set seed: *L. radiata, L. sanguinea, L. squamigera, L. straminea.* Possibly it is the local climate, or possibly they are from sterile stock. The plants are nonetheless welcome in our small yard if they never set any viable seed because their bright splashes of color on tall, graceful scapes add much in late Autumn just when we need them.

Propagation by bulb cuttage. If you will review your old copies of Plant Life you will be able to read much about successful methods of *Amaryllis* propagation by bulb cuttage. It is exacting work. I wouldn't care to have to do it all day long for long periods of time. But used on a few of your best bulbs it will give you a large stock in short order. As is suggested in the articles, practice on some throw-aways before you try a one and only bulb of high value to you. My best results have come with the use of a soil mix on the sandy side in plastic dish pans. In this I work a lot of chopped sphagnum moss. The cut pieces are dusted with my favorite fungicide (A "favorite" fungicide, insecticide or fertilizer is like a favorite fishing plug: it worked well once so you keep on trying it). No fertilizer is used until the leaves are up three inches or more. My cutting knife has a very hard blade which takes and holds a sharp edge; it is part of a bonsai tool kit and has a hollow contour from blade back to edge. This winter I plan to try that method on many other Amaryllids. Try it, you'll like it!

SOMETIMES TANTALIZING, THOSE **LYCORIS**

LEONORA E. MILSTEAD, *Route 2, Box 261, Shawnee, Oklahoma 74801*

Gardening in a betwixt-and-between climate such as Oklahoma's presents many possibilities, many difficulties, and many "perhaps" situations. For some years now I have been trying to gain a little knowledge of species of the genus *Lycoris*, one of which grows like a weed *(Lycoris radiata,* the Red Radiate Lily) and some of which are doubtful in bloom production and, for me at least, not correctly labeled.

My first bulbs, those of the Red Radiate Lily, were brought back from a friend's place in Louisiana years ago at the Christmas season. I had no idea that they were so hardy, so prolific, and so beautiful; neither did I know that they were *Lycoris radiata.* Now I have them in both sun and shade (the ones among trees bloom before those in full sun), and I often have stray plants come up where I have tossed

out small bulbs in re-planting and have not picked up all my toss-outs later.

I have been given some of the fairly recent Japanese imports that bloom earlier than the old southern bulbs, but I am wondering, since they are all of Oriental origin, whether they will not acclimatize themselves to bloom with those so long enjoyed here.

The hardy pink *Lycoris squamigera* was my next acquisition, and now I find that one source says is should be called *Amaryllis belladonna,* while another source says that it is *Amaryllis hallii* and that the true *A. belladonna* is red and a native of Mexico. At any rate, what is usually recognized as *Lycoris squamigera* flourishes here and seems to need separation about every five years. Not so well-known is a similar plant, *L. sprengeri,* which has blue tips. A friend of mine grows this one.

Once I heard about yellow and also white species similar to the red ones, I was eager to try those. That there were pale ones, not white but very beautiful, I was unaware for some time. I still have not seen what I would call a true white *Lycoris.*

The yellow ones, both *L. aurea* and *L. traubii,* performed for me the first year I had them, as I was able to buy them when the foliage had ripened and they were dormant. Since then, I have had flowering only once, on *L. traubii,* not *L. aurea.* Farther south I have seen wonderful foliage in December, but here the leaves make a brave beginning and are nipped by our off-and-on freezes. *Lycoris radiata* is not daunted.

I tried a bulb of *L. aurea* and one of *L. albiflora* on the south of the house but they do poorly there also. No bulb labeled *L. albiflora* has bloomed for me, but one labeled *L. elsiae* has bloomed consistently since I was lucky enough to get it. It is a delight in pale salmon pink. This year I added *L. straminea* and put it into a pot, but I am uncertain as to whether its foliage had ripened when I bought it and none appeared after planting. To my surprise, after *L. straminea* the seller had in parentheis the word *"alba".*

At the same time that I bought *L. elsiae,* (June 1968) I bought *L. incarnata,* described as white with rose keels. This produced foliage only until 1971, when it sent up a tall bloom stalk, quite worth the wait as far as I am concerned.

One *Lycoris* that is easy to come by and is also a satisfactory bloomer here is *L. sanguinea,* the small orange one. I have almost forgotten it some years until it has reminded me of its existence, and now I have moved it, and its increase, to a better place.

The whole tribe is fascinating although I have yet to see any pale one except *L. elsiae* bloom in my own garden. (I saw *albiflora*—not noticeably different in color—in a friend's garden, one time only.) To date I am still wanting to see a truly white *Lycoris,* if it exists, and to know whether there is any great difference between *alba* and *albiflora.* I am, of course, aware of the fading to creamy color of some.

Meanwhile, I cherish those *Lycoris* that will ripen their foliage here in Oklahoma outdoors.

AMARYLLIS MOSAIC?

E. A. ANGELL, *25406 Lane St., Loma Linda, California*

In the Amaryllis Year Book of 1970, an article on page 120 is concerned with Mosaic Virus. It states that fans should do away with all virus infected bulbs.

I should like to state that after Mr. Buck wrote the article in the year book of 1964, a man in England wanted to have me ship him some of my bulbs, but the Agricultural Inspector would not give me permission to ship them, as some of mine had what they call Mosaic. He sent some to the Riverside station, and to Oakland, and to Davis, and all said it was Mosaic. I was very disappointed for I had been breeding the most infected plants for 15 years, because I thought it made the leaves look nice.

I wrote to the man in England. He answered immediately stating he bought Mosaic *Amaryllis* all the time, stating it was not Mosaic at all, but only a soil deficiency, and that he had purchased them for years, so I decided to see if he was right.

The University here had at that time their own Disposal Plant, and I could have all the Sludge and water from the plant I wanted. I bought a roll of Vinal black plastic, 8 millimeters thick, 30 x 100, and planted about 1800 bulbs of the infected ones in about 6″ of sludge, and irrigated them from the plant sewage water. In about 6-8 months, there were not over a dozen plants that showed any Mosaic.

My son had a horse, and a lot of manure, so I thought I would try that on about 800 bulbs with the same way on the Vinal plastic, and they also cleared up in the same way in about the same length of time. I had about 4000 bulblets that I planted under the Vinal plastic by plowing a 4″ furrow with a Planet junior hand plow, and pressing it down with the wheelborrow wheel, then cutting a 3″ hole in the plastic with a hatchet, and putting a bulblet right through the hole. I sprinkled right over the plastic with rain bird sprinklers. They have done very well. The plastic has been there 8 years, and I walk on it all the time. It won't stand high heels. Very few of the bulbs show any Mosaic. These bulbs (the 4000) have not been treated with any fertilizer, yet are good. The weeds are almost non-existant except for a few "Mairs Tails", and some creeping Spurge (Medicinal Spurge). I do not think White plastic will do the trick. The weeds grow right under it, but not under the black.

All my *Amaryllis* are from Luthur Burbank stock which I purchased from Mr. W. H. Henderson Experimental Gardens near Clovis, Calif., Mr. Burbank's successor. I bought 3 bulbs from him, and grew the seeds to bloom from one of them, but I did not have any real dark red ones, so I sent back to Mr. Henderson for a dark red one, and from the 2 bulbs I have probably grown 100,000 bulblets in 36 years, and have seen, probably, 75,000 bloom. These bulbs last winter took frost

down to 17° above zero without being hurt. I now have about 6000 at that place. I also have about 100 bulbs at the same location, that I have crossed with a South American bulb, and have some very fine flowers from them. They didn't freeze either. At the same patch I have several hundred Red-leaf bulbs with different colored flowers.

I see my name on Page 42, as a special award for cut flowers in the 1970 year book, under the heading Southers Calif., official Amaryllis Show for 1969. I sent them about 100 stems, and have sent about the same amount the past 3 or 4 years.

Nov. 20, 1970.

TWO NEW FUNGICIDES

CHARLES D. COTHRAN, *1733 N. Gibbs Street, Pomona, California 91767*

Several years ago two new fungicides of an entirely new class were offered to industrial laboratories for experimental testing. At that time the author was primarily interested in safer and more effective fungicides for citrus fruit, and in that regard both fungicides were astonishingly good. Both effectively controlled blue and green Penicillium molds, and were useful against Botrytis cinerea and Fusarium species. They caused no damage to the fruit and were safe for the user and consumer. Further testing showed these fungicides to have a very broad spectrum of activity, and thereby both became of interest to *Amaryllis* growers and plant hobbyists generally.

The first material to be discussed is manufactured by Merk Chemical Division of Merck and Co. and is called Thiobendazole or TBZ. It is supplied as a wettable powder with 60% active material under the trade name of Mertect 160. It is not soluble in water, has no odor, does not cause dermititis and is relatively non-toxic if swallowed. It is not toxic to plants and bulbs within the range recommended, and as a fungicide is both systemic and contactual.

In the area of bulb diseases it controls Fusarium, Botrytis, Penicillium, and possibly others. Extensive testing has been done on gladiolius, iris, narcissi, and tulips, and very good results have been obtained. No published results are known of tests made on amaryllis.

The Mertect 160 label suggests using 1.5 pounds per 100 gallons of water for dipping harvested bulbs. This is about 1.5 level tablespoons per gallon of water. A wetting agent such as Triton 100 or Vatsol OT is useful in dispersing the powder, but not absolutely necessary.

No mention is made in the literature of spraying or drenching potted bulbs, or bulbs growing in the ground. On other plants, both in greenhouse and outdoor environments, this method has been successful against molds, and has not caused damage to the plant.

The second fungicide is manufactured by E. I. Du Pont du Nemours and Co. and is Called "Benlate", the name being a trademark of du Pont. It was formerly called Fungicide 1991, and most of the

early work refers to it by this number. Benlate is said to be systemic, preventive, residual, and curative. It has very low toxicity to plants and animals, and is not known to cause dermititis.

Benlate is suggested for use on bulbs and tubers as a control for Aspergillis, Rhizoctonia, and Fusarium. It is also used to control Botrytis grey mold, and Penicillium mold on carnations, dahlias, and cut flowers.

BRIEF AUTOBIOGRAPHY OF CHARLES D. COTHRAN

I graduated from the University of Washington with a major in chemistry. After graduation I worked for several firms for short intervals doing work other than chemical work. But in 1927 I had an opportunity to work for Brogdex Co., of Pomona as a chemist.

The Brogdex Co. was the originator of the use of wax and fungicides to protect citrus fruit, and has remained the leader in the field up to and including the present time. After about two years I became chief chemist, and later Director of Research and Development. A number of patents were obtained in my name on wax and fungicidal processes, and our processing field at this time includes all varieties of citrus, tomatoes, cantaloupes, bell peppers, sweet potatoes, cucumbers, apples, peaches, and other specialty crops.

The Brogdex Co. started work in Italy in 1934, and I directed the work until 1939 when the war forced us to close down our business. I went to Israel in 1949 and was instrumental in getting packing houses built, and wax and fungicides in use. Later Lebanon, Greece, Tunisia, Morocco, Spain, and Argentina were added to the Brogdex business community.

To use TBZ, Benlate, and Botran required solving some severe technical problems which the Brogdex Laboratory was able to do under my direction. It was done in a manner which continued our leadership in this field. These materials, and our manner of application are very highly regarded by all branches of the fruit industry in California, Florida, and abroad.

I retired two years ago but still remain a consultant to the Brogdex Co. In this capacity I remain in touch with the packing plants which use the Brogdex processes, including Florida and some foreign countries.

PHYTOSAN (CONSAN 20)—DISINFECTANT FOR PLANT VIRUSES

PAUL C. CHEO, Virologist, *Los Angeles Arboretum, 301 N. Baldwin Av., Arcadia, California 91006*

[We are indebted to Mrs. Emma D. Menninger, of Arcadia, Calif., for sending in the following summary of Dr. Paul C. Cheo's experiment.]

Plant viruses are a threat to many greenhouse crops. They are spread by tools and handling under unsanitary conditions. Effective

chemical solutions to disinfect tools and containers without corrosion and poisonous effect is needed. This is a summary of a paper to study the effect of Phytosan (Consau 20) on plant viruses. Tobacco mosaic virus (TMV) is the most stable virus, and it is a common greenhouse problem. Therefore TMV is used entirely for this study.

The airbrush spray method was used for virus inoculation. For each test, at least 14 replications were used. The common strain of Tobacco mosaic virus (TMV) was used, and was purified by means of differential centrifugation.

Different dilutions of Phytosan were prepared. Crude juice from leaves previously infected with TMV was obtained. At active concentrations of 1—640 (311 ppm. or approximately 1/5 oz. Phytosan per gallon of water) dilution of Phytosan, complete inactivation of infections crude juice was obtained.

Based on these tests, Phytosan used at a rate of 1 oz. to 3 gallons of water will inactivate plant virus where the solution contacts the virus. At this strength, Phytosan will inactivate virus on cutting tools, work benches, pots, compost, tags, stakes, hands, and on the plant. Further tests are being conducted to determine whether Phytosan is also systemic.

A complete report of these tests has been submitted to Plant Disease Reporter for publication.

[Editorial Note.—Copy of tests is available from Consan Pacific Inc., P. O. Box 208, Whittier, Calif. 90608.]

GROWING AMARYLLIDS IN NORTH FLORIDA

Beckwith D. Smith, *2036 Post Street, Jacksonville, Florida 32204*

The fabulous African Blood Lily, Haemanthus multiflorus is fittingly described as having a "Beautiful and showy inflorescence forming a perfect ball, with up to 100 flowers coral pink to red, crimson at base, stamens tipped yellow. Most ideal for pot culture."

This cousin in the Amaryllis family is always a "people stopper". When first viewed by the onlooker the normal reaction is "What is that gorgeous flower?" "Where may I get one?"

Haemanthus multiflorus is reported to have originated in Zaire, formerly known as the Republic of Congo. There in the shady reaches of the African forest the bulbs grow and prosper. Aside from their worth as a highly prized flower, they are said to be a favorite food of elephants of the region.

Haemanthus multiflorus plants are of moderately easy culture. They seem to have some sort of clock mechanism built into them which regulates the time of bloom. During the winter they are completely dormant, even losing their roots, but come April or May, a green-brown collar emerges from the center of the bulb, and before long a scape

appears to develop into the beautifully rounded flower head.

These bulbs are generally oval in shape, with a very large and thick basal plate from which the roots emerge. They are well suited for growing outside in a warm climate, and just as well suited for pot culture in the north where they should be grown inside, protected from the cold weather. General *Amaryllis* culture is suitable. They like a soil described as being on the "sweet side", and which can be achieved by the addition of ground limestone to the potting mixture.

General culture: Porous soil, not too heavy, to allow good root growth. Place bulbs in pot with most of the bulb outside the soil to allow warm air to promote growth. The basal plate should be well covered by the soil. Bulbs are generally received dry, without roots. Water sufficiently to allow the bulb to settle comfortably in the soil. Thereafter hold the pot in dry, warm storage until spring. In April

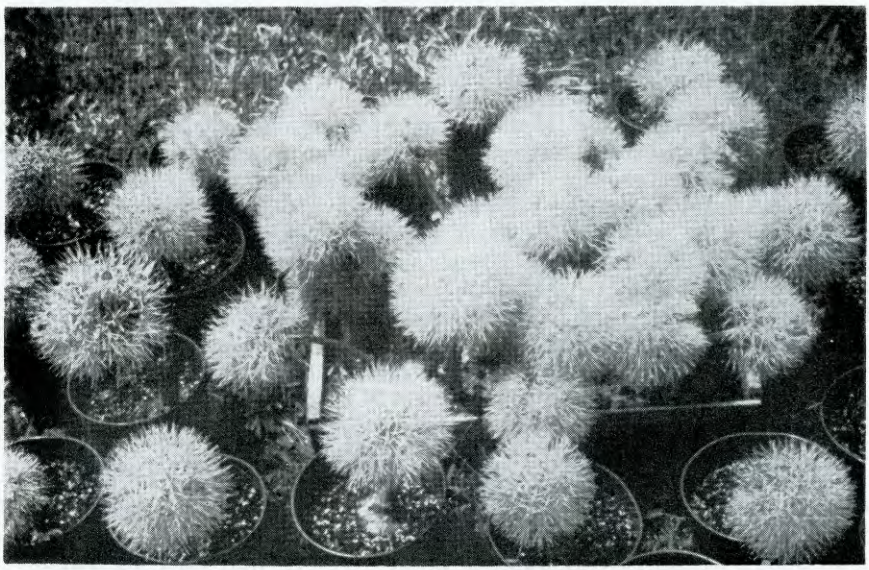

Fig. 23. A group of **Haemanthus multiflorus** Martyn in flower in Northern Florida. Photo by Beckwith D. Smith.

and May examine the top of the bulb to see if the collar has emerged. When it does, then is the time to start regular watering, once a week. After blooming the flower scape will die down if it has not been pollinated, and the leaves will emerge. If the flower head has been pollinated it will hold and the seed will appear as small rounded "apples", first green, they yellow, and finally red when ready to remove and plant to make individual bulbs.

