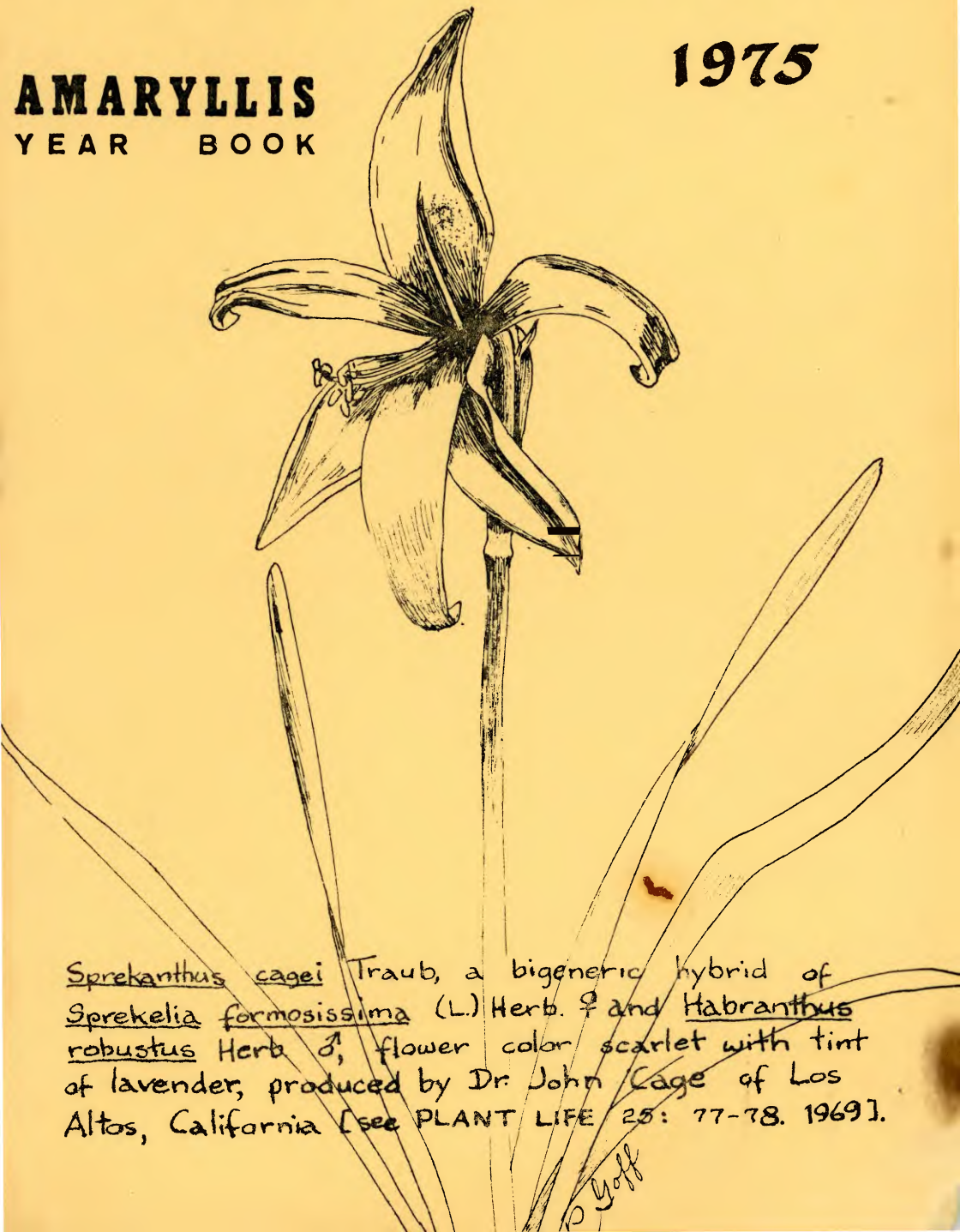
PLANT LIFE

AMARYLLIS YEAR BOOK

1975



Sprekanthus cagei Traub, a bigeneric hybrid of Sprekelia formosissima (L.) Herb. ♀ and Habranthus robustus Herb ♂, flower color scarlet with tint of lavender, produced by Dr. John Cage of Los Altos, California [see PLANT LIFE 25: 77-78. 1969].

P Goff

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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Correspondence regarding articles and illustrations for PLANT LIFE, incl. HERBERTIA, is cordially invited.

STYLE. Manuscripts *must be typewritten* and *double-spaced* throughout [using a new heavy black ribbon]. Calculations, figures, tables, names, quotations and literature citations should be carefully verified.

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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 $7.00 to $8.00; (foreign, $8.00 to $9.00) depending on the publishing costs. At present they are (domestic $7.00); (foreign $8.00) 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 31

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

1975

EDITED BY
HAMILTON P. TRAUB
THOMAS W. WHITAKER
HAROLD N. MOLDENKE

THE AMERICAN PLANT LIFE SOCIETY
Box 150, La Jolla, California 92037

Printed in the United States of America

Library of Congress Catalog Card Number: 51-23475

Address correspondence and send membership dues to:
Dr. Thomas W. Whitaker, Executive Secretary,
The American Plant Life Society,
Box 150, La Jolla, California 92037

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The cover design, by Prof. Penrith B. Goff, represents the bigeneric hybrid, **Sprekanthus cagei** Traub, a cross between species of **Sprekelia** and **Habranthus.**

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GENERAL AMARYLLID EDITION

PLANT LIFE, VOLUME 31, NOS. 2—4, INCL., 1975

GENERAL EDITION

ILLUSTRATIONS

PLANT LIFE LIBRARY—continued from page 112.

THE SEEDLIST HANDBOOK, by Bernard E. Harkness. Kashong Publications, Box 90, Bellona, New York 14415. 1974. Pp. 187. Paper, $3.00.—The purpose of this book is to furnish a guide to seed selection from the seed lists of the American Rock Garden Society, the Alpine Garden Society, and the Scottish Rock Garden Club. The literature references are keyed so that at least one source for more information is indicated for each of the plants listed alphabetically from **Acer** to **Veronica** species. Highly recommended to all interested gardeners.

REDIDUE REVIEWS: RESIDUES OF PESTICIDES AND OTHER CONTAMINANTS IN THE TOTAL ENVIRONMENT, edited by Francis A. Gunther & Jane Davies Gunther. Vol. 49 (1973, pp. vii + 158); Vol. 51 (1974, pp. ix + 189); and Vol. 53 (1974, pp. ix + 157). Springer-Verlag New York, 175 5th Av., New York City 10010. $18.50 per volume.—In these three volumes contributions on the residues or other contaminants are published in the order in which they are received, and the mass of information is indispensable to all who are concerned with problems caused by the use of pesticides, particularly those engaged in the production, storage, marketing, regulation and consumption of foodstuffs.

BIOLOGICAL CONTROL OF PLANT PATHOGENS, by Kenneth F. Baker and R. James Cook. W. H. Freeman & Co., 660 Market St., San Francisco, Calif. 94104. 1974. Pp. xiv + 433. Illus. $12.50.—In this outstanding new text on the biological control of pathogens, the authors discuss the control of plant pathogens by the host or other organisms through environmental manipulation—they organize the available knowledge into a thorough treatment of the principles of biological control of plant pathogens, and they suggest practical ways of applying those principles. They present biological control as one part of an integrated disease-control program, along with cultivation practices, pathogen-free propagules, soil treatment, sanitation, host resistance and mild chemicals. Selective soil treatment and mass transfer of antagonists from a suppressive to a conducive soil are emphasized. Highly recommended to those working in this research area, and to those interested in applying this knowledge in the control of plant pathogens in agriculture, horticulture and forestry.

PLANT LIFE LIBRARY—continued on page 4.