Haemanthus multiflorus may also be propagated by bulb cuttage similar to *Amaryllis* bulb cuttage. They respond very well to this method. Cut the bulbs in small sections, keeping attached a portion

of leaf tissue. Place the cuttings in sand and peat, or sand and vermiculite and water well with a solution of soluble fertilizer, say a spoonful to a gallon of water. Do not overwater. Keep in a warm environment and soon you will see a small leaflet emerge from the cut section. Slant the cuttings for better drainage.

You will find growing *Haemanthus multiflorus* most rewarding. Get one or more bulbs (three bulbs in a pot is very effective) and enjoy to the fullest this very beautiful and exotic member of the Amaryllid family.

NERINES IN AUSTRALIA

LINDSAY J. FORBES, *59 Union Road, Surrey Hills, Victoria, 3127, Australia*

The story by Charles Hardman in the 1972 Year Book prompted me to respond by agreeing with most of his observations. The general context of his article implies that there is a world shortage of nerines and on this point I agree. One needs, however, to analyse this fact and determine the reason why.

Perhaps difficulty with cultivation is a reason. This may be true in the northern hemisphere where, in many instances, green house culture is necessary and one is then immediately confronted with a space problem and also a complicated growth plan which necessitates continual attention. This is not the case in the southern hemisphere as in temperate areas of Australia, conditions are quite suitable for outdoor culture and no attention is needed for years. Bulbs imported by me from England have grown with such zest and have made so many offsets in the first twelve months, that it seems as if the bulbs are singing an "Ode to Joy" in celebration of their being released from the bondage of greenhouse culture.

Perhaps the size of the flower is another reason. To me, a flower does not have to be "The Greatest" to be admired. I derive as much pleasure in examining, on my knees, a tiny crocus as I do in looking at a huge hybrid flower which has been bred to such a degree that it bears little resemblance to its ancestors. Everyone to their own taste but in the Amaryllid family, where will one find such consistency as displayed by the nerine in strong unright scapes, long lasting flowers and a truly delightful array of colours and forms.

Perhaps lack of knowledge, which creates lack of interest, is another reason. Mr. Hardman suggests that the Nerine Society membership of 235 is good. On the contrary I believe that this is a very poor figure. The latest Nerine Society bulletin shows eight names of Australians as members. Why, with Australia's millions, do only eight people display an interest in nerines. Other countries have more members but I suggest that according to population, the pro rata percentage is no better than Australia's.

Perhaps another reason, and I think the most important one, is the slow degree of multiplication. Professional growers cannot afford to spend their time on such slow growing material and the nerine therefore is not promoted through normal commercial retail outlets. Perhaps the only exception is nerine Bowdenii which is widely grown in Melbourne. This finds its way into chain stores but on the other hand, sales are not necessarily good, as it is a very simple matter to obtain a few bulbs from your next door neighbor. I don't think anyone has the solution to the quick multiplication of nerine cultivars but he who might find the solution will make a big contribution to horticulture.

Amateurs are usually quite generous in helping their friends, but when one starts with one bulb only, it is years before any offsets are able to be passed on. The conclusion seems to be that nerine growers are in proportion to the supply available and we who enjoy growing them cannot expect any increased interest until supplies are sufficient to find their way to new growers.

I received recently a letter from Holland from a bulb grower who said that he became interested in growing nerines in 1969 and he wondered if I had any bulbs I could let him have. He said that his collection amounted to five named varieties and a few unnamed seedlings. This is a demonstration of how difficult it is to build up a collection, as this grower's collection, after three years, is still extremely poor. I will certainly let this grower have some bulbs to add to his collection although I can ill afford to part with them as, in most instances, I am still building up my clumps from one bulb.

When I started adding to my collection seven years ago I was already growing the commonly known species—*N. bowdenii, N. flexuosa* alba, *N. fothergilli major* and *N. sarniensis.* With a little difficulty I was able to add 'Aurora', 'Hera', 'Afterglow', *N. pudica,* 'Gilbert Errey', and 'Manselli'.

I then heard of the Nerine Society, joined it, and was able to make contact with other growers here. That important break, together with some imports from Borde Hill Gardens and the Exbury Gardens in England, resulted in my collection growing substantially and I added the following named varieties:—

filifolia	'Beacon'	'Eddy'
filimentosa	'Adela'	'Rotherside'
sarniensis var. *corusca*	'Lady Havelock Allan'	'Grilse'
sarniensis var. *salmonea*	'Lady Eleanor Keane'	'Gaiety'
flexuosa var. "excellens"	'Miss E. Bromley'	'Rushmere Star'
	'Diana Olliver'	'Rushmere Victor'
sarniensis var. *rosea*	'Miss Carrington'	'Mars'
'Coral Queen'	'Timoshenko'	'Inchmery Kate'
Corcusca Major	'Stephanie'	'Joan'
'Splendens'	'Dunkirk'	'Solent Swan'
'Albatross'	'Adelaide'	'Carolside'
'Ariel'	'Queen Mary'	'Plymouth'

'Old Rose'	'October David'	'Hamilton'
'Novelty'	'Fletcherii'	'Blenheim'
'Bridesmaid'	'Mrs. H. J. Elwes'	'Vestal'
'Carmenata'	'Pamela'	'Margaret Rose'
'Mrs. Cole'	'Cardinal'	'Audrey'

This is not as large a collection as other growers must have but it does include most of the recent well known English hybrids and the famous first tetraploid 'Inchmery Kate'. I also have many unnamed seedlings of Australian origin, some of which are of excellent quality and I therefore rate my collection as good by Australian standards.

None of the eight members of the Nerine Society in Australia are professional, although one member does grow the bulbs for the sale of the flowers.

Two of the collections are very large and began by collections being handed down from earlier Australian bulb specialists. Much work has been done on the original collections and much new material has been added. One of these collections goes close to rivaling some of the biggest in England.

From one of these growers I have had some very interesting unnamed hybrids. One which appeals to me very much *is an alledged* seedling, *N. bowdenii* X *Lycoris sprengeri.* It has the robust habit of *N. bowdenii,* never fails to bloom each year and in colour, it is a good lavender. It does not "blue" until the flower is ready to wither.

In looking at the overall position there does seem to be an increasing world wide interest in nerines, even though it be slight and I commend all growers to be generous within their own limits, so as not to discourage any newcomer to the "fan club".

I hope these notes will prove interesting to nerine growers in the U.S.A., but I must regretfully close on an unhappy note by saying that I do not have any spare bulbs at present.

NERINE COMMITTEE REPORT, 1972

Charles Hardman, *Chairman, Nerine Committee,*
Box 936, Temple City, California 91780

The past year's growing seasons certainly brought its share of surprises.

One of the biggest surprises of all came in the form of a non-event: the lack of adequate rainfall here in Southern California. Total annual rainfall figures as scant as eight and one half inches—and some not even reaching that mark—were common throughout Southern California. It was the driest winter season in a long time.

But if the wet season was notable for its dryness, the current dry season has been remarkable for its wetness. In May, just as the Nerine bulbs were drying off for their summer dormancy, a storm passed through the area and dropped a quarter of an inch of rain. In August, another storm repeated that performance, bringing my back-yard summer rain-

fall total to half an inch. And we've had three more storms pull their shirt-tails over the Los Angeles Basin this year, scattering sprinkles here and there, and pushing the humidity readings way up into the uncomfortable range. For humans, that is. Growing plants loved it.

Nerines were not supposed to be growing, however. They were supposed to be dormant, and dry. Trying to keep them sufficiently dry to prevent rotting, has presented a challenge at times during the course of this summer. Just as trying to keep them sufficiently moist presented a challenge during their growing period last winter. I've heard it said that Nature tries to achieve a point of balance in all things. Well, She really outdid herself this year.

I've never found that irrigation water—blessing that it is—could do for growing plants all the good things sweet rainwater can do. My Nerines, for instance, did not make the leaf growth I expected of them last year in spite of copious waterings with the hose. They wanted rain, and showed their dissatisfaction over the substitute by pouting with slower growth.

While some of the bulbs did manage to make fair growth and increase, others just sat there, putting forth only a meager effort. They are alive and ready to give the coming winter season a try. But they knew something was amiss during the last one.

How all this will affect their blooming come autumn, is not certain as yet. A wait-and-see attitude serves one well during such times of trial by anticipation.

Nevertheless, the old adage that "Nothing is so bad that it does not produce a bit of good" held true during last winter season. If we did not get much of rain, then we likewise did not get much of the frost that nearly always follows a winter rain out here, when the low pressure area passes over and trails in its wake a cold front that sends temperatures plummeting. Our last "cold" season was a quite mild one. We did get some frost, and two or three nights when the temperatures went down into the lower twenties. But in former winters, I've seen the temperature plunge clear on down to 16° F. in my own yard during an especially cold pre-dawn hour. And 18° F. has been registered during several.

Now I won't swear to the accuracy of my outdoor thermometer, but the ground was frozen dent-proof to the standard heel test (three sharp jabs with a leather boot heel) on these occasions. (Not that the heel test is itself any more accurate than my thermometer.)

Nevertheless, when the temperature drops below the twenties, what grower of frost-sensitive plants is going to quibble over the detail of a degree or two? In that temperature range, Nerines need plenty of protection. And usually some heat as well. Apparently, 45° F. or thereabouts is the critical range for good flowering. Drop the temperature much below that mark for very long, and the flower bud—which is formed at the same time is the new leaves—suffers damage, and, often, death. This does not occur right away, of course. But keep

the bulb thoroughly chilled for several hours, and your chances of losing next season's flowers are very good.

Much more work needs to be done in this area, for it is obvious that critical temperature factors follow somewhat along varietal lines, as do so many other factors. Just as certain varieties increase rapidly while others make large bulbs, we can expect a degree of inbuilt cold-resistance in certain hybrids. And it would be natural to expect this cold-resistance ability in varieties that have the hardier species in their backgrounds, *N. bowdenii* being the one brought to mind immediately. This species and its varieties—and no doubt many of its hybrids as well—do not seem to be affected by low temperatures to anywhere near the same extent as are varieties derived largely from the more cold-sensitive *N. sarniensis*.

There were other surprises during the growing seasons just past. Can you imagine Nerines blooming in May, at the beginning of the dormant season? Six bulbs did just that in the Greenoaks collection of Mrs. Emma Menninger. Three were of the same variety: 'Glacier'. All six of these bulbs had lost their leaves and gave every appearance of having gone off to sleep for the summer. Then they bloomed. Immediately following this anachronistic display of arrogance and caprice, they lapsed into dormancy again.

A potful of the variety 'Ben Hills' produced a spike in my own collection during July, and another in August. These spikes were perfectly formed, though perhaps a few inches taller than usual. The first bloomed during a heat wave which hovered the thermometer somewhere between 95° F. and 105° F. for very nearly the entire blooming period. This spike set no seed, although all florets were pollinated.

The second spike is in the process of blooming now (August 28). Temperatures are a bit cooler at the moment than they were for the first spike. Even so, three of the first florets to open have now matured and dropped off this second spike already, taking the seed capsules with them. Again, each floret was pollinated. 'Ben Hills' has set seed for me in the past, so I'm blaming the excessive heat for its current failure.

The remarkable thing about this performance, is that *the bulbs never went dormant.* They retained green leaves right through the summer, heat and all. Growth did slow down a bit during the blooming of the first bulb when the weather became so warm. Right now, though, the growth rate seems to be accelerating again. The plants show no sign of going dormant at all for this year.

What is more, a bulb of 'Mansellii' is now in the process of sending up its flower spike in spite of the fact that it has never had a period of dormancy this summer either.

What does all this mean? I'm not quite sure. It is for certain, however, that, under the right conditions, some varieties can bloom in the spring rather than holding their buds until autumn. And, too, some can be kept growing right on through the summer to give a very early

crop of flowers. Experimenters and lovers of the off-season bloom take note! As for myself, I intend to attempt a follow-through on this interesting tendency with further observations next year.

It has always been amusing to me to notice the way so many members of the Amaryllis family—Nerines included—occasionally lose only the tops of the newest leaves as they go dormant. Then, on re-awakening at the next growth cycle, the bottoms of those old leaves resurrect themselves and come out battle-scarred but eager to get on with the furnishing of whatever help they can provide to the bulb's welfare. That is quite a different slant on dormancy and breaking dormancy than the method used by the Iridaceae, in which a new plant is sent up to grow and produce an entirely new bulb underground. And it seems to occur most frequently with my own Amaryllids when they are hastened into dormancy rather than when they can take their own leisure time about the process.

My seedling Nerines have been potted up recently and are starting to push out tiny new leaves. They are altogether fascinating—as all seedlings are—and provide me with a thrill of anticipation each time I take a peek to see how they're coming along. That's on an average of three times each day. I doubt if the flowers they will subsequently produce can ever provide me with quite the sense of fulfillment just growing them is giving me.

Yet, the goal is to bloom them all out as soon as possible, and, with luck, to find at least one worthy of registration. At that point, though, it becomes a variety, and, as such, it then belongs to the world. For the time being, no one but myself cares about those seedlings, their care, their watering, their fertilizing. It's the thrill of working with life and the satisfaction that comes with helping to create new forms of life that make the step by step chores and tediums of hybridizing worthwhile.

It is a source of contentment mixed with wonder to watch each new leaf as it is formed. (Somehow, Nerine leaves always end up looking too short, even when they're fully developed.) The blue-greens, gray-greens, and bright greens of the leaves, some of the newest with a pencil-thin edging of spicy red, provide color enough in their own right, were the truth known. Such leaves make waiting for the flowers endurable, even exciting.

The Nerine Committee received a communication this year from Mr. Lindsay J. Forbes, whose article on growing Nerines in Australia appears elsewhere in this issue. The down-under continent has a small group of Nerine enthusiasts at the moment. But, if we can judge from Mr. Forbes' article, it is composed of serious and dedicated growers.

Another communication arrived from Mr. Zelimir K. Tvrtkovic Sahin who is located in the Netherlands. This gentleman is currently in the process of building what must surely become the most comprehensive Nerine collection in the world. Mr. Tvrtkovic Sahin has spent

a part of this year purchasing stock from several important collections throughout the world. We certainly wish him well in this endeavour. Even a single, truly comprehensive Nerine collection could serve as an important genetic pool for hybridizers. Viewed in this light, contemporary hybridizers and those of the future can be grateful to Mr. Tvrtkovic Sahin for his efforts in this regard.

The GREENOAKS Nerine collection, owned by Mrs. Emma Menninger of Arcadia, is still the only major gathering of Nerine hybrids here in Southern California, or, as far as I have been able to determine, in America. For any individual privileged to see the collection in full bloom, that sight marks the high point of the Nerine season. There are so many to view and admire that it is difficult to determine favorites. However, . . . I doubt if I'll ever forget that one intensely scarlet seedling with the head of fifteen mammoth blooms and buds. The sight was overpowering! I found myself going back to it repeatedly for "just one more look".