CORRIGENDA

PLANT LIFE, VOLUME 30, 1974

Page 29, paragraph 2, for "UP", read "UB."
Page 33, paragraph 3, for "Vallecite", read "Vallecito".
Page 35, paragraph 2, for "compressess", read "compressed".
Page 36, paragraph 1, for "marketedly", read "markedly".
Page 37, paragraph 7, for "lunulate", read "lunulatae".
Page 38, paragraph 9, for "Chukuisaca", read "Chuquisaca".
Page 43, paragraph 7, for "balde", read "valde".
Page 43, paragraph 8, for "auranthiacus", read "aurantiacus".
Page 44, paragraph 2, for "exerophytic", read "xerophytic".
Page 44, paragraph 3, for "Inter Londres and . . .," read "Inter Londres et. . ."
Page 46, paragraph 1, for "board", read "broad".
Page 47, paragraph 2, for *"Oxalis machin"*, read *"Oxalis macachin"*.
Page 47, paragraph 2, for *'Nothoscordum balaenese"*, read *"Nothoscordum balaenense"*.
Page 47, paragraph 3, for "Pruguriae", read "Uruguariae".
Page 51, paragraph 8, for "Argentinan", read "Argentinian".
Page 57, paragraph 1, for *"Hippeastrum gladiolodes"*, read *"Hippeastrum gladioloides"*.
Page 58, subheading 1, for "subspecies", read "forma".
Page 59, paragraph 1, for "bublets", read "bulblets".
Page 61, paragraph 3, for "Folad", read "Folia ad. . ."
Page 62, caption of Fig. 19 for (X. 0. 02), read "(X 0.3-0.4)".
Page 63, paragraph 9, for "illustradition", read "illustration".
Page 65, paragraph 2, for "de cumbens", read "decumbens".
Page 66, caption of Fig. 20, for "Marel", read "Morel".
Page 72, paragraph 6, for "Mentham & Hooker f. (1880, p. 723)", read "Bentham & Hooker f. (1883, p. 723)".
Page 73, paragraph 1, for "which occurs", read "that occur".
Page 73, paragraph 3, for "porthern", read "northern".
Page 73, paragraph 6, for *"Castellanoa martinata"*, read *"Castellanoa marginata"*.
Page 76, paragraph 5, for *"Stenomesson blareosum"*, read *"Stenomesson glareosum"*.
Page 77, paragraph 3, for "(type HUT 6054)", read "(type TRP 6054)".
Page 78, caption of Fig. 24 for "Photo by Pierfelice Ravenna", read "Drawing by Pierfelice Ravenna".
Page 90, Figure 27 is up-side-down. As the Figure now appears, the caption should read: from left to right, *Upper, Amaryllis* clone 'Senorita'; *A. evansiae* x *A. starkii; A. iquazuana*, and *A. belladonna minor. lower, A. starkii; A. evansiae; Amaryllis* clones 'Ludwig's Dazzler' and 'Superba'.

PLANT LIFE, VOL. 31, NO. 1, January, 1975

AMARYLLIS
YEAR BOOK
1975

Year Book of

The American Amaryllis Society

42nd Issue

GENERAL AMARYLLID EDITION

EDITED BY

HAMILTON P. TRAUB

THOMAS W. WHITAKER

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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The Hattiesburg (Miss.) Amaryllis Society, Mrs. Sam Forbert, **Pres.,** 117 North 23rd Ave., Hattiesburg, Miss.

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The Southern California Hemerocallis & Amaryllis Society, Mrs. Dorothy Rose, **Secy.,** 10300 Rosewood Ave., South Gate, Calif.

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PREFACE

Once again we are indebted to Prof. Penrith B. Goff of Wayne State University, Detroit, Michigan, for the excellent cover design featuring *Sprekanthus cagei* Traub, a bi-generic hybrid between *Sprekelia formosissima superba* ♀ and *Habranthus robustus*, ♂ reported by Dr. Cage in the 1969 Amaryllis Year Book (Plant Life 1969, pp. 77-78).

This 42nd annual edition of HERBERTIA, THE AMARYLLIS YEAR BOOK, is dedicated to Dr. John M. Cage of Yuba City, California, for his outstanding contribution toward the achievement of true breeding large-flowered hybrid *Amaryllis* lines. The need for such breeding lines has been realized for a long time, but Dr. Cage is the first to provide some of these. His work makes it feasible to grow large-flowered *Amaryllis* hybrids which come true from seeds making it possible to propagate these rapidly. The alternatives now usually used is to reproduce clones by natural offsets or by bulb cuttage, which are slower and more expensive methods for the increase of desirable clones. Dr. Cage has also made outstanding contributions towards efficient culture, disease and pest control, and the storage of Amaryllis bulbs. For his important contributions to science he has received the WILLIAM HERBERT MEDAL of the AMERICAN AMARYLLIS SOCIETY. In the present issue of the AMARYLLIS YEAR BOOK, Dr. Cage contributes a charming autobiography, and articles on the breeding and culture of Amaryllis, and on the flowering of dry, dormant Amaryllis bulbs. For these valuable contributions we are all grateful.

Dr. A. Graham Sparkes of Sussex, England, contributes a charming biography of the late great gardener, Walter Fleming, including a photograph of him working in his garden which is really a work of art, reminiscent of the work of the great masters.

Other articles on Amaryllis in the present edition are contributed by Dr. Cesar Vargas on Peruvian Amaryllids; by Dr. William D. Bell, on the Korsakoff Amaryllis hybrids, by John W. Hirschman, on breeding Amaryllis; and by Drs. Nowicki and O'Rourke, on the elimination of mosaic virus from Amaryllis.

Marvin Ellenbecker reports on the world-wide geographical distribution of the Amaryllidaceae; Sr. Ravenna favors us with his usual outstanding contribution on Latin American Amaryllids; and Dr. Flory reports on the chromosome numbers of several southeastern United States and Mexican *Hymenocallis* species.

Mrs. Marcia Clint Wilson favors us with a world wide report on the Zephyrantheae, and Mr. Forbes reports on his collection of Zephyrantheae in far off Australia. Mr. Tisch writes about his experiments with the increase of the Zephyrantheae by bulb cuttage; and Mr. Zuidgeest favors us with a preliminary report on color classes of Nerines in his collection.

Dr. William D. Bell speaks up for the neglected Bomareas; and

Miss Josephine Henry writes about Agaves cultivated in Pennsylvania.

There are reports on the Amaryllis shows in the Greater Houston (Texas), New Orleans (Louisiana), Mobile (Alabama), and the greater Los Angeles (California) areas, and other contributions as shown in the Table of Contents.

Contributors to the 1976 issue of the AMARYLLIS YEAR BOOK are requested to send their articles by August 1, 1975, 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.*

December 15, 1974,
2678 Prestwick Court,
La Jolla, California 92037

Hamilton P. Traub
Thomas W. Whitaker
Harold N. Moldenke

PLANT LIFE LIBRARY—continued from page v.

FLOWERS AND PLANTS: INTERNATIONAL LEXICON WITH BIOGRAPHICAL NOTES, by Robert Shosteck. Quadrangle-New York Times Book Co., 10 E. 53rd St., New York City 10022. 1974. Pp. xx + 329. $9.95.—This is a botanical, etymological, biographical and historical guide to 1150 varieties of the flora of the world, arranged alphabetically from **Abelia** through **Zinnia,** preceded by an informative introduction. A glossary, bibliography and index complete the volume.

A CONCRETE LOOK AT NATURE: CENTRAL PARK (AND OTHER) GLIMPSES, by Eugene Kinkhead. Quadrangle-New York Times Book Co., 10 E. 53rd St., New York City 10022. 1974. Pp. xii + 242. $8.95.—This is a look at nature through the medium of the great Central Park of New York City, as observed by an ardent naturalist. The first four chapters are concerned with the animals that inhabit the park—birds, squirrels, etc., and also the soil and water life. The remaining chapters deal with various aspects of nature, meteorites, heavy rainfall, the largest **Ailanthus** tree, the lady who defends beavers, biluminescence, and so on. Highly recommended.

A GUIDE TO NATURAL COSMETICS, by Connie Krochmal. Quadrangle-New York Times Book Co., 10 E. 53rd St., New York City 10022. 1973. Pp. vi + 227. $8.95.—This is a practical guide to the making of cosmetics from plants and other natural ingredients, with illustrations of some of the common plants mentioned. An appendix describes the raw material and their composition, with a list of sources for the raw materials. An index completes the volume.

PLANT CONSCIOUSNESS; PLANT CARE, by Shirley Ross. Quadrangle-New York Times Book Co., 10 E. 53rd St., New York City 10022. 1973. Pp. x + 170. Illus., $7.95.—This book explores the relationship of plants to man by examining both the historical and mythical context and the modern scientific developments. Part One is concerned with the controversial subject of plant consciousness. Part Two is devoted to plant care.

PLANT LIFE LIBRARY—continued on page 5.

DEDICATED TO

JOHN MARTIN CAGE

PLANT LIFE LIBRARY—continued from page 4.

QUANTITATIVE AND DYNAMIC PLANT ECOLOGY, 2nd Edition, by Kenneth A. Kershaw. American Elsevier Publ. Co., 52 Vanderbilt Av., New York City 10017. 1974. Pp. x + 308. Illus. Paper, $8.50.—Since the publication in 1964 of the first edition, there has been much progress in the fields of quantitative and dynamic ecology which necessitated the production of this revised edition. The subject matter is developed under the following headings—Description of vegetation; sampling methods; plant succession and climax; cyclic and vegetational change; casual factor of positive and negative association between species; plant population dynamics; the detection of non-randomness; casual factors of pattern; classification and ordination methods; digital computers and ecology; and computer simulation studies. Very highly recommended to all interested in plant ecology.

VIRUSES AND INVERTEBRATES, edited by A. J. Gibbs. American Elsevier Publ. Co., 52 Vanderbilt Av., New York City 10017. 1973. Pp. xiii + 673. Illus. $60.00.—The objective of this symposium is to cut across traditional research barriers in order to facilitate progress in the field of virological research: (1) those who study viruses of invertebrates, and (2) plant, and (3) mammal virologists who study vector-borne viruses. The first section is concerned with historical accounts; the second, deals with viruses involved with invertebrates; and the classification and biology of various invertebrates involved with viruses; the third is given over to general topics; the fourth, is concerned with the ecology of viruses; and the final section deals with the control of viruses; and also the control of certain invertebrates with viruses. Very highly recommended to all who are interested in viruses.

BOTANY, by Michael Neushul. John Wiley & Sons (Hamilton Publ. Co. Div.) 605 3rd Av., New York City 10016. 1974. Pp. xviii + 532. Illus.—This generously illustrated book on plant science is divided into four sections. Part I deals with type history of classification; the plant cell; cell chemistry; genetic code; cellular energy; diversity and the plant kingdom. Part II is concerned with procaryotes—bacteria & blue green algae; and eucaryotes—algae, fungi, liverworts and mosses. Part III deals with land plants, the rest of the eucaryotes—ferns and seed plants; conifers and flowering plants. Part IV is concerned with growth and development; environment and plant response; ecosystems and plants and man. A special color section deals with major crop plants. Very highly recommended to all interested in botany.

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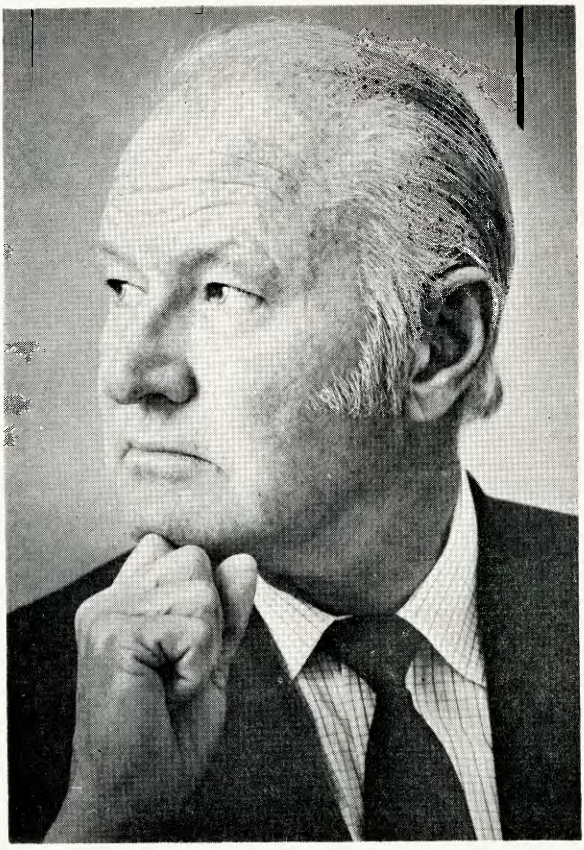

HERBERT MEDALIST—JOHN MARTIN CAGE

JOHN MARTIN CAGE

AN AUTOBIOGRAPHY

I was born on December 23, 1909, in Stephenville, Texas, and had the advantage of growing up in this small community in the center of that great state. Until he lost everything in the Great Depression, my father, the head of a small, old family bank, had all the money we needed, and I had much freedom and encouragement to play, to fight, to think, to read, to study music, to dream. I would not know how to select better parents—a father who quietly assumed as a fact that my brother and sister and I would develop a good life, and a mother, Ivy Lenore, who never let any hardship curtail her free spirit, her protective love, her beauty, or even her frivolity.

Guglielmo Marconi would not be envious of the fact that I built the first radio set in Erath County, while I was in high school. After I spent two years in a small local college, my interest in radio led to a B.S. degree in electrical engineering from Iowa State University, and I was lucky to spend seven years during the depression doing vacuum tube research in the laboratories of the General Electric Company. I continued graduate studies during this time and was granted an honorary E.E. degree by Iowa State for my research, patents, and scientific papers. Recipients of that degree were usually addressed as "Doctor" in those days, but abuse on the part of some schools made me feel uncomfortable about the title, and I have tried always to avoid its use.

This avoidance was not made easier when I later taught graduate courses in electronics at Colorado University and Purdue University. Between positions at these two schools, World War II sent me back into industry and some business ventures and consulting. I wrote a college textbook in electronics and have recently co-authored a technical reference book, "Electronic Measurements and Instrumentation."

From 1956 until my retirement in 1974, I held various positions in research and general management in the Hewlett-Packard Company, which manufactures a very extensive line of electronic instruments and small computers. In 1956 I was Chairman of the Board of the National Electronics Conference, and I am a member of several technical and scientific societies.

However, it was in 1938 in Boulder, Colorado, after winning some ribbons at the County Fair for my vegetables, that I bought two dime-store amaryllis bulbs. They bloomed, and out of curiosity I crossed them and grew the seeds to maturity. During this time I began to study botany and horticulture as a hobby. My study of inbreeding started almost immediately, and my various inbred strains and the records thereof were hauled with much difficulty from one residence to another.

After meeting and corresponding with some wonderful people like Wyndham Hayward, Cecil Houdyshel and our revered editor, I began to study the work of other amaryllis breeders in America seriously. After two or three years, the following became apparent to me:

1. Mainly, the work was simply a splendid hobby for amateurs, with limited regard for the principles of genetics.

2. Some very interesting results with much potential were produced, but nearly always the plants and the records of their parentage were lost as the breeders grew older. There was little continuity of objective.

3. The Dutch breeders did have continuity from generation to generation, and by growing thousands of seedlings every year from crosses of their best bulbs, they developed beautiful, fairly uniform strains through selection.

Fig. 2. John M. and Mildred Cage in their greenhouse devoted to Amaryllis breeding.

It was obvious that I could not compete with Dutch breeders at their own game, and so I searched for a project that I could handle with my limited time and facilities. The inspiration came from reading about the wonderful development of F:1 hybrid corn, and I later met some of the leaders of that work at Purdue University. I decided I would inbreed selected *Amaryllis* hybrids, blend with some species *Amaryllis,* and inbreed some more, to see how much uniformity of desired characteristics could be obtained. It quickly became obvious that heterosis, or hybrid vigor, often occurred when inbred strains of different parentage were crossed.

Now I have several red inbred strains that produce a high percentage of exhibition-type 5a plants when properly crossed. I also have white, dotted-and-flushed, orange pastel, and miniature solid red strains—all inbred to the point of good uniformity and breeding value.

My hope is that the projects will have been taken over by a competent breeder by the time this is published.

I have one spirited, gifted son by my first wife, who passed away some years ago. I also have my wonderful Mildred and four great step-offspring (they certainly are not children). Mildred quickly became friends with my *Amaryllis* lines and selected clones, and she has been of priceless assistance in our plant work and in every other way. Marriage in the fifties for love is highly recommended.

My real problem here is to express my gratitude to, and affection for, so many friends in the world of plants. They are so numerous that I really should name none, but if the list included none but Len and Corabelle Doran, Quinn Buck, Gladys Williams, and Hamilton Traub, it would be, as Omar said, "paradise enow." Besides, I count each member of the Southern California Hemerocallis and Amaryllis Society equally as my good friend.

WALTER FLEMING—GARDENER EXTRAORDINARY

A. Graham Sparkes, *Churchfield, Station Road, East Preston, Sussex, England*

Walter Fleming was born on the 16th July 1882 at Moffatt in the County of Dumfries, Scotland. His father, Alexander, was a shepherd so it was perhaps not surprising that Walter had an instinctive and abiding love and respect for all things in nature. This stayed with him until his death on the 27th October 1965 at the age of 83 years.

He was a gardener in the widest sense of the word and it was in 1915 that recognition of his abilities as a gardener came when he was awarded the Gold Medal of the Scottish Horticultural Association for a paper on the Cultivation of the Potato. He served his country with the Royal Artillery from 1914-1918.

In 1920 he was appointed Head Gardener by Captain McEachan at Galloway House, Garlieston in Wigontownshire, Scotland, where he remained for eight years and won the respect and acclaim of horticulturalists over a wide area. It was at this time that he married his wife, Jean, who was also a Scot. The only child born to them was a son who unfortunately died in infancy. Later a 17 year old niece came to stay with them in Sussex and was taken into the family permanently and was looked upon as a daughter.