White Nerines with their ethereal laciness are among the loveliest flowers in Nature. Hybridizing the white has become a specialty with Mrs. Menninger in recent years. Her article on the subject appears elsewhere in this year book.

The GREENOAKS collection also includes a number of smokies—"blues" to some—which were blooming when I visited last autumn. I've never been much of an admirer of these off-colors. But after seeing these, I'll admit I'm hooked.

Somehow, the pink-, rose-, and coral-tinted varieties remind me of little girls with their hair done up in curls and ribbons. That's not a particularly original comparison perhaps, but there you have it. It's a comparison I like anyway.

There were a great many of these last-mentioned colors on display in the collection. So many, so nearly perfect. Had I been awarding a perfection trophy, it might easily have gone to a pink one, another seedling, which, at the time of my visit, was putting on a show reminiscent of a small Agapanthus: stout stems, full rounded head of bloom, wonderful color. Nothing was lacking. As I say, I'd be hard put to select a favorite.

But, oh! That red seedling. . . .

We start another bloom season in a few weeks. I noticed just the other day that our last shower has brought out a spike already on one of the bulbs of 'Edith Godman'. It would have been preferable to have had it bloom a bit later to permit the cooler weather a chance at helping assure seed set. But we learn to take Nature's help when it's offered.

And we learn to ride out each year as best we can.

1972 DAYLILY REPORT

W. Quinn Buck, *Chairman, Daylily Committee,*
The American Plant Life Society

Looking back over the 1972 season in my own garden, the most beautiful of the new introductions blooming for the first time was 'Mary Moldovan' (Moldovan) ['Kathleen Elsie Randall'/ ('Summer Splendor' x 'Kum Yin')], particularly outstanding for its perfect form, which made me try to cross it with everything showing deficiencies in form, such as the treated 'Fuchsia Flame' (Hardy), which had intense, clear, sunfast color, and the treated 'Charlemagne' (Moldovan), a good lavender purple in our climate. 'Mary Moldovan' was used as pollen source for such other treated clones as 'Pink Superior' (Fay), still outstanding in the clarity of pink; F63-1 (Fay), a large pink seedling out of 'Beautiful Lady' (Fay), and the beautiful rose pink 'Vivacious' (Munson).

'Chicago Silky' (Marsh) was excellent for first season bloom, showing good form, color, and plant habit, and its blending of colors made it promising as a parent.

Among the new yellows 'Erin Prairie' (Fay) was a greenish shade, with even more green in the throat; it showed amazingly good branching, being rivalled only by the pale, round 'Galena Moon' (Blocher) in this respect. 'Florence Byrd' (Peck) was able to show what fine flowers it can produce, but its performance was obviously not typical this first season here. Mr. Fay's 'Mary Todd' was not displaced by any newer variety as the best performing fine yellow tetraploid in my collection. It was pleasant news from the Convention for 'Mary Todd' to receive the President's Cup, a tardy recognition of this wonderful variety.

'Lusty Lealand' (Peck) in its second season was again the outstanding red, and 'Jock Randall' (Peck) was the premier dark rose blend, as it was last year; both clones were much used with such treated plants as the bronzy-red 'Double Pace', one of the late Robert Baker Wynne's multiflora doubles, which produced seed freely. 'Cherry Cheeks' (Peck), for its equisitely pure dark rose-pink color, was approached only by the treated 'Vivacious' (Munson).

The induced form of 'Frances Fay' (Fay) again was spectacularly beautiful in mass effect, besides being an excellent seed-setter. 'Alison' (Peck) was superb in form and performance among the darker melons.

For color, 'Empress Mei Ling' (Munson) and 'Scarborough Fair' (Munson) were outstanding blends of intense coral and rose. 'Georgica' (Munson) was also good in clear color and plant habit, but its flowers did not open well here.

Among the treated minatures, the wonderful lavender-purple color of 'Little Wart' (Spalding) paled when temperatures rose late in the season; its intense color was still rivalled only by the medium-sized, paler 'Tai Pan' (Moldovan), which is a most outstanding performer for me.

Such new varieties as 'Grape Harvest' (Moldovan); 'Queen of Roses' (Peck); 'Kincraigie' (Peck), and others, could not be judged fairly from first season performances.

One of the best things to be reported from the American Hemerocallis Society Convention in Indianapolis, Ind., this year was the awarding of the Bertrand Farr Medal to Dr. Virginia L. Peck, of Murfreesboro, Tenn., for her outstanding work in tetraploid daylily breeding. She has been one of the most earnest workers using colchicine to broaden our horizons in tetrapliod breeding, and her own developments make this award most deserved. Dr. Peck's new red seedlings in 1972 gave so many finished flowers as to make it difficult for her to see further avenues for progress in this color. Seedlings out of an induced form of 'Catherine Woodbury' (Childs) used with her own seedlings gave a wonderful range of colors from pale pink and lavender to deep purple, many showing great promise. Particularly fine results came from using 'Lusty Lealand' in red crosses, as well as from using 'Jock Randall' in rose and red crosses. The many doubles derived from 'Jock Randall' were delightful surprises, some showing amazingly good color and form.

Steve Moldovan's garden in Avon, Ohio, was full of unbelievable colors and fine forms among the new tetraploid seedings. His siblings 'Puccini' and 'Disraeli' ('King's Cloak' x 'Royal Watermark') were cerise rose wines of most outstanding quality. 'Burmese Moon' ('Heather Green' x 'Jade Bowl') was a pale pastel blend of exceptional merit. 'Camphor Flame' ('Noahs Ark' x 'Empress Mei Ling') was a very superior blend of pink, rose, and coral. From among the lavender seedlings out of the induced 'Catherine Woodbury', the two most outstanding were named 'Concubine' and 'Empress Seal'.

In the Chicago area, Bro. Charles Reckamp at Mission Gardens had many superb new melon seedlings, but there were also new pinks and reds obtained by crossing 'Shell Pink' (Fay) and a red tetraploid with some of his finest melons. His 'Evening Gown' was reported as producing its fine, lovely melon pink flowers for a very long period in the Deep South, and 'Amber Palace' has been called a "Pinnacle" among deep apricot copper melons.

James E. Marsh had many more very fine lavender and purple seedlings, some showing white edgings. In his garden, 'Chicago Thistle', a round, ruffled lavender released in 1972, and 'Chicago Two Bits', a very fine purple tetraploid to be introduced in 1973, were most outstanding performers. Clarence J. Blocher had some amazing new color segregations in his seedlings; he released his 'Galena Star' this fall.

Among the seedlings of Wm. R. Munson, Jr., in Gainesville, Fla., there were many new delights, such as 'Strasbourg' ('Kings Cloak' x 'Scarborough Fair'), a large rosy wine; 'Fugue', a medium large rose pink with circular cream throat; 'Kirishima', a large pastel peach and ivory blend; 'Embassy', a very round raisin wine, incredibly pro-

ducing three and four spikes per fan; 'Chittagong,' rose magenta to rose peach, with yellow eye washed rose, and carrying up to 50 buds; 'Mountain Violet' ('Kings Cloak' x 'Chicago Regal'), a rich violet purple; 'Ruwenzori', ('Medea' x 'Chicago Regal'), a fantastic blend of lavenders, and edged white; 'Kara Kum', a pastel blend, and its sibling 'Magnifique'—a superbly formed flower—out of 'King's Cloak'; and 'Prussia', the only red seedling used this year at Wimberlyway Gardens, where some 35,000 seed from the new crop were planted this autumn.

Frank Childs had outstanding new seedlings among his diploid whites and the lavenders out of 'Catherine Woodbury'. Dr. Currier McEwen of South Harpeswell, Maine, has found an exceptionally fine yellow among his seedlings, and he is looking for more tetraploid seedlings that can always open well in his cool climate; this quest can be of great value to areas having cool nights such as parts of California.

There has been no news from many of the other breeders, and we regret not being able to give some word of their efforts. All in all, 1972 was a busy and fruitful time for breeders all over the country, and great progress is being made in both tetraploid and diploid breeding.

TETRAPLOID HEMEROCALLIS TO CHINA

Hamilton P. Traub

Under date of August 16, 1972, seeds of the tetraploid daylily species, 2n=44, *Hemerocallis washingtonia* Traub clone 'Golden Ring' (Traub, 1971) were sent to the People of China through the Chinese Ambassador to the United Nations. Seeds of 'Golden Ring' were sent because it sets seeds readily to its own pollen, and thus it can be easily propagated by that means.

We know from the literature that in China the buds of the daylily, the native diploid *Hemerocallis* species, are harvested and used as a delectable fresh or cooked vegetable for use with meats, in soups and salads. The buds may also be dried and sold as a cash crop in China or for export in World trade. The dried product imported into the United States by Chinese immigrants is known under the names, Gum-jum (Golden Needle), or Gum-tsoy (Golden Vegetable).

However, the daylilies grown in China today are native diploid species, 2n=22, and the flowers have rather thin tepalsegs. Since 1949 (see Traub, 1951) in the United States, tetraploid daylilies have been produced. These are included under the species name *Hemerocallis washingtonia,* 2n=44, having flowers with very thick tepalsegs, and these are far superior to the diploids (2n=22) species now used as a vegetable.

GROWING AMARYLLIS FROM SEEDS

BURR CLOUETTE, *701 7th Av., San Diego, Calif. 92101*

In January 1970, I received some *Amaryllis* seeds from Dr. Traub who had in turn received them from Blossfeld in Brasil. There were ten good seeds in each of two packets. One was labeled *Amaryllis* 'Beautiful Lady' x *A. striata crocata,* and the other *A. striata crocata* self.

I germinated both lots by the tap water flotation method. Five good plants were obtained from each lot. The seedlings from each lot were planted in communal 5-inch pots. The potting mixture used was 2/3 Black Magic potting mixture and 1/3 coarse sand (actually Parakeet Gravel and charcoal mixture sold by Harts Mountain) plus a little baked crushed eggshell. I kept the soil moist at all times, and watered with regular strength solution of fish emulsion or dry fertilizer every second or third watering. They grew well. The *A. striata crocata* seedlings started to offset when quite small, and never did get larger than 1-inch in diameter during the entire time, except one seedling.

The 'Beautiful Lady' hybrid seedlings soon crowded the pot and at the end of seven months they were repotted. The largest two (about 1-inch in diam.) in one 6-inch pot, the other three in another 6-inch pot using the same potting mixture already indicated and the same watering procedure. They had slight periods of inactive growth but remained evergreen. The *A. striata crocata* seedlings had to be divided and repotted at the end of about a year. At that time most of the offsets were removed—all bulbs except one were scarcely more than ½-inch in diam. One exception was more robust in all particulars; the bulb was about 1-inch in diam., and leaves much broader than the others.

All seedlings were grown in half daylight sun or more. The pots were against a south facing wall most of the time or a south facing third story window. I have found in my experience with *Amaryllis* that they thrive with warm roots. All my best results have been with pots against a sunny wall, and a light well-drained potting mixture and regular watering and fertilizing.

In the spring of 1971, the 'Beautiful Lady' hybrids were again repotted singly in the potting mixture already indicated in 5-inch pots. They had been in more or less active growth since germination. Repotting did not set them back.

In the fall of 1971, the 'Beautiful Lady' hybrids were dried off and stored for a few months in a dry location. In February, two of the bulbs appeared to show slight sprouting and these were watered and placed in a warm place, where they started growth. They were moved to light. Soon buds shot up and they bloomed in March. The other three made leaf growth and two bloomed in April, and the fifth in May. Thus, they bloomed in two years from seeds.

None of the 'Beautiful Lady' hybrids showed any *A. striata crocata* influence. They were all similar to 'Beautiful Lady', but none were of

the same color—slightly different orangy color. One bulb produced two, 2-flowered scapes; three each produced one 2-flowered scape. None of the bulbs was over 1½-inches in diam. All flowers were smaller than 'Beautiful Lady'; all had a nice lacquered sheen and a darker throat.

The outstanding *A. striata crocata* self seedling developed a bulb 1½-inches in diam. and leaves about midway between 'Beautiful Lady' and *A. striata crocata* in width. All were good growers with few offsets, but no blooms as yet. The four other seedlings in the lot produced offsets in great profusion but there was very little increase in size of the bulbs, and no blooms. Perhaps they need less fertilizer and a drier culture than the 'Beautiful Lady' hybrids.

AMARYLLIDS IN PORTUGAL

H. CHRISTIANSON, *Fabrica de Tintas de Sacavem, Sacavem, Portugal*

Portugal is one of the native countries of *Narcissus* species, and where also other amaryllids such as *Allium, Leucojum* and *Pancratium* are to be found, all favored by the Mediterranean climate with dry warm summers and wet cooler winters. Because of this climate it is possible to grow here also a wide range of other amaryllids, taking care to water species coming from summer rain countries during the summer months, and planting these in a soil with very good drainage so that they will not get too much moisture during winter.

Still a few have to be kept dry in the winter in order to give them a dormant period; without which some will refuse to flower. In this way it has been possible to grow about 150 different *Amarylidaceae* here in my garden, including the Mediterranean natives and most of the species from South Africa and California where the climate is similar to that of Portugal.

From South America come many amaryllids and in PLANT LIFE one can frequently read about these, which in general are difficult to obtain in Europe. Surely, members of the AMERICAN PLANT LIFE SOCIETY would be interested in exchanging seeds of Amaryllids. I would be most interested in receiving letters from other members interested in making exchanges, not only of seeds, but also of experiences about the growing of the more difficult species. My address is given at the beginning of this brief article.

AMARYLLIDACEAE

Agapanthus: africanus minor - pendulus - umbellatus (+alba), **Allium**: akaka - albopilosum - caeruleum - callimisheriana - libani - moly - multibulbosum - neapolitanum - nigrum - odorum - oreophilum - polyastrum -pseudoflavum - pulchellum - roseum - schoenoprasum - schuberti - siculum sphaerocephalum - triquetrum tuberosum. **Alstroemeria**: aurantiaca - haemantha - hookeri - violacea. **Boophane**: disticha. **Brunsvigia,** appendiculata - gregara - orientalis - radula - rosea (Cape Belladonna). **Calostem-**

ma: luteum - purpurea. **Chlidanthus:** fragrans. **Clivia:** nobilis. **Cooperanthes:** X lancasteri. **Cooperia:** drummondii. **Crinum:** angustifolium - bulbispermum - campanulatum - flaccidum - macowanii - moorei - pedunculatum - Cape Dawn - Powellii. **Cyanella:** capensis. **Cybistetes:** longifolia. **Cyrtanthus:** coccineus - mackenii. **Dichelostemma:** congesta - ida-maia - pulchella. **Elisena:** longipetala. **Eustephia:** jujuyensis. **Galanthus:** plicatus (Ophelia + Washam). **Habranthus:** andersoni (+aurea F) - brachyandrus - pratensis - robustus. **Haemanthus:** albiflos - coccineus - katherinae - magnificus - multiflorus. **Hieronymiella:** childanthoides. Amaryllis; (syn. Hippeastrum); aulicum - bagnoldi - johnsonii. **Hymenocallis:** amancaes - harrisiana - ovata - Advance.

Leucojum: aestivum - autumnale - roseum - trichophyllum. **Lycoris:** aurea - incarnata - radiata - sanguinea - squamigera. **Narcissus: Aurelia:** broussonetii. **Hermione:** papyraceus. **Jonquilla:** fernandesii - gaditanus - wilkommia. **Apodanthae:** calcicola - rupicola - scaberolus - waterii. **Ganymedes:** triandrus cernuus. **Bulbocodium:** bulbocodium (graellsif +nivalis+ serotinus) - cantabricus (clusii+foliosus+monophyllus). **Pseudonarcissus:** asturiensis - hispanicus - minor - nevadensis - obvallaris - pseudonarcissus (+nobilis). **Nerine:** "alba" - bowdenii - crispa - duparquetiana - filifolia - flexuosa alba - krigeri - masonorum - sarniensis corusca major - undulata. **Pancrantium:** maritimum. **Rhodophiala** bifida. **Sprekelia:** formosissima **Sternbergia:** fischeriana - graeca - lutea - macrantha. **Tapeinanthus:** humilis. **Urceolina:** peruviana. **Vargaria:** parviflora. **Vallota:** speciosa. **Zephyranthes:** atamasco - candida - citrina - clintiae - grandiflora - lindleyana - pedunculata - sulphorea - verecunda.