In 1928 Colonel Stephenson R. Clarke appointed Walter Fleming as Head Gardener and together they planned and developed the gardens at Borde Hill, Sussex, where some sixteen gardeners were under the direction of the Head Gardener. Sir Ralph Clarke carried on the labour of love started by his father so that today Borde Hill Gardens are among the loveliest in Sussex and open to the public particularly when the rhododendrons are in full bloom, many of them developed and bred by Walter Fleming. Until his retirement he lived on the estate at East Lodge in order that he might be with his plants and tend them at all times.

During his period at Borde Hill and with the utmost encouragement and support of both Colonel and Sir Ralph Clarke, Walter Fleming emerged as a hybridist of repute whose experience, resourcefulness, ingenuity and skill were seen to the full in his association with the Borde Hill Camellias of which he bred many successful hybrids such as 'Donation' and 'Salutation'. 'Donation' proved to be outstanding and received from the Royal Horticultural Society a First Class Certificate in 1952 and in the same year an Award of Merit which was a great distinction. This was a cross between *C. saluensis* x *C. j. donckelarii* and thousands of plants throughout the world have resulted from this original plant (which is still flourishing at Borde Hill) which, as well as its qualities for hardiness and of being easily raised from cuttings, has the attraction of flowering at a very early age.

He is also remembered as being the originator of the *Alstroemeria* 'Walter Fleming' which was awarded an Award of Merit by the R.H.S. in June 1948. This is a cross between *A. violacea* x *A. aurantiaca*, the outer petals are a dull white suffused with purple while the inner petals are a deep yellow, heavily marked with maroon. This is still the major variety throughout European commercial horticulture for flower production. He showed frequently at the Society's shows where his exhibits were noteworthy for their excellence both of cultivation and presentation. He helped build up a collection of Nerines at Borde Hill, winning many awards for these flowers. One named after him was awarded a F.C.C. in 1959. It says much for his skill that his hybrids of various species are still widely used in the trade.

In recognition of his services to horticulture he was elected in 1953 an Associate of Honour of the Royal Horticultural Society and retired the following year in 1954 at the age of 72 years. This distinction is conferred on British persons who have rendered outstanding service to horticulture in the course of their employment. The roll of Associates of Honour may not exceed 100.

Even at this age, however, retirement was not acceptable and for a few years until his health began to fail he occupied himself with landscape gardening in the Lindfield area. This remarkable man was still tending his cottage garden up to a few weeks before his death. He is buried, along with his wife who survived him by five years, in the Ardingly Churchyard, which is an old church typical of the locality and in a beautiful Sussex country setting. Obituary notices appeared in local papers and many gardening journals. The following appeared in The Gardeners Chronicle at that time:-

"The many old friends of Walter Fleming will be grieved to learn of his passing away on October 27 at the age of 83 after a short illness. For almost 30 years he was Head Gardener at Borde Hill in Sussex where the creation of *Camellia williamsii* 'Donation' and *C.* 'Salutation' will remain as monuments to his and the late Col. Stephenson Clarke's gardening ability. Mr. Fleming was a quiet humble man with an unassuming manner that often cloaked the genius that was so obvious to those who knew him. His particular interests were of course

Fig. 3. Walter Fleming in his garden.

rhododendrons and trees and shrubs for which the gardens are famous but a plant bearing his name, *Alstroemeria* 'Walter Fleming' will remain as a living testimony to a gardener in the first rank. We convey our heartfelt sympathy to Mrs. Fleming for the loss of a gentle and kindly man."

Walter Fleming was physically a big man and immensely strong, but he was to all who knew him an extrenely modest, gentle and generous man. To his nephew by marriage in a rare and treasured moment he confided "As I work with my shrubs and plants, my trees and vegetables, I sometimes feel as if I touch God".—This was the measure of Walter Fleming, gardener extraordinary.

DR. JOHN HUTCHINSON, 1884-1972

We are sad to record the death of the eminent lineagicist, Dr. John Hutchinson who went to his reward, aged 88, September 2, 1972.

In connection with the *WILLIAM HERBERT MEDAL* award to him in 1939, a brief autobiography with portrait, was published in the 1939 *HERBERTIA*. In the same issue he also contributed an article on the Tribe *Gilliesieae* (Herbertia 6: 139-145. 1939).

A brief biography of Dr. Hutchinson by J. P. M. Brenan appears in *Kew Bulletin* 29(1): 1-5, plate 1. 1974. In addition, Carolyn M. K. Pope, in the same publication (*Kew Bulletin* 29(1): 5—14. 1974), contributes a complete bibliography of Dr. Hutchinson's contributions in the field of lineagics.—*Hamilton P. Traub.*

EDITOR'S MAIL BAG

Under date of June 14, 1974, Mrs. Sam Forbert, Hattiesburg, Miss., writes,—"The Hattiesburg (Miss.) Amaryllis Society mourns the passing of Mrs. J. W. (Sudie) Snowden, on April 16, 1974. She was a charter member of the local organization, (1956); a long member of the American Plant Life Society and its affiliate, the American Amaryllis Society (1956), and the National Amaryllis Judges Council (1957). Through her association with the organizations, she acquired a rich knowledge of her favorite flower. She generously shared seeds and seedlings with all interested persons. Sudie was indeed a shining star."

Under date of August 9, 1974, Dr. William D. Bell, Horticulturist, Fairchild Tropical Garden, 10901 Old Cutler Road, Miami, Florida 33156, writes,—"I now have *Amaryllis cybister* and *A. angustifolia* in sterile culture. When several plantlets have formed, I plan to treat these with colchicine in the manner the others were treated previously. Mrs. Korsakoff had *A. cybister* x Dutch, a showy plant pollinated with a tetraploid *cybister*. I suggest that one could easily have a new strain of 'spider' hybrids."

Amaryllid breeders will be interested in the new intergeneric cross between wheat (genus Triticum) and rye (genus Secale). This

new man made genus has been appropriately called *Triticale.* The article by Joseph H. Mulse and David Spurgeon reporting the history of this breeding program up to the present its published in *Scientific American* of August 1974, pp. 72-80. The summary states, "This hybrid combines the high yield of one of its parents (wheat) with the ruggedness of the other (rye). It now seems certain that it will compete successfully with the traditional cereal grains."

We have received the sad news that Mr. David E. Wilson, husband of Mrs. Marcia Clint Wilson of Galveston, Texas, passed away Saturday, August 6, 1974. He had been on medication for an undiagnosed ailment. An acute allergy due to medication made him desperately sick for a few days and resulted in his death. Mrs. Wilson is the beloved and efficient Chairman of the Zephyrantheae Committee, and condolences go out to her and the children in their great loss.

1. REGIONAL ACTIVITY AND EXHIBITIONS

THE 1974 AMARYLLIS SHOW SEASON

The 1974 Amaryllis Show season began with the New Orleans Intra-Club Amaryllis Show on March 30, and was followed closely by the Greater New Orleans Official All-Horticulture Amaryllis Show on April 6 and 7. On these same dates over in Texas the Corpus Christi Amaryllis Show was also staged. These opening events were followed by the Amaryllis Society of Mobile (Ala.) Show on April 13 and 14, and the Amaryllis Society of Alabama Show on April 20 and 21. The main show season ended with the Southern California Hemerocallis and Amaryllis Society Show on April 27 and 28. Other displays and shows sponsored by this Society were staged from February 23 to June 9.

THE GREATER HOUSTON AMARYLLIS CLUB

Mrs. Sally Fox, *Corresponding Secretary,*
1527 Castle Court, Houston, Texas 77006

The Weatherman in the Gulf Coast area must have had the "Energy Crisis" on his mind, as we only had a few nights in the mid 20's—one of the warmest Winters on record! As a consequence, our amaryllis bulbs were very early in putting up buds. Our show date of April 21st was too late to have sufficient show quality blooms for the public to view, so reluctantly we had to cancel our show.

We are looking forward to staging a show in 1975 but, as always, must depend on growing conditions.

Fig. 4. Some award winners at the 1974 Mens' Amaryllis Club of New Orleans Show: **left to right,** L. W. Mazzeno, Sr., R. L. Luckett and O. J. Robert, Sr.

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.

1974 NEW ORLEANS INTRA-CLUB AMARYLLIS SHOW

L. W. Mazzeno, Jr.
944 Beverly Garden Drive, Metairie, Louisiana 70002

Again this year the Men's Amaryllis Club of New Orleans held an Intra-Club all horticulture Amaryllis Show. The Show, held on March 30, 1974 in the City Park Backer Room, was divided into three categories. Winners were S. P. Gasperecz, best 4-floret specimen 'Apple Blossom'; V. J. Peuler, best 3-floret specimen 'Violetta'; and, J. E. Peuler, best 2-floret specimen 'Salmon Tower'.

The Club's regular annual Show was staged April 6-7, 1974 and is reported separately below.