In addition to Mr. Christianson's large plant collection includes various species of **Bessera, Bloomeria, Leucocoryne, Brodiaea, Tristagma** (Ipheion), **Tulbaghia, Triteleia, Milla,** and **Agavaceae, Iridaceae, Liliaceae,** and **Orchidaceae.**

PLANT LIFE LIBRARY—continued from page 52.

PHYSICAL EDAPHOLOGY, by Sterling A. Taylor and Gaylen L. Ashcroft. W. H. Freeman & Co., 660 Market St., San Francisco, Calif. 94104. 1972. Pp. xiii + 533. Illus. $17.50. Subtitled, The Physics of Irrigated and Non-irrigated Soils, this attractive new book on the latest scientific innovations and their application to soil-water-plant relationships will fill a serious need in the field of soil science, including irrigation science. The subject is developed under the following headings,—foundations of irrigation science; climatic factors; evapotranspiration; physical properties of water; the colloidal system; soil solids; energy relations, movement and measurement of soil water; water retention and flow in soils; soil structure and aeration; temperature, irrigation and maximum production; irrigation under adverse conditions; and irrigation methods. Very highly recommended.

FUNDAMENTALS OF PLANT PATHOLOGY, by Daniel A. Roberts and Carl W. Boothroyd. W. H. Freeman & Co., 660 Market St., San Francisco, Calif. 94104. 1972. Pp. xii + 402. Illus. $15.00. This attractive, easily readable book was written for the "Fully 90 percent of the 4000-odd students who take college courses in plant pathology every year and who are undergraduates studying the subject for the first and last time, as well as for those who decide to undertake a career in this field." The subject is presented in two parts: (1) the theory of plant pathology, and (2) plant pathology in practice. There are two useful indicies: (a) techniques for diagnosis of plant diseases, and (b) use of the literature of plant pathology. Very highly recommended.

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EDITED BY
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Box 150, La Jolla, California 92037

NEW PECK TETRAPLOID DAYLILIES, shown in color in the following insert; through the kind permission of Mrs. Arthur W. Parry; Drs. Richard C. and Virginia L. Peck; the Hemerocallis Journal; and the Southern California Hemerocallis and Amaryllis Society, the sponsoring organization, we present the color plates of four new outstanding originations in **Hemerocallis washingtonia** Traub, the tetraploid species. Our debt to the above named persons and organizations is hereby gratefully acknowledged.

'Queen Eleanor' (Peck, 1967). Photo by Mrs. Arthur W. Parry. Flowers delicate creamy pink on opening, deepening to a glowing, diamond dusted shell pink in the sun; edges of segs gold-colored, ruffled, midribs lavender; throat green; recurrent blooming; fertile both ways; (Wood Sdlg x 'Crestwood Ann').

'Gypsy Laddie' (Peck, 1969). Photo by Dr. Virginia L. Peck. Flowers rose pink, deeper rose red veining on segs, and edges, slightly banded rose, throat tangerine-colored. Fertile both ways; recurrent blooming; ('Singalong x Sdlg).

'Queen the Roses' (Peck, 1972). Photo by Dr. Virginia L. Peck. Flowers of a very deep, vibrant rose with lavender tones; petsegs veined deeper rose, setsegs mauve with deeper rose veining; throat apricot-colored; segs ruffled and crimped. Recurrent blooming. (T2-34-67 x T12-65)

'Someday Maybe' (Peck, 1972). Photo by Dr. Virginia L. Peck. Flowers the color of "crushed strawberries dusted with gold", setsegs strawberry pink, petsegs lighter pink; deep flamingo-colored throat shades out into the pink segs. (T2-34-67 x T12-65)

QUEEN ELEANOR (Peck)

GYPSY LADDIE (Peck)

THE SECOND DECADE OF **HEMEROCALLIS WASHINGTONIA** JAN. 1, 1959—DEC. 31, 1968 *

HAMILTON P. TRAUB, W. QUINN BUCK AND HUBERT C. LLOYD

ABSTRACT

The development of the colchicine-induced tetraploid species, Hemerocallis washingtonia Traub (1951) **under cultivation is detailed for the second decade. 1959—1968.**

I. INTRODUCTION

The readers are referred to the first report published in PLANT LIFE (Traub, 1959, 1960) which covered the first 10 years of *Hemerocallis washingtonia* Traub, 1949 through 1958. This report was also published in the Hemerocallis Journal (Traub, 1960, 1963).

Hemerocallis washingtonia Traub (1951) is *the first named and published colchicine-induced tetraploid plant species, and is thus unique.* From the first it was planned to publish reports of the species under cultivation at ten year intervals (decades) so as to preserve a record of its development. It was also planned, if possible, to naturalize the species in Eastern Asia, the native home of the diploid *Hemerocallis* species, in order to observe its development in the wild in competition with the native species. However, the political conditions in Eastern Asia were unfavorable for such an undertaking during the first and second decades. It is hoped that such studies can be undertaken in the future.

The outlook on *Hemerocallis washingtonia* since the 1950's has changed radically. When the senior author offered a first progress report to the newly organized publication of the Hemerocallis Society, it was refused and returned so deep was the disbelief in its future. The late E. J. Kraus (1885-1960) stated flatly that the future of hybrid *Hemerocallis* was not in the direction of tetraploids. However, even towards the end of the first decade, 1949-1958, some recruits were enlisted as indicated in Table 1, showing that seven named clones had been introduced by three hybridizers. This, however is not a true index since a number of other outstanding clones had been selected but had not been formally introduced and these technically belong in the second decade and are listed in Table 2, particularly clones named and introduced during the transition period, 1959-1961, including 'Big Brassy', 'Billy Budd', 'Cabrillo', 'Canary Butterfly', 'Captain Reid', 'Crestwood', 'Crestwood Ann', 'Crestwood Bicolor', 'Crestwood Evening', 'Crestwood Rose', 'Doctor Whitaker', 'Elizabeth Traub', 'Giordano Bruno', 'Lemon Beauty', 'Lucia', 'Lucretius', 'Madrid', 'Magdalena Luethi', 'Ophelia', 'Pacific One', 'Pacific Two', 'Peter Cooper', 'Purple

* This is a cooperative paper; the first two authors are responsible for the text; Mr. Lloyd has prepared the tables of clones.

Premier', 'Ralph Cornell', 'Reverend Traub', 'Salmon Orchid', 'Sue Booth', 'Tetra Arthustar', 'Tetra Aurantorosea', 'Tetra Blossom', 'Tetra Carmine', 'Tetra Elaine', 'Tetra Elyandre', 'Tetra MacArthur', 'Tetra Prima Donna', 'Tetra Rose', 'Tetra Yandre', 'Tetra Yandrestar', 'Traub Violetta', 'White Prelude' and 'Wyndham Haward'.

Now (1968) at the end of the second decade, the interest in the species had greatly increased and many indeed had jumped on the band wagon (See table 2). It is thus incredible that when a daylily handbook (Darrow & Meyer, eds. 1968) was published at the end of the second decade of the species, *Hemerocallis washingtonia* was not recognized, and the plants included in it were lumped with diploid *Hemerocallis* hybrids as tetraploids. For any remaining doubting thomases, the basis of the species is here restated.

First, it should be noted that various other recognized plant species exist only as cultivated plants, including Amerindian Corn or Maize, *Zea mays* L., Polish Wheat, *Triticum polonicum* L., Durum Wheat, *T. durum* Desf., English Wheat, *T. turgidum* L., Grapefruit, *Citrus paradisi* Macf., and many others. Thus species restricted to cultivated plants are not unusual, but *Hemerocallis washingtonia* Traub is the *first named colchicine-induced* plant species.

In *Hemerocallis* L., under natural conditions, only diploids had been evolved over long periods of geological time. A few sterile triploids had appeared in the wild but these were dead-end individuals that could not reproduce their kind. When tetraploids were produced under laboratory conditions by means of colchicine poisoning, fertile offspring could be obtained from certain individuals and these became the beginning of an evolving interbreeding line *which would not intercross with the diploid species.* As still other diploids were tetraploidized, the gene pool was further increased and enriched. Such a line is a species whether it originates under natural conditions or artificially in the laboratory. Thus, such a species cannot be lumped as tetraploids with the diploid species and has to be recognized as a valid species in its own right.

By the end of the first decade, as shown in Table 1. *Hemerocallis washingtonia* was definitely established, with populations in a number of gardens in the United States, numbering in the thousands of individual plants. Seven outstanding individual selections had been named and introduced and 41 had been selected but had not been introduced; all of these were propagated as clones. Thus, a thriving cultivated species was being maintained.

TABLE 1. Catalog of named clones of **Hemerocallis washingtonia** Traub introduced during the first decade, Jan. 1, 1949—Dec. 31, 1958.

Breeders; W. Quinn Buck (California); Robert Schreiner (Minnesota; later Oregon); and Hamilton P. Traub (Maryland; later California).

A number of clones (41 in number) originated up to 1958, but not formally named until 1959-61 (see text) technically belong in the second decade, and are listed in Table 2.

'Brilliant Glow' (Schreiner, 1951), yellow orange self; first bloomed in 1947.

'Tetra Apricot' (Traub, 1951), apricot colored.
'Tetra Kanapaha' (Buck, 1949), Jour. Cal. Hort. Soc.; raspberry self.
'Tetra Peach' (Traub, 1951), peach colored.
'Tetra Rosalind' (Traub, 1953), pastel pink.
'Tetra Soudan' (Buck, 1949), Jour. Cal. Hort. Soc.; yellow self.
'Tetra Starzynski' (Traub, 1949), orange red, medium, self; the nomenclatural type of **Hemerocallis washingtonia** Traub.

II. THE SECOND DECADE OF HEMEROCALLIS WASHINGTONIA, 1958—1969.

As already indicated, at the beginning of the second decade, there was a definite swing in favor of tetraploid daylilies as represented by *Hemerocallis washingtonia.* This swing gained momentum during the following ten years as a number of determined workers made contributions in this field. Especially to be noted are papers on (a) genetics, (b) improvement in the methods for tetraploidizing, (c) the utilization of these methods for the enrichment of the tetraploid gene pool, and (d) the increase in the number of workers engaged primarily in breeding tetraploid daylilies. These developments will be briefly reviewed. An attempt was made to gain first hand information to supplement published reports. If there are any inadvertent omissions, these can be corrected by a supplementary note in the next issue of the PLANT LIFE.

(a) Genetics

Various preliminary studies in genetics have appeared since 1958 concerning inheritance in *Hemerocallis washingtonia.*

Traub, Bohn & Whitaker (1968) on the basis of preliminary data conclude tentatively that only the full recessive of "melon" flower color exhibits the "melon" phenotype, and suggest a method for testing this hypothesis.

Flory & Phillips (1968) report that in less than 1% of the slow-growing delayed-flowering seedlings that appear when tetraploids are crossed, called "static dwarfs", the loss or gain of chromosomes and perhaps particular chromosomes, would seem to be ultimately responsible for the abnormal growth habits of the plants studied. In this connection, it should be noted that new aneuploid *Hemerocallis* species, with a lesser or greater than the euploid number of chromosomes, 2n= 40, 42, 46, could be established. These might not intercross with the diploids, 2n=22 or the tetraploids, 2n=44.

According to Shults (1968) on the basis of preliminary results with seeds of diploids, the optimum x-ray dosage for maximum potential mutations in seeds are 3,000, 4,000 and 5,000 roentgens. Similar experiments with seeds of tetraploids remain to be carried out. However, it might be good practice to use diploids in such experiments, and then tetraploidize any individuals showing desired mutations. Although some progress has been made toward a pure white daylily, this goal has not as yet been reached. It is suggested that the use of x-rays and

other radiation treatments may be utilized in treating seeds of near white diploid daylilies in attempts to obtain white-flowering individuals, It is possible that the complement 2n=22 might be easier to modify than the 2n=44 complement. Once diploid white-flowering individuals have been obtained, these could be tetraploidized and the latter used in further breeding. It is hoped that some one will follow up this lead. Perhaps, also other desirable characters could be obtained as by-products, such as longer lasting flowers.

A heritable defect in *Hemerocallis* named "stamen-embracing petepalsegs" (Traub, 1968) has been reported. This can be minimized by making crosses with normally-flowering plants followed by selection of non-affected seedlings among the progeny.

(b) Methods for Tetraplodizing

The classical methods for inducing polyploidy in daylilies by means of colchicine treatment in daylilies have been reported during the first decade of *Hemerocallis washingtonia.* Schreiner (1951), Buck (1949) and Traub (1949, 1951), who all began their work in the 1940's, reported on such techniques, giving particulars about procedure. The initial successes in time were recognized by others and the classical techniques were used as the basis for further progress in this field during the second decade of *Hemerocallis washingtonia.* These will be briefly reviewed here.

The publication in 1961 of the Griesbach-Fay-Horsfall method for inducing polyploidy in newly germinated *Hemerocallis* seedlings was a major new technical advance since it was so clearly worked out and described as to be useful even to the amateur. R. A. Griesbach in 1953, under the direction of Professor Paul Voth at the University of Chicago, began a series of tests to study concentrations of colchicine solutions to be used, duration of treatment, stage of development of the seedlings, using the Traub (1951) report as a basis for his tests. These experiments led to the treatment in the early spring of 1955 of 5000 seedlings, which were barely submerged for 12 hours in a 0.05% solution of colchicine, then washed in running water for four hours, and immediately planted just at the surface of flats of loose soil. Approximately 1000 seedlings survived the treatment and were set out in the Fay fields in Northbrook, Illinois in the spring of 1956; of this number about 125 outwardly showed characteristics of polyploidy. Out of this group were selected the clones later named 'Crestwood Evening' and 'Crestwood Bicolor'. Large batches of seedlings of selected Fay crosses were treated in 1957, 1958, and 1959, and for some years thereafter.

The paper describes pre-treatment and germination of seed and pictures very clearly the exact recommended stage for treating the seedlings; it emphasizes the need for washing the treated seedlings before planting.

The next landmark technique in polyploidizing *Hemerocallis* came with the publication of the Arisumi method; because of its much easier accomplishment than the earlier Buck (1949) technique reported in a brief note in 1949, Dr. Arisumi's method has been used widely

and very successfully by some of our hardest working breeders to be enumerated later. The Arisumi method cut off the entire top about ½ inch above the crown; the leaf tissue was then hollowed out to about ¼ inch above the crown, forming a depression for holding the 0.2% colchicine solution. Careful and specific information on the preparation of the vigorously growing plant, the treatment, and the interpretation of results are all discussed in this paper.

Dr. Virginia L. Peck began experimenting with inducing tetraploidy in daylilies as early as 1958 and 1959, when small ramets were treated in various ways. In 1960 she began treating germinating seedlings by the Griesbach-Fay-Horsfall method, which she modified in 1962 by prolonging the immersion of the germinating seedlings, just prior to shoot emergence, to 24 to 48 hours, instead of 12, getting thereby a lower survival rate, but with a much higher percentage of affected seedlings. Much work went into the winter greenhouse care and growing of the treated seedlings, and this experience Dr. Peck described. A major contribution of the Peck work was in identifying and evaluating polyploidy in the treated material by measuring stomate and pollen grain sizes and interpreting results. By 1963 there were 3000 treated seedlings in the Peck fields, and using all of these plants Dr. Peck made comprehensive breeding studies in the use of chimeras and complete tetraploids.

Dr. Peck was one of the first to begin using the Arisumi method for treating clonal material, and in this she exhibited the same energy and devotion as in previous experimenting. During the winter the greenhouse has had as many plants crowded in for treatment as possible. This work has been reported to several of the scientific seminars of the national conventions of the American Hemerocallis Society by Dr. Peck and her husband, Dr. Richard C. Peck, who has given unlimited help and encouragement in all projects. These years of work have resulted in the production of many important and beautiful named varieties of tetraploids now available.

Dr. W. H. Lachman in 1968 presented an extremely valuable simple way of treating *Hemerocallis* seedlings by a modification of the Traub (1951) method of soaking small ramets: Seedlings about six inches tall were placed in beakers of 0.025% to 0.03% colchicine solution for 5—7 days, at room temperature, then washed and planted out in the open ground. This method gave a very much better survival rate than when newly germinated seedlings were treated, and it gave 5—10% affected adult plants.

The latest new technique for inducing polyploidy in *Hemerocallis* to be published in this second decade of the tetraploid daylilies was the injection method for treating spikes worked out by W. Quinn Buck (1968, 1969) in experiments begun in the early 1950's. By 1955 it was clear that this was a very useful short-cut to getting tetraploid pollen from desirable diploids for use on fertile tetraploids already developed, which could serve as pod parents. The mechanics of the procedure were outlined, and the need to reduce the concentration of

the colchicine solution to about 0.03% was pointed out. There have been reports of wide discussion and use of the method, but only two workers have communicated their results to the writers.

A careful study of the use of measurements of guard cells and the pollen grains in identifying chimeras among colchicine-treated seedlings by Nicholas C. Arguimbau in 1967 should be noted because it clarifies certain problems of interpreting these measurements.

A simple method for studying stomatets as indicators of ploidy in *Hemerocallis* was presented by W. H. Lachman.

(c) Increasing the Gene Pool, and Breeding

Two types of activity have to be distinguished, (1) polyploidizing to increase the existing gene pool of the tetraploid species, *Hemerocallis washingtonia,* as detailed in the preceding section, and (2) utilization of the available tetraploids of the cumulative gene pool in breeding.

Among those who were active in increasing the gene pool by colchicine treatment during the first decade of *Hemerocallis washingtonia,* Buck and Traub have continued in breeding tetraploids during the second decade. Most of the other workers in techniques have also made contributions in the field of breeding tetraploids using the cumulative gene pool. Still others, not engaged in devising techniques, make use of the ever enlarging tetraploid gene pool in their breeding operations. Traub now has an array of near whites, yellows, oranges, pumpkin, large-flowering "melons", pinks, reds and purples. Buck has had similar results and has a wide range of colors through purple, red, pink, melon, yellow and orange.

Among the more productive of tetraploid breeders in the Chicago area is Bro. Charles Reckamp, S.V.D.,who began working with tetraploids at Mission Gardens shortly after the Fay-Griesbach experiments were initiated. Bro. Daniel Yunck, S.V.D., did the actual treating of germinating seedlings in the laboratory for Bro. Charles, using the Griesbach-Fay-Horsfall method. These seedlings, crossed with the Crestwood Series and other available tetraploids, gave Bro. Charles the foundation stock for his marvelous melons and light yellows. By 1967 and 1968 he had raised many seedlings, including some of the finest named tetraploid clones in these two groups, and he was beginnig to have a few pinks.

James E. Marsh, of Chicago, using seed from crosses of his highly successful diploid lines and including some 400 seed of the cross, 'Prairie Thistle' x 'Lavender Flight', in March of 1965 germinated and treated 3000 seedlings by the Griesbach-Fay-Horsfall method; the 300 survivors were grown under lights in the Marsh basement until late spring when they were planted out in the garden. The first of these bloomed in 1966, and the last of this batch bloomed as late as 1968, giving him some important tetraploid breeding material in the purples and lavenders, such as the chimeric TR 67-90, which later gave a number of the Marsh named varieties. Other batches of 3000 seedlings were treated in 1966 and 1967, with about 300 survivors from each, giving him a particular

advantage in the purples. After those years Mr. Marsh concentrated on germinating the seed of his tetraploid crosses under lights.

Orville W. Fay, in summarizing a decade of work with tetraploid daylilies, in 1964 reported having treated an estimated 25,000 germinating seedlings in that period. 1959 was his first really successful year in flowering induced tetraploid seedlings; this was the year when 'Crestwood Ann' first bloomed, and this matriarch of tetraploids has been of great importance ever since. By 1964 Mr. Fay had tetraploids in every color, being limited only in numbers of reds and lavenders.

Dr. R. A. Griesbach for a number of years grew many seedlings of his own crosses in his home garden in Chicago, having begun with much material from Professor Paul Voth's lines. By 1966 he had named 'Arriba', a large green-throated red, and in 1967 Mrs. W. T. Hardy bought a selected group of his tetraploid seedlings, which she released in 1968.

Nathan Rudolph, of Chicago, almost as soon as the Crestwood Series became available, began combining the Fay clones with the Traub tetraploids, and by 1968 he had released several of his own varieties.

C. J. Blocher, of Wheaton, Illinois, began intensive breeding of the various tetraploid lines in his Chicago area in the early 1960's. By 1968 he was beginning to see promising seedlings in his chosen colors of red, rose, pink, lavender, and purple.

Mr. Walter Jablonski, of Merrillville, Indiana, experimented with treating spikes by his own modification of the method (by using hypodermic syringes) immediately after the appearance of the Buck article, and from this first season's work he raised 200 tetraploid seedlings, some of which gave very beautifully formed flowers. Being able to get and use tetraploid pollen from treated spikes of selected diploids saved several years, he reported. Much experimenting with various other methods of tetraploidizing was begun and has been continued, with excellent results.

Steve Moldovan, of Avon, Ohio, must be included in this group of Chicago workers because Moldovan's Gardens for some years released the new Fay tetraploids, as well as Bro. Charles's new introductions, which it still lists each year. In addition, Mr. Moldovan treated seed and plants for a number of years, all of this giving him an extremely rich bank of material from which he has begun to get important color breaks and segregations.

In the Northeast, Dr. Currier McEwen 1972, of South Harpswell, Me., began treating sprouted daylily seed in March of 1961 following a visit to Mr. Fay at Iris time in the previous year. Over the years since, some 12,000—15,000 seedlings have been treated by him. His first induced Chimera bloomed in 1963, but he did not have his own tetraploid crosses blooming until 1966. In his extensive breeding program he has been working to get hardy clones that will open well in his cool climate; he has been interested in greens, near-whites, purples, and green-throated reds, as well as doubles.

In Massachusetts, Lawrence Arguimbau (1967) and his son Nicholas have been working with tetraploids since 1963 and have had moderate success in tetraploidizing.

W. H. Lachman, of Amherst, Mass., had had some very favorable results with his tetraploid breeding program.

In the South, Frederick M. Benzinger (1966, 1972) of Ruckersville, Va., began treating diploid plants in October, 1964, using the Traub (1951) method and an original method of injecting the whole crown with a hypodermic needle. This injection method was abandoned in favor of Dr. Traub's technique. Mr. Benzinger worked out methods of propagation so that he could isolate affected tissue of chimeras. He also raised diploids from seed treated with X-rays and Cobalt 60, later successfully tetraploidizing these clones and using them in breeding. In his large commercial greenhouses Mr. Benzinger has carried on his very extensive programs even in winter, using not only his own induced material, but also the Traub clones and the Arisumi induced clones from the United States Department of Agriculture, and named tetraploid clones from other breeders. He has been making progress in shortening the time from seed to blooming, in quality, form, and ruffling of flowers, in reblooming tendencies, in colors such as blue, which he has in his acid soil, and in a number of other directions. He anticipates flowering many important seedlings from all the stock at hand. A number of Benzinger tetraploids have been named and released.

The work of R. W. Munson, Jr. of Gainesville, Florida, has been particularly noteworthy because of the new colors that he has gotten in certain fine tetraploid clones. Aided and encouraged by his equally tireless mother, Mrs. Ida M. Munson, this breeder has been growing a large number of tetraploid seedlings annually. In 1960 the Munsons treated some 8000 germinating seedlings, finally getting 200 affected survivors from a lot. Various diploid clones and seedlings have been treated by the Arisumi technique since it was published, with several instances of very important successes; many of these plants have been treated directly in the ground beds after the tops were cut off, and this work has usually been done most successfully in the fall. Mr. Munson annually has obtained the best new introductions from other tetraploid breeders, thus enlarging the genetic pool available for his work.

In Jenkinsburg, Georgia, Frank Childs began working with tetraploids even before the Crestwood Series became available. He also had germinating seedlings from his crosses treated, and this material was the foundation stock for his tetraploid breeding, which has led to a number of introductions.

Mrs. W. T. Hardy, of Mount Olive, Alabama, early began breeding tetraploid daylilies from introduced clones and seedlings of her own which she had someone treat for her. For a number of years she selected and introduced the new Traub varieties that were released, such as 'White Cloud.' In 1967 she bought a group of selected Griesbach seedlings, including 'Arriba'; these were released the following year.

Mr. Clyde W. Davidson, of Decatur, Georgia, bought his first tetra-

ploid varieties in 1964; by 1968 he had named and introduced 8 of his own clones. The foundation stock included Fay, Traub, and Reckamp varieties.

Mr. C. T. Tanner (1972), of Cheneyville, Louisiana, tried seed treatment once unsuccessfully, and then turned to treating diploid clones by the Arisumi method. His trials have led him to do most of his treating in the fall in the open ground, and he uses a 0.02% solution because he prefers to re-treat after a couple of years rather than risk losing the plants from a higher concentration. Mr. Tanner has named and introduced some of his tetraploid seedlings.

In Iowa, Louisiana, Miss Edna Spalding (Ca. 1965) worked very hard for several years before her death treating many plants in the beds of her garden. She had even greater success than Mr. Tanner, and many of us are familiar with her 'Tetra Dorcas' and 'Tetra Edna Spalding'. She left a number of her own tetraploid seedlings, including 'Uncovered Treasure', released in 1969.

E. W. Brown III of Orange, Texas, began breeding tetraploid daylilies in the early 1960's, and it is reported that much work has been done at his ranch and that some clones have been named. It has not been possible to get definite information from Mr. Brown.

Dr. Margaret Alexander (Mrs. Kirby Vance) of Taylor, Texas, was one of the first to treat flower spikes of diploids, preferring to use disposable hypodermic syringes of her profession rather than the glass tubes suggested by the Buck article. She had favorable results and was able to get tetraploid seedlings for further breeding.

In Dallas, Texas, a small group of enthusiastic breeders has been working hard. Dr. Robert P. Miller (1968) began germinating and treating several hundred seedlings each year since 1963, and he has acquired many named tetraploid clones for his serious breeding program. Mr. Urey M. Winniford has been treating both sprouting seed and clonal material, and these he has used with representative varieties. He has introduced one tetraploid variety, 'Elma Lee'. Mrs. Jay E. Warner and her daughter Malinda became interested in tetraploid daylily breeding in 1961. In 1966 Malinda treated 3000 seedlings in preparing her Science Fair project, while Mrs. Warner treated 5000 seedlings in both 1966 and 1967. They both began treating ramets of named clones in early 1967. In the fall of 1967 Mrs. Warner set out 1000 fans of named and seedling diploids which, when established, were treated in the ground by cutting off the tops as in the Arisumi method but using a single drop of 1% colchicine solution in each fan. In the fall of 1968 Mrs. Warner treated an additional 1500 ramets, while Malinda treated 300 more for their big joint project, from which much can result.

In the West, Jack S. Romine, of Walnut Creek, California, became interested in tetraploidizing in about 1965 after visiting the Traub, Buck, and Peck gardens. Thereafter he treated hundreds of fans by the Arisumi method, and from chimeras and tetraploids obtained he made many crosses, using named tetraploid cultivars in addition. He now has an wide range of material to use in his breeding program.

(d) Concluding Remarks

This report covering the period, 1959—1968, the second decade of the species *Hemerocallis washingtonia,* shows clearly that this colchicine-induced species is a viable entity with a relatively large population distributed in the gardens of devotees in continental United States. Some plants are also grown in foreign countries, and these collections should increase materially during the third decade. Since the first report, the number of those who have introduced (registered) named clones has increased from 3 to 24, and no less than 211 named clones had been introduced during the second decade ending in 1968. Many others were engaged in breeding tetraploids, but had not as yet introduced any clones.

INDUCING POLYPLOIDY.—Steady progress has been made in devising methods for inducing polyploidy in diploid *Hemerocallis* so that even the beginning amateur may try his hand at this fascinating work. He now has the power to play God and enrich the gene pool of the new species. Great diligence is necessary to master the technique for inducing polyploidy. The amateur should try and try again until he has achieved his goal. The material must be in the right physiological condition when treated with the right concentration of colchicine. Other details also have to be just right. Only patient trials will bring the desired results.

BREEDING EXPERIMENTS.—It was noted from the start that no matter how wonderful the original diploid seedling or clone might be, the value of the resulting tetraploid can only be determined by actually testing it as a parent for important progeny. The writers can testify that they have often been disillusioned when the induced tetraploid gave poor or indifferent progeny. The rule should therefore be to discard and discard, starting again with new induced tetraploids. They should not cry over spilled milk, or blame the one who introduced the poor parent, but should get busy and induce some tetraploids of their own.

Perseverence is not only necessary when attempting to induce tetraploids that give excellent progeny, but also in breeding experiments to attain a desired objective. It is well known that only a very minor percentage of crosses are superior plants. Thus, it is necessary not only to try promising crosses in various directions again and again, but also to discard and discard, keeping only the very finest as parents of the next generation.

At the end of the second decade, it is clear that desirable flower size has been attained, and the color range has been increased so that it varies from very light yellow, yellow, orange, pumpkin, red, pink, purplish and bluish. The pure white daylily has not been achieved. Probably X-ray treatment can do the job? The next important step is to breed for color fastness, which has been achieved in some tetraploids; and colors which although changing slightly are still desirable at the end of the day, and can withstand the effects of rain and dry winds. And

the time has arrived when plants of excellent growth habit should be the objective sought by the breeder. Plants should ordinarily be three feet or less in height, recurrent blooming, evergreen or semi-deciduous for southern climates, and deciduous for northern regions.

The third decade should bring some outstanding results by 1978.

TABLE 2. Catalog of named clones of **Hemerocallis washingtonia** Traub introduced during the second decade, Jan. 1, 1959—Dec. 31, 1968. Number of hybridizers, 24; number of clones introduced: 211.

HYBRIDIZERS

Benzinger, Mr. F. M. (Va.)
*Buck, Mr. W. Quinn (Calif.)
Childs, Mr. Frank W. (Ga.)
Davidson, Mr. Clyde W. (Ga.)
Fay, Mr. Orville W. (Ill.)
Griesbach, Dr. R. A. (Ill.)
Hamacher, Mrs. Lavinea (Mich.)
Hankins, Mrs. Wm. F. (Fla.)
Hardy, Mrs. W. T. (Ala.)
Hite, Mr. H. J. (Mich.)
Long, Mr. J. H. (Ga.)
Maynard, Mrs. C. G. (Mich,)
McEwen, Dr. Currier (Maine)
Moldovan, Mr. S. C. (Ohio)
Munson, Mr. R. W., Jr. (Fla.)
Peck, Dr. Virginia L. (Tenn.)
Reckamp, Bro. Charles (Ill.)
Rudolph, Mr. N. H. (Ill.)
* Schreiner, Mr. Robert (Oregon)
Sellers, Mr. Van M. (N. C.)
Tanner, Mr. C. T. (La.)
*Traub, Dr. Hamilton P. (Calif.)
Webster, Mr. R. L. (Ala.)
Winniford, Mr. U. G. (Tex.)

* Hybridizers who introduced named clones also during the first decade (1949—1958).