1974 GREATER NEW ORLEANS OFFICIAL ALL-HORTICULTURE AMARYLLIS SHOW

L. W. Mazzeno, Jr.
944 Beverly Garden Drive, Metairie, Louisiana 70002

The fifteenth annual all-horticulture amaryllis show of the Men's Amaryllis Club of New Orleans was held on April 6 and 7, 1974 at the Kenilworth Shopping Center Mall, New Orleans, Louisiana. Approximately 300 entries provided a beautiful display. Again the competition was open to the public and 29 ribbons and two trophies were won by non-members.

Unusual but true, the "Best in Show" rosette went to an unnamed unregistered hybrid. This beautiful specimen was displayed by Mr. L. W. Mazzeno, Sr. For it he also won the T. A. C. Construction Co. Award and an Award of Merit.

Mr. O. J. Robert, Sr. with a beautiful "Candy Cane" won the James E. Mahan Memorial Award, the Ludwig Challenge Cup, the MACNO Club Trophy, and an Award of Merit.

The Robert Diermayer Memorial Trophy for the best specimen in the Breeder's section was awarded to Mr. Edward Beckham. He also won the Sweepstakes Ribbon for registered and named varieties as well as the George Merz Trophy for most blue ribbons by a Club member, and the Amaryllis, Incorporated Trophy for the best species specimen.

Dual winners were Dr. T. A. Calamari, Jr., the Edward F. Authement Memorial Trophy for runner-up in the unnamed, unregistered

section and the Sweepstakes Ribbon in the unregistered sections; Mr. A. T. Diermayer, the Lester Laine Award for the best double specimen, and the O. J. Robert, Sr. Trophy for the best three-floret registered hybrid, 'Apple Blossom'; Mr. L. W. Mazzeno, Jr., the Laurence Mazzeno Trophy for the best registered *A. gracilis,* and the Ludwig Gracilis Trophy with a 'Constant Comment'.

Other trophy winners were Mr. George Merz,—the W. J. Perrin Memorial Award, for runner-up in the registered section; Mr. J. E. Peuler,—the Southern Seed and Popcorn Trophy for runner-up in the breeder's section; Mrs. L. C. Gelbke,—the Reuter Seed Company, Inc. Trophy for the best cut flower; Mr. T. A. Calamari, Sr.,—the Vincent Peuler Award for the best registered single floret; Mr. Emile Flauss,—Amaryllis Society of Baton Rouge Trophy for the best unregistered single floret; and Mrs. Cathy Gautier,—the Nola Luckett Trophy for best two-floret potted specimen.

Other Club members meriting blue ribbons were Messrs. W. R. Latapie, Sr., V. Pannell, V. J. Peuler, and J. T. Schmidt.

Show Chairman was Mr. Robert Luckett and Co-chairman Mr. E. Macentee. They admirably carried on the Club tradition of staging a well-coordinated, beautiful show. Mr. Al Diermayer did his usual excellent job on the publicity. Club members appeared on local and regional (13 states) TV shows. Our special thanks are extended to all who took an active part in the show, and an added note of gratitude to the Show Judges, members of the Amaryllis Society of Baton Rouge for their assistance, and to the donors of the awards.

1974 CORPUS CHRISTI AMARYLLIS SHOW

Mrs. Carl C. Henny, *Corresponding-Secretary,*
Coastal Bend Amaryllis Society, P. O. Box 3054,
Corpus Christi, Texas, 78404

Once again it is time to report to you as to the results of our annual Exhibit of Amaryllis staged by our Coastal Bend Amaryllis Society in conjunction with the City Council of Garden Clubs "Festival of Flowers", which was held on April 6th and 7th, in our City Coliseum. We had a rather warm winter, with cold northers arriving each weekend; then spring-like weather would last for a week or more, confusing the growth of our bulbs and flowers no end. Many of our Dutch Hybrids bloomed ahead of show time so we were able to exhibit only a few of the Ludwig named and registered varieties. Among those entered were 'Apple Blossom', 'Dawning', 'Fire Fly', 'Picture', 'Little Sweetheart', 'Bouquet', 'Peppermint', 'Royal Dutch', 'Trixie', 'White Favorite', and 'White Witch'.

Mr. Duane Eckles was awarded the "Silver Bowl Award" for his entry of 'White Favorite'—which scored 94 points, and for 'Fire Fly'—which also scored 94 points. He also received the greatest number of blue ribbons in the Ludwig registered and named Amaryllis classes.

Mrs. Wilber Bunselmeyer, non-member, received a Special Trophy

for her entry of 'Apple Blossom', which scored 94 points.

Mr. E. P. Adams, club member, received a Special Trophy for his entry of his 'cross between Royal Dutch and United Nations' in the Breeder's Class, which scored 94 points, and also for his entry of 'Trixie'.

The Council of Garden Clubs presented an "Award of Merit" to Mrs. C. W. Gillespie for her entry of an Apple Blossom seedling, which scored 95 points.

Preliminary Commendation Awards were given to Mrs. C. W. Gillespie, Mr. H. M. Hanscheck, and Mrs. Lee Schroeder for their entries—each scoring 95 points—in the Seedling Division. These Awards were given by the American Amaryllis Society which is affiliated with the American Plant Life Society. Mr. Claud Ward also received this award for his entry of a Striata seedling, which scored 95 points.

A total of 65 entries were judged, with members and non members receiving 26 blue ribbons; 14 red ribbons; 13 yellow ribbons and 2 white ribbons. Judges for the show were Mrs. Robert Arnold, National Accredited Amaryllis Judge from Kerrville, Texas; Mrs. D. A. Ingalls, of San Antonio, Texas and Mrs. Charles E. Weeks of Corpus Christi, Texas, Flower Show Judges.

AMARYLLIS SOCIETY OF MOBILE (ALA.) SHOW 1974

VELMA THOMPSON, *Secretary*
P. O. Box 17, Mt. Vernon, Ala. 36560

The Amaryllis Society of Mobile, Ala., presented its 21st annual Amaryllis show on April 13th and 14th. The theme of the show was "EASTER LORE" and was in memory of Mrs. Marie Dameron, a member who passed away during the year.

In spite of adverse weather conditions there were approximately 293 exhibits, including 24 artistic arrangements. Mr. Huey Summers of Mobile, Ala., was show chairman. Mr. E. A. Wiggins, also of Mobile, is President of the Club.

Mrs. Lois Koontz was the winner of the AMERICAN NATIONAL BANK & TRUST COMPANY TROPHY, awarded to the winner of the most blue ribbons in show, including Horticultural and Artistic Arrangements. Mrs. Koontz also won the following trophies: JOSEPH S. NORTON TROPHY—HORTICULTURAL SWEEPSTAKES, awarded to the winner of the most blue ribbons in Horticultural Division. THE SWETMAN AMARYLLIS GARDEN TROPHY, awarded to the winner of the most blue ribbons in the combined DUTCH HYBRID POTTED AND CUT AMARYLLIS DIVISIONS. THE ROBERT HIRAM SWETMAN MEMORIAL TROPHY, awarded to the winner of the most blue ribbons in THE DUTCH HYBRID POTTED AMARYLLIS DIVISION. THE JOHN J. MASON MEMORIAL TROPHY, awarded for the most outstanding HORTICULTURAL POTTED BULB SPECIMEN OF AMERICAN HYBRID AMARYL-

LIS IN SHOW. THE WESLEY J. MARSHALL SR. MEMORIAL TROPHY, awarded to the winner of the most blue ribbons in THE DUTCH HYBRID CUT AMARYLLIS DIVISION. THE T. J. SWETMAN TROPHY awarded for the MOST OUTSTANDING HORTICULTURAL POTTED BULB SPECIMEN OF SOUTH AFRICAN GROWN HYBRID AMARYLLIS IN SHOW. THE AMARYLLIS SOCIETY OF MOBILE TROPHY, awarded for the MOST BLUE RIBBONS IN THE DUTCH NAMED VARIETIES. THE AMARYLLIS SOCIETY OF MOBILE TROPHY, awarded for the MOST BLUE RIBBONS IN THE UNNAMED POTTED SEEDLINGS. THE AMARYLLIS SOCIETY OF MOBILE TROPHY, awarded for the MOST BLUE RIBBONS IN THE SINGLE BLOOM NAMED DIVISION, and THE AMARYLLIS SOCIETY OF MOBILE TROPHY, awarded for the MOST BLUE RIBBONS IN THE SINGLE BLOOM UNNAMED DIVISION.

THE FIRST NATIONAL BANK OF MOBILE TROPHY was won by Mrs. EDNA CAZALAS, awarded to the winner of the MOST BLUE RIBBONS IN ARTISTIC ARRANGEMENT DIVISION and THE FIRST FEDERAL SAVINGS & LOAN ASSOCIATION TROPHY, awarded for the MOST OUTSTANDING ARTISTIC ARRANGEMENT OF AMARYLLIS IN SHOW.