NAMED CLONES

'Adam' (Moldovan, 1968)R; Red with blue cast.
'Adela' (Griesbach-Hardy, 1968) R; Pink melon self.
'African Gold' (Benzinger, 1968) R; Golden orange self.
'African Melon' (Benzinger, 1968) R; Light melon blend.
'Alcazar' (Traub, 1959), Golden West Bulb Farm catalog. Nasturtium orange.
'Alison' (Peck, 1968) R; Pink blend.
'Allegiance' (Griesbach, 1968) R; Red self.
'Allurearama' (Hamacher, 1967) R; Brilliant yellow self.
'Angelus Bells' (Hite, 1968) R; Coral suffused gold.
'Ann Castonguay' (McEwen, 1968) R; Rich yellow melon self.
'Anya' (Munson, R. W. 1966) R; Yellow self.
'Arbordale' (Davidson, 1967) R; Melon pink with pink midrib.
'Arcadia Buttercup' (Buck, W.Q., 1963) R; Empire yellow self.
'Arriba' (Griesbach 1968) R; Dark red self with green throat.
'Asia Minor' (Munson, R.W., 1965) R; Orange gold self.
'Ballerina' Pink (Tanner, 1968) R; rose pink blend.
'Barcelona' (Schreiner, 1968) R; Bright orange self.
'Beaumont' (Davidson, 1967) R; Light yellow self.
'Bengaleer' (Peck, 1968) R; Deep yellow self.
'Big Brassy' (Buck, 1961); Bright gold self.
'Billy Budd' (Traub, 1959); Golden West Bulb Farm catalog. Red self.
'Binnorie' (Peck, 1968) R; Pink blend with yellow throat.
'Bond Street' (Hardy, 1967) R; Golden orange self.
'Bonnie Barbara Allen' (Peck, 1967) R; Rose pink self.
'Bonnie John Seton' (Peck, 1967) R; Light yellow self.
'Bonny Hour' (Peck, 1968) R; Peach pink blend with green throat.
'Borderline Gold' (Benzinger, 1968) R; Red with gold border.
'Bountiful Harvest' (Reckamp, 1967) R; Buff with orchid midribs.
'Bright Copper' (Fay, 1968) R; Bright copper self.

'Bright Dawn' (Rudolph, 1967) R; Deep golden yellow self.
'Butterfly Beauty' (Traub, 1966) R; Yellow self.
'Cabrillo' (Traub, 1959) Golden West Bulb Farm catalog. Cadmium orange self.
'Cahaba Gold' (Hardy, 1967) R; Golden orange self.
'Canary Butterfly' (Traub, 1959) Golden West Bulb Farm catalog. Canary yellow.
'Canary Glow' (Benzinger, 1968) R; Canary yellow self.
'Captain Reid' (Traub, 1959) Golden West Bulb Farm catalog. Deep red self.
'Caption' (Griesbach-Hardy, 1968) R; Lavender self.
'Cathedral Bells' (Childs, 1965) R; Pink blend with green throat.
'Catoosa Dream' (Long, J.H., 1967) R; Cream blend.
'Catoosa Sun' (Long, J.H., 1967) R; Golden self.
'Champlain' (Davidson, 1967) R; Medium yellow self.
'Changing Times' (Reckamp, 1966) R; Creamy apricot blend.
'Cherokee Princess' (Peck, 1967) R; Blush pink blend.
'Cherry Cheeks' (Peck, 1968) R; Rose pink blend.
'Child of Ann' (Hanacher, 1968) R; Medium self with yellow throat.
'Commandment' (Reckamp, 1968) R; Bright pinkish orange blend.
'Coventry Court' (Munson, R.W., 1968) R; Peach rose blend.
'Crestwood' (Fay-Griesbach, 1961) R; very light melon self.
'Crestwood Ann' (Fay-Griesbach, 1961) R; Medium melon self.
'Crestwood Bicolor' (Fay, 1961) R; cream and bronze bicolor.
'Crestwood Evening' (Fay-Griesbach, 1961) R; Canary self.
'Crestwood Gold' (Fay-Griesbach, 1963), Fay catalog. Gold self.
'Crestwood Lucy' (Fay-Griesbach, 1963); Moldovan's catalog. Salmon pink.
'Crestwood Rose' (Fay-Griesbach, 1961) R; Deep rose pink self.
'Deacons Darling' (Maynard, 1966) R; Yellow self.
'Doctor Whitaker' (Traub, 1959); Golden West Bulb Farm catalog. Tangerine orange.
'Domani' (Munson, R.W., 1967) R; Rose pink self.
'Douglas Dale' (Peck, 1968) R; Red blend.
'Drexel' (Davidson, 1967) R; Light yellow self.
'Earl Brand' (Peck, 1967) R; Medium yellow self.
'Egleston' (Davidson, 1967) R; Copper gold.
'Elfin Knight' (Peck, 1967) R; Pink apricot blend.
'Elizabeth Traub' (Traub, 1959); Golden West Bulb Farm catalog; orange self.
'Elna Lee' (Winniford, 1968) R; Melon self with green throat.
'Elvira' (Traub, 1960), Golden West Bulb Farm Catalog. Chinese yellow self.
'Empress Mei Ling' (Munson, R.W., 1967) R; Rose self.
'Envoy' (Reckamp, 1966) R; Cream pink blend.
'Esperanza' (McEwen, 1967) R; Golden orange self.
'Eve' (Moldovan, 1968) R; Pink self.
'Fair Annet' (Peck, 1967) R; Pink blend.
'Fair Isabel L' (Peck, 1967) R; Apricot pink self.
'Fair Margaret' (Peck, 1967) R; Apricot pink and yellow blend.
'Fairview' (Davidson, 1968) R; Rose pink with darker viens.
'Forecast' (Hardy, 1967) R; Bright medium yellow self.
'Fortune Teller' (Reckamp, 1968) R; Creamy buff with rose purple eyezone.
'Frosted Full Moon' (Hamacher, 1966) R; Vivid yellow self.
'Georgica' (Munson, R. W., 1966) R; Rose self.
'Gertrude Smith' (Fay, 1966) R; Light tan pink.
'Gil Benton' (Peck, 1967) R; Apricot yellow blend.
'Giordano Bruno' (Traub, 1959); Golden West Bulb Farm catalog. Dark reddish orange.
'Glendale' (Davidson, 1968) R; Melon with pink midrib.
'Glowing Times' (Benzinger, 1967) R; Yellow gold self.
'Golden Bounty' (McEwen, 1968) R; Rich gold self.
'Golden Note' (Hardy, 1967) R; Deep golden yellow self.
'Golden Prize' (Peck, 1968) R; Gold self.

'Golden Surrey' (Fay, 1967) R; Golden yellow self.
'Good Omen' (Reckamp, 1968) R; Orange apricot overlaid gold.
'Grecian Garden' (Munson, R.W., 1967) R; Cream melon self with cream throat.
'Gypsy Laddie' (Peck, 1967) R; Rose pink blend.
'Heather Green' (Peck, 1968) R; Pink blend.
'Heavenly Harp' (Reckamp, 1966) R; Apricot overlaid bright gold.
'Hibernian' (Hardy, 1967) R; Green yellow self.
'High Spirit' (Reckamp, 1968) R; Apricot cream blend.
'Holy Grail' (Reckamp, 1968) R; Cream yellow blend.
'Imp' (Buck, W.Q., 1963) R; Blend of gold.
'Impertinence' (Buck, W.Q., 1963) R; Dark golden orange.
'Intensified Tide' (Benzinger, 1968) R; Reddish brown, brushed yellow.
'Iron Gate Premier' (Sellers, 1968) R; Red self.
'Jamie Douglas' (Peck, 1967) R; Deep yellow self.
'Katherine Cogswell' (McEwen, 1968) R; Soft rich rose pink self.
'Katherine Jaffray' (Peck, 1967) R; Apricot pink blend.
'Kathleen Elsie Randall' (Fay, 1965) R; Creamy melon, orchid midribs.
'Kathy Goodrich' (McEwen, 1968) R; Apricot melon self.
'Kemp Owen' (Peck, 1967) R; Soft yellow self.
'Lacearama' (Hamacher, 1967) R; Strong pink.
'Lady Cynthia' (Fay, 1965) R; Melon, pink midribs.
'Lady Liberty' (Hardy, 1967) R; Golden yellow self.
'Lemon Beauty' (Traub, 1959); Golden West Bulb Farm catalog. Lemon yellow.
'Lord Randall' (Peck, 1967) R; Yellow and pink bicolor.
'Loyal Subject' (Reckamp, 1966) R; Yellow apricot blended pink.
'Lucia' (Traub, 1959), pink.
'Lucretius' (Traub, 1959); Golden West Bulb Farm catalog. Cadmium orange.
'Lynn Markham' (Fay, 1967) R; Pinkish melon self.
'Machu Pihu' (Hite, 1968) R; Coral with lavender overlay.
'Madrid' (Traub, 1959), Golden West Bulb Farm catalog. Vivid red self.
'Magdalena Leuthi' (Traub, 1959); Golden West Bulb Farm catalog. Empire yellow.
'Magic Wand' (Reckamp, 1968) R; Apricot overlaid gold.
'Major' (Childs, F. 1968) R; Gold self.
'Mary Gray' (Peck, 1967) R; Melon pink blend.
'Mary Hamilton' (Peck, 1967) R; Creamy yellow, pink undertone.
'Mary Todd' (Fay, 1967) R; Buff self.
'Matilda Mendez' (McEwen,1968) R; Pale yellow melon self.
'Milady Lou' (Hamacher, 1967) R; Strong yellowish pink.
'Milanese' (Munson, R.W. 1965) R; Pale amber rose.
'Minted Gold' (Reckamp, 1968) R; Gold self.
'Moire Night' (Benzinger, 1968) R; Raspberry and purple blend.
'Moon Temple' (Fay, 1967) R; Sulphur self.
'Noahs Ark' (Reckamp, 1968) R; Creamy buff yellow self.
'Northbrook Gold' (Fay, 1968) R; Gold self.
'Northbrook Pink' (Fay, 1968) R; Dawn pink self.
'Northbrook Star' (Fay, 1968) R; yellow self.
'Notable' (Childs, F. 1968) R; Peach self.
'Ophelia' (Traub, 1959); Golden West Bulb Farm catalog. Porcelain rose.
'Oporto' (Griesbach-Hardy, 1968) R; Lavender cast with deeper halo.
'Orange Star' (Rudolph, 1968) R; Orange self.
'Oriana' (Munson, R.W. 1966) R; Tomato cream with red halo.
'Oriental Mist' (Rudolph, 1968) R; Apricot with rose eyezone.
'Pacific One' (Traub, 1959); Golden West Bulb Farm catalog. Red self.
'Pacific Two' (Traub, 1959), Golden West Bulb Farm catalog. Red self.
'Padua' (Munson, R.W. 1966) R; Yellow gold self.
'Peter Cooper' (Traub, 1959); Golden West Bulb Farm catalog. Tangerine orange.

'Phantom Ring' (McEwen, 1968) R; Pale greenish yellow with reddish pink halo.
'Picture Perfect' (Webster, 1968) R; Gold self.
'Pinkarama' (Hamacher, 1967) R; Strong pink self.
'Pink Ballet' (Hamacher, 1968) R; Strong yellowish pink self.
'Pink Contrast' (Webster, 1968) R; Pink blend with darker halo.
'Pink Darling' (Benzinger, 1968) R; Baby ribbon pink.
'Polka Time' (Hardy, 1967) R; Burnt orange with red brown eyezone.
'Prolific' (Fay, 1965) R. Golden yellow self.
'Purple Premier' (Traub, 1959), Golden West Bulb Farm catalog. Purplish reddish.
'Queen Eleanor' (Peck, 1967) R; Shell pink self.
'Quinque' (Benzinger, 1967) R; Gold self.
'Ralph Cornell' (Buck, W.Q. 1961), Orange and red bicolor.
'Red Waves' (Schreiner, 1968) R; Bright red self.
'Reverend Traub' (Traub, 1959), Golden West Bulb Farm catalog. Cadmium orange self.
'Rocket City' (Hardy, 1967) R; Bittersweet orange.
'Rosarama' (Hamacher, 1966) R; Deep rose pink self.
'Rose Halo' (Rudolph, 1968) R; Medium rose with deeper halo.
'Salmon Orchid' (Traub, 1959), Golden West Bulb Farm catalog. Rosy salmon.
'Satin Silk' (Peck, 1968) R; Pink blend.
'Seaways Coral' (McEwen, 1967) R; Chinese coral with lighter edges.
'Seed Setter' (Hardy, 1968) R; Deep melon self.
'Serene Silence' (Reckamp, 1968) R; Ivory yellow with pink midribs.
'Shell Pink' (Fay, 1968) R; Shell pink self.
'Silver Fan' (Peck, 1968) R; Creamy yellow blend.
'Sing Toy Allah' (Hite, 1968) R; Light yellow self.
'Sir Patrick Spens' (Peck, 1967) R; Red self.
'Space Ship' (Benzinger, 1967) R; yellow gold self.
'Sue Booth' (Buck, W.Q., 1961), Brown and yellow bicolor.
'Summer Portrait' (Tanner, 1968) R; Peach brushed pink, edged rose, lavender midribs.
'Surprise Package' (Fay, 1965) R; yellow self.
'Tamlin' (Peck, 1967) R; Rose pink; deep rose eyezone.
'Tetra Arthurstar' (Traub, 1959), Golden West Bulb Farm catalog. Medium red self.
'Tetra Aurantorosea' (Buck, W.Q. 1961), Salmon; lighter sepals and midribs.
'Tetra Blossom' (Buck, W.Q. 1961), Empire yellow self.
'Tetra Carmine' (Traub, 1959), Golden West Bulb Farm catalog. Carmine self.
'Tetra Elaine' (Traub, 1959), Light pastel pink.
'Tetra Elyandre' (Traub, 1959), Golden West Bulb Farm catalog. Polychrome eyed.
'Tetra MacArthur' (Traub, 1959), Brilliant red self.
'Tetra Prima Donna' (Buck, W. Q. 1961), Salmon pink blend.
'Tetra Red' (Hamacher, 1967) R; Strong red self.
'Tetra Rose' (Traub, 1959), Golden West Bulb Farm catalog. Medium rose.
'Tetra Salmon Sheen' (Buck, W. Q. 1963) R; Rich salmon self.
'Tetra Yandre' (Traub, 1959), Light brown red.
'Tetra Yandrestar' (Traub, 1959); Golden West Bulb Farm catalog. Polychrome, eyed.
'Thomas Rymer' (Peck, 1967) R; Coral and lavender pink.
'Traub Violetta' (Traub, 1959), Golden West Bulb Farm Catalog. Lavender-reddish-violet.
'Trinity' (Childs, F. 1967) R; Pink bitone; olive green throat.
'Trumpeter' (Hankins, 1967) R; Orange with red halo.
'Twilight Sky' (Fay, 1968) R; Pink melon self.
'Velvet Butterfly' (Traub, 1966) R; Bright gold yellow self.

'Viking Prince' (Webster, 1968) R; Medium gold yellow self.
'Vincent' (Griesbach-Hardy, 1968) R; Rose with deeper halo.
'Welcomed Change' (Benzinger, 1967) R; Pink polychrome.
'White Cloud' (Traub, 1967) R; very light yellow self.
'White Prelude' (Traub, 1960); Golden West Bulb Farm Cat. 2., very light yellow.
'Wyndham Hayward' (Traub, 1959), Golden West Bulb Farm catalog. Orange with reddish eyezone.
'Yellow Beauty' (Rudolph, 1967) R; Golden yellow self.
'Yellow Champagne' (Rudolph, 1967) R; Sulphur yellow self.
'Zippity Zip' (Hamacher, 1968) R; Yellowish pink self.

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THE ART OF DECOUPAGE BEING REVIVED

MRS. ENNA CHAIRS, *Federalsburg, Maryland*

EDITORIAL NOTE.—Mrs. Enna Chairs teaches classes in the art of decoupage attended by Mrs. Doris H. Moran and her husband, Mr. Kendall A. Moran, of Federalsburg, Maryland. The Morans presented an excellent example of their work, showing the Aztec Lily, **Sprekelia formosissima** to the American Plant Life Society. This was shown at the 1972 Spring Amaryllis Show at Arcadia, Calif., and was much appreciated by all who attended the Show.

The following notes were furnished to Mrs. Moran by Mrs. Enna Chairs and are reproduced here for the information of the members of the American Plant Life Society who may be interested in the revival of this art.

That word means cut-out and so decoupage is the art of decorating surfaces with paper cut-outs. Decoupage is thought to have originated in Venice, Italy in the 17th. century. The art soon spread to other European Countries. There are many exquisite works in museums throughout the world and in private collections. Decoupage lasted into the 19th. century and then faded. Now attempts are being made to revive it in this country.

In order to make a plaque such as the one with the Amaryllis on it—you first have chosen the print and cut it out with an X-acto knife and curved cuticle scissors. Prepare the plaque by sealing the wood first, then filling in any holes, gouges or nicks with plastic wood. When dry, sand and then finish smoothing the surface with 0000 steel wool. Clean the surface well and it is time to paint. Use water base paint thinned out and this should insure no brush marks. Painting on 10 to 12 coats and allowing 20 to 30 minutes between coats. Now sand lightly with 600 sand paper and clean surface of all lint.

Ready to paste on the cut-out. Use a water soluble glue and make sure every part of cut-out is well covered. Then lay a piece of wax paper over plaque and cut-out and roll with a brayer (small wall paper roller); starting your rolling in center and smooth out toward the edges. Allow to dry several hours and then clean excess glue from around the cut-out and on plaque. Warm water should do the clean up job, but never leave water lay on plaque. You may use a small piece of sponge and Q-tip. Allow to dry and then spray with a clear plastic spray. Let picture set for 12 hours, then rub down lightly with a piece of 0000 steel wool.

Now for varnishing—The varnishing is what, in the end, makes or breaks the appearance of the article that is being decoupaged. ALWAYS use a high grade of varnish and either glossy, semi-glossy or flat varnish can be used. Use a good brush, between ½″ to 2½″, to apply the varnish. Dip brush into the varnish & flow it onto the surface, brushing in one direction only. Remove any hairs from brush immediately and if you have any runs brush them out before varnish sets up.

They claim you should leave each coat of varnish 24 hours for drying. Many people make the error of trying to get the coats on fast, but that is a No-No. Continue applying coats of varnish until you can no longer feel the cut-out. In other words completely sink the cut-out in the varnish and that may take as many as 50 or 60 coats of varnish. After 15 coats of varnish are applied, wet sand with 400 or 600 sand paper. Then wash the surface with soapy water and allow to dry. Make sure all lint is removed before starting your varnish coats again. Only stop when you can no longer feel edges or traces of the cut-out.

The final step is another wet sanding, steel wooling and finishing. The finishing is done with any good paste wax. Use just a little wax and work in a small area in the circular motion until desired sheen is acquired.

Decoupage work and gold leafing on glass is also a very interesting and rewarding art.

I tell my friends that only through patience and effort can any of this Art be properly achieved.

RANGPUR LIME, **CITRUS RANGPURIENSIS SP. NOV.** SCALE AND MEALYBUG RESISTANT

Hamilton P. Traub

For many years in California, the writer attempted to grow the 'Tahiti' ('Persian') and 'Bearss Seedless' varieties of the Common Lime, *Citrus aurantifolia* (Christm.) Swing. as home garden trees. However, these proved burdensome because ants colonized scale and mealybug insects on the trees making necessary expensive control measures to keep the trees free of the two pests. Then, he remembered the Rangpur Lime which he had grown in Florida. He had no remembrance of scale and mealybug pests on the trees there. Attempts were made to find a source of this species. Luckily, a form of it was located in a neighbor's garden. Cuttings were obtained and rooted, and the trees were set out. He was greatly pleased when no signs of scale and mealybug pests were ever found on the trees; even when grown side by side with the common lime varieties already indicated. The only pest noted so far is the slight presence of aphids on the tips of the new growth in the spring. This is easily controlled by overhead sprinkling.

The Rangpur Lime is considered of hybrid origin. Although it has been grown in India and elsewhere for a very long time, the entity

has not been recognized as a species in spite of the fact that the rind and pulp are orange-colored, and the fruit segments separate as easily as in the tangerine. It is named here as a distinct species because it cannot be included with any of the other *Citrus* species.

Citrus rangpuriensis Traub, **sp. nov.** (Rutaceae)

Arbor parva vel usque ad maior sempervirens spinosa, foliis illas Citri aurantifoliae strictim consimilibus; anthesi recurrenti, floribus mediocribus aliis speciebus Citri consimilibus, 5-fasciculatis vel solitariis, alabastro mediocriter purpureis, in statu plene expanso infus albis extus perpallide purpureascentibus; fructibus mediocribus vel marioribus, cortici aurantiaco, segmentis facile secedentibus, pulpa aurantiaca acida; seminibus paucis.

Holotype: Traub No. 1020 (TRA), grown at 2678 Prestwick Court, La Jolla, Calif., July 7, 1972.

Small or larger evergreen shrub or tree, spiny; foliage resembling that of the lime somewhat; recurrent blooming, flowers medium-sized, similar to those of the other *Citrus* species, produced in clusters of up to 5, or sometimes singly, medium purple in bud; when fully open, white within, very light purplish on the outside; fruit medium to larger in size, with orange-colored rind, fruit segments separating easily, pulp orange-colored, acid; seeds few.

PLANT LIFE LIBRARY—continued from page 122.

REASON AND EXPERIENCE: THE REPRESENTATION OF NATURAL ORDER IN THE WORK OF CARL VON LINNE, by James L. Larson. University of California Press, 2223 Fulton St., Berkeley, Calif. 94720. 1971. Pp. 178. Illus. $7.50. Subtitled, "The Representation of Natural Order in the work of Carl von Linné," the author traces the maturation of Linnaeus' conception of species, genera and higher categories as the foundation of a practical classification, based on sexual characters, as contrasted with the need of a natural system which he recognized as the ultimate aim, but which he could not achieve in his time. The book is divided into five chapters: (1) The system of nature and the natural method: (2) classes and orders: (3) genera; (4) species and varieties; and (5) nomenclature. Recommended to all interested in the history of botany.

EXOTIC MUSHROOMS (NOUVEL ATLAS DES CHAMPIGNONS), edited by Henri Romagnesi (adapted by Rhea Rollin & E. W. Egan). Sterling Publ. Co., 419 Park Av. S., New York, N. Y. 10016. 1971. Text pp. 14; I—XVIII; color plates 1—160. Trade Edition, $12.95. This outstanding Atlas of 160 color plates depicting at life size mushrooms in their natural colors, at the modest price charged, is among the better bargains in books offered during the current year. The book is concerned with the larger-sized members of what the editor calls the higher fungi—Ascomycetes (sac fungi) and Basidiomycetes (club fungi). The text details the role of mushrooms in the life cycle, how mushrooms grow, poisonous and edible mushrooms and mycology, the classification of mushrooms. There are 18 charts, accomodating more than 160 diagrams to help identify the spore and specialized organs of the mushrooms pictured in color on plates 1 through 160. The outstanding color reproductions of mushrooms in this book (all suitable for framing) will appeal not only to naturalists but also to artists and designers as a mine of information. Very highly recommended.

PLANT LIFE LIBRARY

CLASSICA BOTANICA AMERICANA, edited by Joseph Ewan; published by Hafner Publ. Co., New York. Additional volumes in this series (vols. 6 & 7) have recently appeared.

Dr. Ewan has suggested three periods in the development of botany in the United States for the decades from 1800 through 1860: (1) the Barton Period, 1800 to 1815, which included the publication of the significant Michaux accounts; (2) the Eaton-Nuttall period (1816—1820), during which Amos Eaton moved botany into the schools and academies, and Nuttall published his "Genera of North American Plants" (1818); and (3) the Torrey—Gray period (1821—1861), during which Stephen Elliott published his "Sketch of the Botany of South-Carolina and Georgia" (1821-1824), and Torrey and Gray built upon Nuttall's **Genera.**

Hafner Publ. Co., has recently published two facsimile reprints in the Classica Botanica Americana series which fall in the second, (1816-1920) and third (1821-1861) periods. In each case, the attractively produced reprint is preceded by an informative introduction by Dr. Joseph Ewan.

A SKETCH OF THE BOTANY OF SOUTH-CAROLINA AND GEORGIA, by Stephen Elliott, with an Introduction by Joseph Ewan. Vol. 1. Pp. xxxvii + 606 + Plates XII. 1821. Vol 2. Pp. 743 + 14 (Glossary). 1824. Facsimile of the 1816-24 edition. Hafner Publ. Co., 866 3rd Av., New York, N. Y. 10022. 1971. Elliott's **Sketch** is considered a classic in its field. Rafinesque had remarked that under "the modest title, we have the best Flora of the Southern States". Ewan has pointed out that through the publication of the **Sketch,** the botanical identifications of Muehlenberg and Baldwin were validated. The existence of voucher specimens of most of Elliott's proposed species makes them verifiable. Again, we are indebted to Hafner Publ. Co., for making the Elliott classic **Sketch** available to all interested workers in this fine facsimile edition.

THE GENERA OF NORTH AMERICAN PLANTS, by Thomas Nuttall, with an Introduction by Joseph Ewan. Vol. 1. Pp. xxxvi + viii + 512. 1818. Vol. 2. Pp. 254 + 10 + 4. 1818. Facsimile of 1818 Edition. Hafner Publ. Co., 866 3rd Av., New York, N. Y. 10022. 1971. Nuttall brought together descriptions of the North American plants known to him in his 2 volume work. He followed the artificial Linnean sexual system as was the custom with most of his colleagues, but he substituted the English language for the Latin which was a definite advance. Ewan has pointed out that "Throughout the **Genera** there are critical assessments based mostly on personal observation in the field and first hand acquaintance with the plants. Neither Michaux or Pursch had so wide a background as Nuttall and therein rests the importance of his **Genera** for his contemporaries as for botanists today intent on knowing the state of knowledge in 1818." John Torrey and his apprentice Asa Gray were to build on Nuttall's overview of North American genera. Nuttall recognized 834 genera, including 42 newly proposed. We are highly indebted to the Hafner Publ. Co., for this fine facsimile edition of Nuttall's **Genera.**

MANUAL OF THE SOUTHEASTERN FLORA, by John Kunkel Small. Vol. 1. Pp. xxii + 774. 1933; Vol. 2. Pp. 775—1554. 1933. Hafner Publ. Co., 866 3rd Av., New York, N. Y. 10022. (Facsimile of the 1933 Edition). 1972. The late Dr. Small's Southeastern Flora (1933) has long been out of print, and thus the publication of this facsimile reprint will be welcomed by the many who do not at present own this two volume set. Gray's Manual of Botany (7th ed. 1908; 8th ed. 1950 is concerned with the Northeastern United States and adjacent Canadian Floras, and thus Small's text has served since 1933 as one of the supplements to cover the flora of the southeastern United States. Thanks are due the Hafner Publishing Co., for the publication of this fine facsimile reprint edition at this time.

MANUAL OF VEGETATION ANALYSIS, by Stanley A. Cain and G. M. de Oliveira Castro. Hafner Publ. Co., 866 3rd Av., New York, N. Y. 10022. Facsimile of the 1959 edition. 1971. Pp. xvii +325. Illus. $12.00. This stimulating text is concerned with the application of phytosociological concepts and methods, most of which had originated in the north temperate regions, and their testing under tropical conditions in Brasil. The subject is developed under the following headings,—floristics; the community; major vegetation types of the world as exemplified in the tropical rain forest; analysis of vegetation; the problem of numbers—abundance and density; the problem of pattern—frequency; the problem of dominance—coverage; size of sample unit; community characteristics; concepts important in synthesis, and life form and leaf size. Highly recommended to all interested in vegetation analysis.

ISLAND YEAR, by Hazel Heckman. University of Washington Press, Seattle, Wash. 98105. 1972. Pp. xi + 255. Illus. $7.95. This book is concerned with six-by-three mile Anderson Island in Puget Sound. It provides an insight into the natural life, and the recordings of the seasons as experienced by Mrs. Heckman, who is an appreciative and articulate observer. Her diary records the surprises each month brings, the blossoming of the wild red-currant, the appearance of a pod of killer whales, many types of birds, and wild flowers, etc. But the developers have arrived, and the natural world of the Island is threatened as a way of life of its people. Can Anderson Island be saved? Only history will bear witness. This charming book is recommended to all readers.

THE QUANTITATIVE ANALYSIS OF PLANT GROWTH, by G. Clifford Evans. University of California Press, 2223 Fulton St., Berkeley, Calif. 94720. 1972. Pp. xxvii + 734. $22.00. This attractive book is designed to assist ecologists and others who desire quantative solutions to problems involving plants growing in natural and semi-natural conditions. It is based mainly on field studies and examines the difficulties encountered when attempting to relate growth to environment, developmental sequences and genetic constitution. Natural sources of variation between plants, and the classical methods of analysis with recent extensions are discussed and exemplified. This outstanding new book will be useful to those with formal training in the plant sciences and also to many others interested in plants. Very highly recommended.

FLORISTICS AND PALEOFLORISTICS OF ASIA AND EASTERN NORTH AMERICA, edited by Alan Graham. Elsevier Publ. Co., 52 Vanderbilt Av., New York, N. Y. 10017. 1972. Pp. xii + 278. Illus. $25.00. The papers of this symposium on the distribution and differentiation of plant groups common to Asia and North America show the emerging view that "the mixed mesophytic forest, its history, and the origin of floristic affinities between Asia and North America is more complicated and less well understood than generally reflected in the phyto-geographic literature." This stimulating book is required reading for all interested in the floristics of Asia and North America. Very highly recommended.

MAIZE ROUGH DWARF, by Isaac Harpaz. Halstead Press, Division of John Wiley & Sons, 605 3rd Av., New York, N. Y. 10016. 1972. Pp. xvi + 251. Illus. $24.00. "Maize Rough Dwarf" is a virus disease which is primarily a pathogen of plant hoppers with Maize (Amerindian Corn), rice, small grains and grasses serving as intermediary hosts in the passage back to the plant hopper. Local European plants affected are relatively immune to the disease at present, however when hybrid maize was introduced from the United States into Europe the result was drastic resulting in up to 70% reduction in the crop. The value of the book is in that it serves as a warning, indicating that all possible measures should be taken to prevent the introduction of the pathogen into the United States. Highly recommended to all interested in disease control.

RECENT ADVANCES IN PHYTOCHEMISTRY. Vol. 4. Edited by V. C. Runeckles and J. E. Watkin. Appleton-Century-Crofts, Educational Division,

Meredith Corporation, 440 Park Av. S., New York, N. Y. 10016. 1972. Pp. x + 317. Illus. The present volume is based upon the papers presented at the 9th Annual Symposium of the Phytochemical Society in 1969. It was focussed on plant phenolic compounds. Topics ranged from the simple phenols to lignin, and covered aspects of their chemistry, biochemistry and physiology, including commentaries on evolutionary developments. This volume is indispensible to all interested in phyto-chemistry. Very highly recommended.

SEED BIOLOGY, edited by T. T. Kozlowski. 3 Vols. Academic Press, 111 5th Av., New York, N. Y. 10003. 1972. Vol. I. Importance, development and germination. Pp. 416. Illus. $24.00. Vol II. Germination control, metabolism and Pathology. Pp. 447. Illus. $26.00. Vol. III. Insects, and seed collection, storage, testing and certification. Pp. 422. Illus. $26.00. This new, three-volume treatise provides the most comprehensive and up-to-date coverage available of the many aspects of seed biology, including modern treatments of the importance and characteristics of seeds, seed development, mechanisms of seed dispersal, seed germination, seed deterioration, protection of seeds from diseases and insects, seed collection and identification, seed storage and longevity, and seed testing and certification. These texts will be useful as reference material for researchers and seed producers, as well as texts or references in upper level and graduate courses in agronomy, horticulture, botany, entomology, forestry, and plant pathology. The material is interdisciplinary in scope and will be of interest to seed growers, seed analysts and technologists, economic botanists, agronomists, horticulturists, nurserymen, foresters, plant anatomists, biochemists, plant physiologist, ecologists, plant pathologists, entomologists, geneticists, and regulatory personnel concerned with seed quality, storage certification, and distribution. Highly recommended.