Mr. JOHN CLARK won the JOHN A. LAMEY MEMORIAL TROPHY, awarded for the MOST OUTSTANDING HORTICULTURAL POTTED BULB SPECIMEN OF DUTCH AMARYLLIS IN SHOW, and THE LUDWIG TROPHY, awarded for the BEST LUDWIG NAMED VARIETY IN THE SHOW, cut or potted.

THE CLAUDE H. MOORE MEMORIAL TROPHY was won by Mrs. NELL KEOWN, awarded for the MOST OUTSTANDING HORTICULTURAL CUT SPECIMEN OF DUTCH AMARYLLIS IN SHOW, and THE AMARYLLIS SOCIETY OF MOBILE TROPHY, awarded for the most BLUE RIBBONS IN THE UNNAMED CUT SEEDLINGS.

THE AMARYLLIS SOCIETY OF MOBILE TROPHY was won by Mr. HUEY SUMMERS, awarded for the MOST OUTSTANDING HORTICULTURAL CUT SPECIMEN OF AMERICAN HYBRID AMARYLLIS IN SHOW.

Mrs. OLIVE RADFORD won THE LUCY WHITWORTH MEMORIAL TROPHY, awarded for the MOST ARTISTIC DESIGN OF AMARYLLIS WITH ELEMENTS OTHER THAN FRESH PLANT MATERIAL PREDOMINATING.

Mr. E. A. WIGGINS won THE INEZ SCHEUERMANN TROPHY, awarded to the winner of THE MOST BLUE RIBBONS IN THE COMBINED AMERICAN HYBRID POTTED AND CUT AMARYLLIS DIVISIONS, and THE AMARYLLIS SOCIETY OF MOBILE TROPHY, awarded for the BEST POTTED MINIATURE.

THE AMARYLLIS SOCIETY OF MOBILE TROPHY was won by Miss CARMON ROMERO, awarded for the BEST CUT MINIATURE.

THE MEN'S GARDEN CLUB OF MOBILE CERTIFICATE OF HONOR was won by Mr. W. A. McCOLLUM, awarded for the BEST AMERICAN HYBRID SEEDLING (in horticulture) SHOWN FOR THE FIRST TIME.

After the judging of the show, the judges were guests of the Amaryllis Society of Mobile, at a luncheon at a Chinese Restaurant.

All members cooperated to make this one of the best shows to be given by the Amaryllis Society of Mobile. It was held in the Mini-Mall at Bell Air Mall.

1974 HOUSTON AMARYLLIS SOCIETY OFFICIAL SHOW

Mrs. A. C. Pickard, *Official Flower Show Chairman, 1909 Alta Vista, Alvin, Texas 77511*

Another year has passed in the annals of the Houston Amaryllis Society culminating the 17th Annual Flower Show.

It is gratifying to know the Society has made history, not only with the American Amaryllis Society, but for many years in National, State and District garden clubs. We deeply appreciate the honors bestowed upon us during the past with this inheritance and the fine spirit of co-operation, unity and understanding the enlargement of our service will continue toward higher goals.

The Official Amaryllis Show of 1974 presents one of the most ambitious efforts to welcome the membership of garden minded hobbyists, devoted to the culture of Amaryllidaceae family.

This has been another milestone year with award winners in the Spring Show. There were surprises from the gardens, as we did get some heavy late frosts and continuous heavy rains in the area. The prospects for a show looked very discouraging in early March. This enthusiastic group of gardeners did not let the poor weather stop them. Many brought choice hybrids in pots that performed very timely for the show. Considering weather and availability of blooms the show was a very interesting display.

Perhaps the best way to talk with you about our show is to walk with a visitor through the show. As she enters, she is confronted with an elaborate display of Dutch named and registered hybrids arranged in their proper divisions and competitive classes. A lavish display of color and blue ribbon winners.

In the center area she finds a score of garden grown seedlings, these blooms challenge the gardener to provide a growing environment. If she gives even one of them her full attention she will be there as much as twenty minutes, being so impressed she will no doubt try her hand at hybridizing in the near future.

Beyond the competitive classes of Amaryllis are the jewels of the show, the flower arrangements, their excellence is breathtaking. Each featuring one or more Amaryllis blooms, but the goodly number

of entries show that such excellence is not beyond the reach of anyone who will devote enough interest to the undertaking.

At this point our visitor turns the corner and finds another group of educational exhibits. Charts, diagrams, and descriptive material illustrate the culture and propagation from the seed to the full grown bulb. Our hosts are devoted to this special area of growing Amaryllis. Mr. and Mrs. E. E. Koon assembled a striking display of every phase of Amaryllis growing including Amaryllids. Tables of soil, fertilizer, mulch, even those pesky bugs, worms and etc. (bottled of course). Continuing in our educational display one may walk over to another table and select the insect repellants one may use, demonstrated by a local dealer.

Moving on the visitor can find the sales table loaded with bulbs, Amaryllids, house plants and innumerable other items related to horticulture. The results these few dollars derived from the sales help support the Society's public service programs, plus a lot of friendship and aid to horticulture. So much for the partial content of the Show as seen through the eyes of a single visitor.

Now let's take a moment to review the theme of the Show "Amaryllis our Pride", with winners of awards and blue ribbons. Mrs. L. E. Morgan,—award of merit on Ludwigs 'Apple Blossom.' Second highest went to Mrs. O. W. Hanson, with 'White Favorite'. Others in close competition were Mrs. Clem Smith on Ludwigs 'Marie Goretti'. In the Breeders Class Mrs. A. L. Hammond highest score with her Dutch Seedling. Others in the blue ribbon Breeders Class were Mrs. Bell Wright, Mrs. W. Birch and Mrs. O. W. Hanson. In The American Seedling Class blue ribbon winners were Mrs. Enoch Johnstone and Mrs. Clem Smith. The old Johnsonii which is becoming more scarce proudly boasts her blue ribbon in the Belladonna Division, entry by Mrs. Clem Smith who also was awarded the Sweepstakes. Honors go to Mrs. Ada Blankenship for the best in the Artistic Section.

Finally the weary exhibitors dismantle and close the doors for only a short time. The Society staff and flower show committee are reviewing the results, comparing notes and comments and starting to work to expand to make next years show the best ever.

THE AMARYLLIS SOCIETY OF ALABAMA INC. SHOW—1974

Mrs. H. A. (Mae) Allen, *President*
210 Alpine St., Chickasaw, Ala., 36611

The Amaryllis Society of Alabama Inc., held its Seventh Annual Spring Show at the Chichasaw Civic Center on Grant Street in Chickasaw, Alabama on April 20th and 21st, 1974. The theme of the show was "Amaryllis in Chickasaw". There was much interest shown in both the horticulture and artistic arrangements divisions. Mr. Fred Fambrough was the Show Chairman.

Mr. C. E. Tagert of Mobile, Alabama won the American National Bank Trophy for the best named dutch potted specimen in the show. In addition, Mr. C. E. Tagert won the following ten trophies: PRESIDENT'S AWARD: for most outstanding Dutch seedling hybridized and brought into bloom by exhibitor and being shown for first time Division VIII. Large silver tray with handles. CHAVIS FURNITURE COMPANY TROPHY: to winner of the most blue ribbons in horticulture. Divisions I-VIII. Large silver tray with handles. EMILE SCHEUERMANN, SR. MEMORIAL TROPHY: to winner of the most blue ribbons in combined horticulture and artistic arrangement division. Silver champagne cooler. THE WILMER SMITH TROPHY: for most outstanding potted bulb specimen in the show. Silver pitcher. THE AMARYLLIS SOCIETY OF ALA., INC. TROPHY: to winner of the most blue ribbons in the cut Dutch division. Division IV. Silver tray. MERCHANTS NATIONAL BANK TROPHY: for most blue ribbons in horticulture Divisions I through VII. Silver tray. MARTHA BURDETTE MEMORIAL TROPHY: for most blue ribbons in Divisions V and VI. Silver tray. THE VINCENT KILBORN SR. MEMORIAL TROPHY: for most blue ribbons in Division IV. Silver bowl. THE C. E. TAGERT, SR. TROPHY: for most blue ribbons in the single bloom unnamed division. Small silver bowl. ROSES DEPARTMENT STORE AWARD: for most blue ribbons in the single bloom named division. Can Opener.

Mrs. A. R. Simpkins of Mt. Vernon, Alabama received the following trophy: MR. & MRS. H. P. WHEAT MEMORIAL TROPHY: to winner of the most blue ribbons in the potted and cut seedling divisions. Divisions VII and VIII. Large silver tray with handles.

Mrs. Marie Cantrell of Chickasaw, Alabama won the following trophies: CLAUDE H. MOORE MEMORIAL TROPHY: for most outstanding horticultural specimen of potted Dutch Amaryllis in the show. Division III. Silver tray. THE T. J. SWETMAN TROPHY: for most blue ribbons in Division III. Large ceramic tray.

Mr. Fred Fambrough of Prichard, Alabama, won the following trophies: CENTRAL BANK OF MOBILE TROPHY (Formerly Deposit National): for most blue ribbons in the American potted Amaryllis, Division I. Silver tray. THE FIRST NATIONAL BANK OF MOBILE TROPHY: to best specimen in Division VII. Silver Paul Revere Bowl.

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

Mrs. Velma Thompson of Mt. Vernon, Alabama received the following trophy: THE LITTLE GLASS SHACK AWARD: for most outstanding cut miniature of Dutch Amaryllis. Crystal Vase.

Mrs. Horace Young of Chickasaw, Alabama won the following trophies: ELLEN "JACK" CROPP TROPHY: for most artistic

Fig. 5. Southern Calif. Hem. & Amaryllis Show, 1974. **Upper**—Cut **Amaryllis** blooms from Mr. E. A. Angel's **Amaryllis** field at Colton. **Lower** —part of educational exhibits. Photos by C. D. Cothran.

design of amaryllis with elements other than fresh plant material predominating. Silver award. VELMA THOMPSON TROPHY: for most outstanding artistic arrangement in show. Relish dish.

Mrs. Claudine Pierce of Mt. Vernon, Alabama received the following trophy: CLAUDINE PIERCE TROPHY: for most outstanding collection of three (3) scapes in Division X. Ceramic Vase.

Mr. Dewey Hardy of Eight Mile, Alabama received the Cecil Bates Trophy for the Educational Display.

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. Luther N. Davis, Mrs. Sam Forbert, Mrs. Lillie Wilson, Mrs. B. M. Lewis, Mrs. Maye Gaucher, Mrs. C. N. Woods, Mrs. Ethel F. Newton, Mrs. Mollie Fowler, and Mrs. E. R. Trussell.

Artistic arrangement judges were: Mrs. J. T. Barfield, Pensacola, Florida, Mrs. Homer W. Davis, Gonzalez, Florida, Mrs. F. A. Meloy, Milton, Florida, Mrs. J. E. Haynes, Pensacola, Florida.

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

SOUTHERN CALIFORNIA HEMEROCALLIS AND AMARYLLIS SOCIETY SHOW, 1974

C. D. Cothran, *Show Chairman*
1733 North Gibbs St., Pomona, Calif. 91767

The tenth annual show of the Southern California Hemerocallis and Amaryllis Society was held at the Los Angeles State and County Arboretum Lecture Hall in Arcadia on April 27 and 28. As the flowers began to arrive it became apparent that the selection of the theme "Garden Jewels" was truly inspired this year, as this was really a vintage year for Amaryllis. As a background, several hundred of the finest flowers were selected from the thousands available from E. A. Angel, Bruce Claflin, and E. Pencall. These were arranged in vases with the colors of the flowers grouped to make a wave of color from burgundy to white, and this is what the visitor saw as he first entered the auditorium.

A table at the front of the auditorium had the silver and crystal to be awarded as prizes. It also had a large bowl of wine red amaryllis with a strong white star in the throat, which was particularly effective with the silver. This was planned by Gladys Williams, Show Standards Chairman.

Fifteen beautiful arrangements were made and placed by Mrs. Macdonald, all using amaryllis as their principal theme. They were an inspiration to many visitors who asked numberless questions about them.

There were 134 amaryllis entered in competition, all of exceptional quality. The following awards were made by judges Polly Anderson, Jack McCaskill, Roger Fesmire, Quinn Buck, and senior judge Gladys Williams:

Sweepstakes—A first for C. D. Cothran who received the SCH and an award.

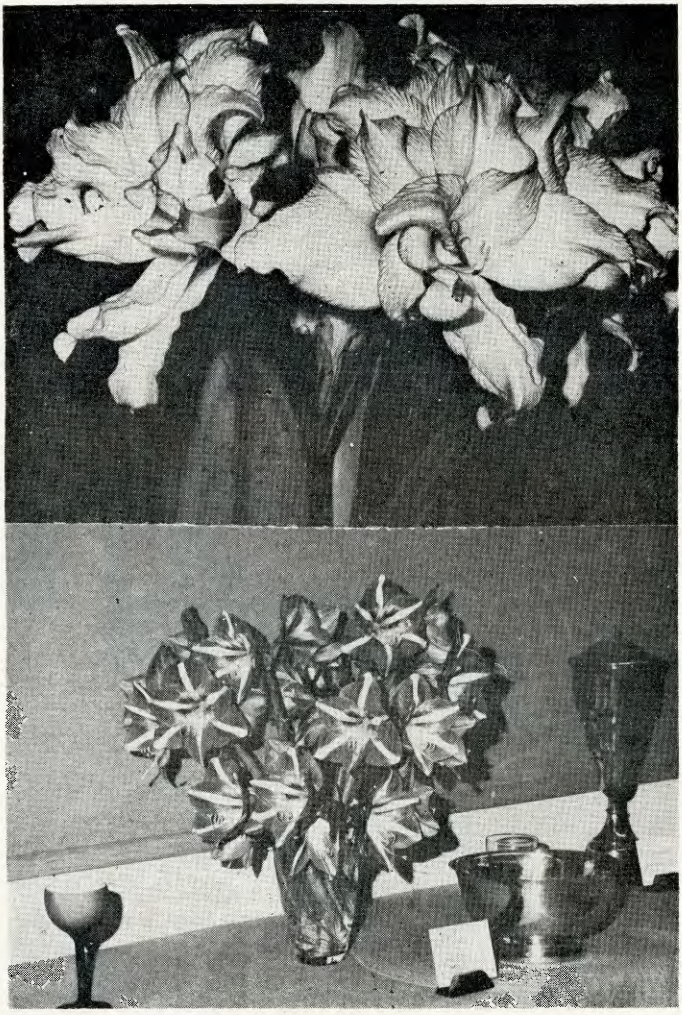

Fig. 6. Southern Calif. Hem. & Amaryllis Show, 1974 . **Upper—Amaryllis** clone 'Double Beauty', which won the Judges' award and the 1974 popularity poll. **Lower,**—Some trophies, and large bowl of wine-red **Amaryllis.** Photos by C. D. Cothran.

Runner up—Leonard Doran who received a SCH and an award.

Best registered large flowered hybrid (other than Ludwig) "Rembrandt" to L. Doran.

Best flower in show. Judges award—Large double seedling to C. D. Cothran.

Popularity poll winner. Large double seedling by C. D. Cothran.

Henry Myers won three SCH and an award in Section 3, Hybridizers class with the best Leopoldii seedling, the best Reginae seedling, and the best seedling with the highest point score. The award for the best Belladonna hybrids went to C. D. Cothran.

American Amaryllis Society Awards of Merit were given to C. D. Cothran for 'Fritz Kreisler', and Leonard Doran for 'Rembrandt'. Both were almost perfect, and bloomed just for the show, and remained in beautiful condition throughout the whole period of the show.

This was a good year for Preliminary Commendations also. The following were awarded:

Leonard Doran for a lovely picotee.

C. D. Cothran for a wonderful double seedling.

Henry Myers for a beautiful Leopoldii orange seedling.

C. D. Cothran for a very fine Belladonna type seedling.

Rosettes are awarded to groups, or to individuals who make big efforts to make the show more beautiful and attractive to the hundreds of visitors who come to see it. In this case the Rosettes were awarded to:

Mrs. D. Macdonald for the beautiful arrangements.

E. A. Angel for the huge displays of cut flowers.

Bruce Claflin for masses of cut flowers mostly red.

Ed Pencall for a large display of Dutch type cut flowers.

And the Special Judges Ribbons sometimes tell you where the judges heart really is, but one has to follow the rules, and these awards were made:

C. D. Cothran for 2 pots with more than a dozen scapes each of the species hybrid "Senorita".

Leonard Doran for a pot of the species *A. aglaiae* in bloom, the first to be seen in this area. Also for a pot of *A. blumenavia* in full bloom. This is very difficult to bloom, and was a first view for almost everyone.

Sterling Harshbarger for an unusual miniature.

Henry Myers for a lime green seedling, both a good flower, and an unusual color.

In addition to the "popularity poll", which caused the visitors to look at all of the flowers very carefully, a small packet of amaryllis seed was given to each visitor who wanted it. This raised many questions about culture and the Society members tried to answer them. As a result about 25 people joined the society, and most of the others were very impressed with the Show and the Society members with whom they came in contact. Most of them enjoyed the educational exhibit which had been prepared by Jim Weinstock. An educational exhibit on

Hemerocallis had also been prepared by Mrs. Gardner, and Mrs. Lewallen. We believe that much enthusiasm was generated, and that we will have an even more extensive show next year.