RECORDS OF THE AMERICAN-AUSTRALIAN SCIENTIFIC EXPEDITION TO ARNHEM LAND. Vol. 3. BOTANY AND PLANT ECOLOGY, edited by R. L. Specht and C. P. Mountford. Melbourne Univ. Press. 1958. For sale by International Scholarly Book Services, Inc., P. O. Box 4347, Portland, Oregon. 97208. Pp. 522. Illus. $19.45. This is the third volume of the report on the 1948 scientific expedition to Arnhem Land; it is concerned with its botany and plant ecology. Various specimens of fungi, ferns, gymnosperms and angiosperms (over 1300 specimens) were collected. The studies concern the distribution of the flora in relation to geological history, climate, soils and notes on plants used by the aborigines. This outstanding volume is very highly recommended.

DISEASES OF PLANTS, edited by J. H. Western. Halstead Press Division, John Wiley & Sons, P. O. Box 4191, Grand Central Station, New York, N. Y. 10017. 1971. Pp. xii + 404. Illus. This up-to-date reference work by outstanding authorities will be welcomed. The particular disease concerned and its associated pathogen is accurately identified by the contributors, including the description of the diagnosis, cure or prevention of the crop diseases affecting the potato, sugar beet, cereals, herbage and forage legumes, grasses, vegetables and hops. Very highly recommended to the practising plant pathologist.

INTRODUCTION TO PLANT BIOCHEMISTRY, by T. W. Goodwin and E. I. Mercer. Pergamon Press, Inc., Maxwell House, Fairview Park, Elmsford, New York. 10523. 1973. This attractive new book was written for students who have had at least a one-year course in general biochemistry, and it should also be useful to natural product chemists and students in the applied aspects of biochemistry, such as food science and agricultural biochemistry. The subject is developed under appropriate headings—bioenergetics and enzyme kinetics; structure and function of the plant cell; the plant cell wall, photosynthesis, respiration; carbohydrate biosynthesis; lipid and nitrogen metabolism; nucleic acids and related compounds; terpenes and terpe-

noids; porphyrins; alkaloids; plant growth substances; and biochemistry of development and growth. Very highly recommended.

INORGANIC PLANT NUTRITION, by Hugh G. Gauch. Dowden, Hutchinson & Ross, Inc., P. O. Box 699, 523 Sarah St., Stroudsburg, Pa. 18360. 1972. Pp. viii + 488. Illus. $21.50. This attractive text on the basic processes and principles of the mineral nutrition of plants will be welcomed by students, teachers and research workers, and should serve as a companion book for courses in advanced plant physiology, soil fertility, and horticulture and agronomic crops. All aspects of the subject—from bacteria to the higher plants from absorption to limiting factors in growth are covered in detail and are thoroughly indexed. All major research papers from 1960 to the present, as well as selected classic studies from before 1960, are reviewed in detail with full citation of papers. A bibliography of over 2600 entries and nearly 2000 authors provides a complete reference source. Very highly recommended to all interested in plant nutrition.

PHYSIOLOGY AND BIOCHEMISTRY OF TOBACCO PLANTS, by T. C. Tso. Dowden, Hutchinson & Ross, P. O. Box 699, 523 Sarah St., Stroudsburg, Pa. 13360. 1972. Pp. xiii + 393. Illus. $24.50. An authority on the subject has produced an up-to-date source book on current tobacco research throughout the world. The subject is developed under six headings,—the plant and tobacco types; growth and development; post marketing handling; organic metabolism, leaf usability, and product regulation. Recommended to research workers, students, and those concerned with the composition and culture of tobacco and tobacco products.

PATTERNS IN PLANT DEVELOPMENT, by Taylor A. Steeves and Ian M. Sussex. Prentice-Hall, Inc., Englewood Cliffs, N. J. 07632. 1972. Pp. xi + 302. Illus. This attractive text presents a factual account of the phenomena of development in vascular plants, including lower vascular plants, and the seed plants. The approach is structural, but emphasis is placed upon experimental and analytical data. Both the embryological phase and the phase of secondary growth are considered. The authors have attempted to document the developmental process as the plant undergoes its beginning with the zygote and the formation of the embryo, through the development of the primary body, and secondary growth, showing how the plant develops as an organism. This stimulating book is very highly recommended to all interested in plant science.

HORTICULTURAL SCIENCE, 2nd Edition, by Jules Janick, W. H. Freeman & Co., 660 Market St., San Francisco, Calif. 94104. 1972. Pp. x = 586. Illus. $12.00. This revision of an excellent standard text designed primarily for beginning students will be welcomed. Part I is concerned with the biology of horticulture,—the classification and structure of the plants; plant growth and development. Part II deals with the technology of horticulture, —controlling the plant environment, directing plant growth, biological competition, mechanics of propagation, plant improvement and marketing. Part III is concerned with the industry of horticulture,-horticulture geography, production systems, crops, and esthetics of horticulture. This outstanding text is very highly recommended to beginning students and all amateur horticulturists.

SOIL MICRO-ORGANISMS, by T. R. G. Gray and S. T. Williams. Hafner Publ. Co., 866 3rd Av., New York, N. Y. 10022. 1971. Pp. viii + 240. Illus. $9.95. This timely book, concerned with the activities of the microflora in nature rather than in the laboratory, is intended mainly for undergraduate students taking courses in microbiology, soil science or botany, but it should also prove useful to school teachers and post graduate students. The topics discussed include,—the soil population; micro-organisms in the soil; methods for studying the ecology of soil micro-organisms; decomposition of dead organic matter; breakdown of organic chemicals in the soil; effects of living plants on the soil microflora; effect of micro-organisms on plant growth; autotrophic micro-organisms in soil; interactions between soil micro-organisms; and micro-organisms in the soil-plant ecosystem. Highly recommended.

HOW WE KNOW WHAT ON EARTH HAPPENED BEFORE MAN ARRIVED, by William C. Carter. Sterling Publ. Co., 419 Park Av. S., New York, N. Y. 10016. 1972. Pp. 96 Illus. Trade Edition, $3.95. This easily readable, profusely illustrated and charming book for the young hobbyist interested in hunting fossils will serve as an effective introduction to the subject. Following the glossary of terms, the subject is presented in three parts: Part I, how we know, explains the evolution of the land masses and seas over the ages, the fossil record, animal fossils from trilobites to primates, including man; and plant fossils; Part II, is concerned with the collection of fossils, and the transition of the fossil hunter to paleontologist. Part III is concerned with the location of fossils in the 50 United States, from Alabama to Wyoming. An index completes the volume. There is no better gift for the young hobbyist; one which will keep him wholesomely employed during his leisure time. Very highly recommended to the young hobbyist.

The following are two new editions to the charming series of the Sterling Nature Series:

A TREE IS BORN, by J. M. Guilcher, and R. H. Noailles. Sterling Publ. Co., 419 Park Av. S., New York, N. Y. 10016. 1971. Pp. 100. Illus. $3.50. Here the germination of the seeds of the Horse Chestnut, Oak and Walnut trees is presented in detail, including informative close-up photographic reproductions of the steps from immature flower buds, opening of the flowers, the stamens and pistil, the fruit, the seeds, sprouting seeds, and the growing seedlings. Similarly, in the case of the pine tree, the female and male cones, seeds and growing seedlings are illustrated. Very highly recommended to the young student.

A TREE GROWS UP, by J. M. Guilcher and R. H. Noailles. Sterling Publ. Co., 419 Park Av. S., New York, N. Y. 10016. 1972. Pp. 96. Illus. $3.50. This is a companion to the book, reviewed above, showing in detail by means of illustrations and text the mature stage in the development of the Beach, Chestnut, Hornbeam, and 10 other species of trees. Highly recommended to the young student. Parents can make no better investment. Very highly recommended.

CRAFTING WITH NATURE'S MATERIALS, by Chester Jay Alkema. Sterling Publ. Co., 419 Park Av. S., New York, N. Y. 1972. Pp. 48. Illus. Trade Edition, $2.95. This charming craft book, adequately illustrated, shows how easily available materials can be fashioned into works of art—sculpture, mosaics, collage, weaving, pine cone and wood sculpture, spatter and spray painting, weed and plant sculpture and sand casting. This book should be available in every home with growing children. However, it also appeals to adults. Highly recommended.

The following two books are additions to the popular series of Sunset gardening books.

SUNSET IDEAS FOR LANDSCAPING, by the Editors of Sunset Books and Sunset Magazine. Lane Books, Menlo Park, Calif. 94025. 1972. Pp. 96. Illus. $1.95. This outstanding book includes specific guidelines to follow that will help the home owner most effectively to landscape his home. It is a guide to making the most of any particular piece of land that requires serious planning. A special section is helpful to evaluate ones needs, develop a workable design, and how to put it on paper. A helpful series of plant charts facilitates plant selection, and excellent photographs illustrate a wide variety of ideas for landscaping all types of homes, in all situations, and in all climates. This easily readable, and profusely illustrated book is highly recommended to all interested in landscaping the home grounds.

SUNSET IDEAS FOR JAPANESE GARDENS, by the Editors of Sunset Books and Sunset Magazine. Lane books, Menlo Park, Calif. 94025. 1972. Pp. 96. Illus. $1.95. This profusely illustrated book describes the basic principles and fundamentals of proportion and design of Japanese Gardens in terms of the United States gardener. Here are ideas for combining the three basic elements of the Japanese garden—stone, plant, water—to create an

entirely new Japanese garden or modify an existing garden with an Oriental touch. Pathways, fences and gates, and structures—pagodas, tea houses, engawa, wells, lanterns—add interest to the Japanese garden and are discussed in several helpful chapters. Actual garden plans are shown and described to help start the reader on the way to Oriental garden beauty. Highly recommended to all interested in Japanese gardens.

THE NEW CREATIVE DECORATIONS WITH DRIED FLOWERS, by Dorothea S. Thompson. Hearthside Press, 445 Northern Blvd., Great Neck, N. Y. 11021. 1972. Pp. 156. Illus. $7.95. The author, who originated the now widely used silica gel method of drying flowers, here extends its use and branches out into new fields, showing how to dry plant material, drying buds and foliage, timing and storing, using spray and wax, pressing, antiquing flowers, making stems, retaining color and texture, making decorative wall panels, butterflies, decorated Japanese rocks, seed mosaics, espaliered trees, pressed flower pictures, botany frames, unique shadow boxes, mantel clocks, lamps, placques and mobiles, bedroom pictures, drawer pulls and pincushions. Also dried flower arrangements involving basic art principles and elements of design, and special instructions for handling materials. This profusely illustrated book is recommended to all interested in the decorative arts.

HAWAIIAN HERBS OF MEDICINAL VALUE, by D. M. Kaaiakamanu and J. K. Akina; translated by Akaiko Akana. First published in 1922; this is the 1972 facsimile reprint by Charles E. Tuttle Co., Rutland, Vermont, 05701. Pp. 74. $3.00. This is a brief catalog of the medicinal herbs found among the mountains and elsewhere in the Hawaiian Islands and assumed by "the Hawaiians to possess curative and palliative properties most effective in removing physical ailments." The publishers do not endorse nor do they make any claim "as to the efficacy of the remedies given; nor do (they) guarantee the accuracy of the scientific identifications of the herbs used." Recommended to all interested in Hawaiian folk lore.

TIME-LIFE ENCYCLOPEDIA OF GARDENING SERIES, edited by James Underwood Crockett and editors of Time-Life books. In every case the volumes are profusely illustrated in color. The individual volumes are distributed by Little, Brown & Co., Boston, Mass. Library and school edition, by Silver Burdett Co., Morristown, N. J. 07960. Five volumes were reviewed in the 1972 PLANT LIFE. The following six additional volumes were published in 1972.

6. FOLIAGE HOUSE PLANTS. 1972. Pp. 160. Illus. $6.95. The subject is considered under the following headings: (1) a world of greenery at home; (2) the advantages of tender and loving care; (3) helping your plants to multiply; (4) the fascinating family of cacti and succulents, and (5) an encyclopedia of foliage plants. Highly recommended.

7. PERENNIALS, with watercolor illustrations by Allianora Rosse. 1972. Pp. 160. Illus. $6.95. The subject matter is grouped under the following headings: (1) the flowers that bloom year after year; (2) planting and caring for perennials: (3) propagating new plants for your garden, and (4) an encyclopedia of perennial and biennials. Highly recommended.

8. BULBS, with watercolor illustrations by Allianora Rosse. 1972. Pp. 160. Illus. $6.75. The subject matter is grouped under the following headings: (1) Flowers for all climates, all seasons; (2) the flamboyant history of bulbs; (3) the bulbs that bloom in the spring; (4) summer's grand parade of color; (5) plants for fall winter bloom; and (6) an illustrated encyclopedia of bulbs. Highly recommended.

9. FLOWERING SHRUBS, with watercolor illustrations by Allianora Rosse. 1972. Pp. 160. Illus. $6.95. The subject matter is grouped under following headings: (1) Bargains in beauty; (2) choosing, planting and

PLANT LIFE LIBRARY—continued on page 52.

THE AMERICAN PLANT LIFE SOCIETY

For the roster of the general officers of the Society, the reader is referred to the inside front cover of this volume.

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[AMERICAN AMARYLLIS SOCIETY, continued from page 2.]

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III. PUBLICATIONS OF THE AMERICAN PLANT LIFE SOCIETY

BOOKS

1. AMARYLLIDACEAE: TRIBE AMARYLLEAE, by Traub & Moldenke (including the genera Amaryllis, Lycoris, Worsleya, Lepidopharynx, Placea, Griffinia, and Ungernia; Manila covers; 194 pages, incl. 18 illustrations. $5.00 postpaid.
This is required reading for every amaryllid enthusiast.

2. DESCRIPTIVE CATALOG OF HEMEROCALLIS CLONES, 1893—1948, by Norton, Stuntz, and Ballard. A total of 2695 Hemerocallis clones are included and also an interesting foreword, and explanatory section about naming daylilies. Manila

covers; 100 pages (1—X; 1—90), includes a portrait of George Yeld. $5.00 postpaid.

3. THE GENERA OF AMARYLLIDACEAE, by Hamilton P. Traub. Includes a general introduction, a key to the subfamilies, infrafamilies, tribes, subtribes and genera of the Amaryllidaceae, and descriptions of all the genera. Every member of the Society should have this book for constant reference. Manila covers; publ. 1963; 85 pages. $5.00 postpaid.

4. LINEAGICS, by Hamilton P. Traub. This is the first outline text for the undergraduate student on the grouping of organisms into lineages. The text is divided into four parts: (a) the history of lineagics and lineagics as an integrated science; (b) basic lineagics, principles and procedures; (c) applied lineagics, principles and procedures; and (d) research methods in lineagics. Recommended for the student in biology. Publ. 1964. Manila covers, 163 pages, incl. 8 illus. $5.00 postpaid.

PERIODICALS

(A) HERBERTIA, or AMARYLLIS YEAR BOOK [**First series,** 1934 to 1948, incl.], devoted exclusively to the amaryllids (Amaryllidaceae), and the workers concerned in their advancement. A complete set of these volumes is indispensable to all who are interested in the amaryllids. Libraries should note that this may be the last opportunity for complete sets.

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Vols. 1-5 (1934-1938), $30.00, postpaid.
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Vols. 21—25, 1965-1969, $ 25.00 postpaid
Vols. 1—25, 1945-1969, $120.00 postpaid

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