The Society has been very active this year in the matter of displays and flowers shows. In February (the 23rd) Mrs. Dorothea Boldt, Mrs. Mildred Cothran, and the writer put in a large table exhibit of Senorita and other species hybrids at the California State College at Fullerton flower show. Mrs. Boldt also had some very nice early hemerocallis blooms. This show is to advance the cause of The Arboretum which is nearby the College.

Following the Society Show in April, a large exhibit of cut and potted amaryllis, and hemerocallis was arranged in the Lecture Hall of the Arboretum in connection with the "Spring Extravaganza At the Arboretum" put on by The California Arboretum Foundation and the Los Angeles State and County Arboretum. The number of visitors approached thirty thousand, and it seemed that most of them had a question about the amaryllis. This event covered two days from 8am to 5pm and the Society had hosts and hostesses there the entire period and made many friends.

The fourth show was the Hemerocallis Show at Descanso Gardens on June 9th. There were quite a few entries of cut hems from several exhibitors, and a very large number from Quinn Buck's garden. He also brought a number of plants flowering in pots. Altogether it was a very impressive display. Since it was a first we can certainly look forward to even better shows in the future.

PLANT LIFE LIBRARY—continued from page 5.

PLANT CELL STRUCTURE AND METABOLISM, by J. L. Hall, T. J. Flowers and R. M. Roberts. Longmans, Inc., 72 5th Av., New York City 10011. 1974. Pp. xi + 426. Illus. Paper, $14.50.—This attractive and generously illustrated text is suitable for students at the college and university levels. In Chapter 1, an outline of cell structure, some techniques used in cell science are presented. Chapter 2 deals with a sufficient background of cell chemistry for the book to be read by the non-specialist, and in addition membranes are discussed in some detail. The rest of the chapters are devoted to the structure and biochemical properties of the soluble phase of the cell and the major cellular organelles. The author and subject indices complete the volume. Very highly recommended.

PLANT LIFE LIBRARY—continued on page 63.

2. LINEAGICS

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

CONTRIBUTION TO PERUVIAN AMARYLLIDACEAE

Cesar Vargas Calderon,
Apartado 79, Cuzco, Peru, December 1973

The present article includes new species in the following genera of the Amaryllidaceae: *Hymenocallis, Amaryllis* and *Eustephia.* I have still under cultivation a number of *Hymenocallis* and *Amaryllis,* to be described in the near future, and also I plan and expect to collect in unexplored areas in South Peru. In some cases I have enough bulbs to be distributed for introduction; the new species are as follows:

Hymenocallis Hawkesii Vargas **sp. nova** [Fig. 7.]

Bulb, 8.5 cm long, 5.5 cm wide, neck 10 cm long. *Scape* about 66 cm tall, 18 mm wide at the base, 10 mm at the apice; *spathe valves* lanceolate, longer than the perianth tube, yellowish, membranaceous. *Umbel* 3-5 flowered, fragrant, *pedicels* 12-15 mm long, 3 mm wide angular, greenish, 26-30 mm long in fruit; *ovary* triangular greenish 12 mm long, 55 mm wide. *Perianth tube* greenish, 46 mm long, 3.5 mm wide; *tepals* white-yellowish; parandroecium campanulate, greenish-yellowish toward the base, whitish toward the rim, 6-7 mm wide at the base, 40 mm diameter, 48-50 mm long at the borders, dentate-laciniate; *stamens filaments* 10-12 mm long, *anthers* yellow 6-7 mm long, 1 mm wide, *pollen* yellow; *style* clear green 10 mm longer than the stamen, *stigma* almost visible; *fruits* fericus, leaves 3 lanceolatae, obscurely erect, 52 cm long, 42-48 mm wide.

Bulbus ovoideus, 8.5 cm. longus, 5.5 cm latus; collum 10 cm. longus. Scapus 66 cm longus, 18 mm latus, ad basim 10 mm latus ad apicem acute angulatum; bracteae, tubum perianthium flavum et membranaceum superant; umbella 3-5 flora, aromatica, pedicellus, 12-15 mm longus, 3 mm latus, paule angulatus, viridis, in fructum 26-30 mm longus; ovarium triangulatum viride, 12 mm longum, 5 mm latum; perianthium, tubus viridis, lineolatus, 46 mm longus, 35 mm latus; tepala alba in nervo centrali subflava; sepala oblonga, angustiora quam tepala unguis 6 mm longus, viridis; petala oblonga. in medium 12 mm lata, unguis paene visibilis; paracorolla anguste campanulate, viridis, at basim flava, apex vel fuax albidulus, ad basim 5-7 mm lata, in faucibus 40 mm lata, 48 mm longa, dentato laciniata, cum fissuris inter segmenta usque at 9 mm profundis; androceum, stamina 10-12 mm longa, antherae luteae, 6-7 mm longae, 1 mm latae, polline pallidus luteo; ginoceum viridum, stylus plus quam stamina 10 mm exsertus, stigma paena visibilis; fructus sphaeroideus; folia in quoque scapo 3 lanceolatus, oblique-erecta, 52 cm longa, in medium 42-48 mm lata,

costa subtus notate.

This species has been named for Dr. John Hawkes a good friend of mine and a well known scientist and research worker on potatoes (University of Birmingham) in England.

Perú: Department of Cuzco, Province of Quispicanchis, Lucre, 3050 m, C. Vargas C., 16995, type in CUZ, (Herbario Vargas Cuzco, Perú).

Fig. 7. **Hymenocallis hawkesii Vargas.**

Eustephia kawidei Vargas **sp. nova.** [Fig 8.]

Bulb ovoid, 3-4 cm long, 4 mm wide; *scape* 30 cm long almost angular; *umbel* 3-5 flowered; *perianth* lemon yellow 42 mm long, tubu-

lar; sepals and petals narrow at the base, spatulate at the apex, *pedicels* 4 cm long, green, *bracts* lanceolate, whitish; style 1 cm longer than the stamens; *stigma* pyriform, *stamens* shorter than the pistil, *filaments* narrowly winged, acute 2-3 mm long the teeth; *fruit* sulcate, seeds plane brownish with the border transparent. 8 mm long 2 mm wide.

Bulbus ovoideus, 3-4 cm longus, scapus 30 cm longus, ad basis 4 mm latus, subangulatus. Umbella 3-5 flora. Perianthum citrinum, 42 mm longum, tubulosum, ad basim angustatum, ad apicem latum; spata petalaque spathulata ad basim angustata, pedicelli usque ad 4 cm longi, inaequali, quam scapus viridi; bracteae lanceolatae, membranaceae, albidae, bracteolae filiformes; androceum, stamina in maturitae marginem tepalorum attingentes; ovarium subtetragonalis, alae lanceolatae, acutae, 2-3 mm longae. Fructus trilobulatus, semina plana. Folia plura, 66 cm longa, 5-6 mm lata.

Eustephia kawidei is related to *E. coccinea,* but differs in the perianth, color and size, and also in the form of the stamen appendages. It is named in memory of *Kawide,* the legendary Quechua hero, Manco II. Inca. *Kawide* died fighting at the Sajsaiwaman fortress, alt. 3550 m.

Perú: Departamento Cuzco, Provincia Cuzco: Sajsaiwaman Fortress, 3550 m. (C. Vargas C., 22386, TYPE, CUZ).

Amaryllis variegata Vargas **sp. nova** [Fig. 8.]

Bulb subglobose, 4-6 cm long, neck 3-4 cm long. *Scape* greenish 35-42 cm long, *two bracts,* exceedingly the ovary, *pedicels* lightly greenish, 6-6.5 cm long, 10 mm wide; *umbel* 2-flowered, *ovary* purple 20 mm long, 8 mm wide. *Perigone,* 15-16 cm diameter, tube 3-4 mm long, *paraperigone* almost absent, only few bristles, 44mm long; throat with short greenish-white star, *tepalsegs* obovate, acute 3.2-4 cm wide at the middle, the lowest tepal narrower, brilliant red, with red and white dotted at the inferiore 3 tepalsegs, a typical characteristic and variable one accordingly with the different clones; *stamens* shorter than the perianth, *anthers* yellow, 7 mm long; *style* longer than the perianth, *stigma* trilobed; *fruit* trisulcate, seeds brownish, membranaceous; *leaves* 5 or 7 after flowering, lanceolate, acute, 44-50 cm long 2.7 cm wide.

Bulbus subrotundus, 4-6 cm longus, collum 3-4 cm longum; bractea, ovarium superantes, lanceolatae, rubrae; unbella biflora, ovarium rubrum, 20 mm longum, 8 mm latum; perigonium in faucem 15-16 cm diam. tubus 3-4 mm longus, stella lata albido-viridia, tepala obovata, acuta, in medium 2.3-3 cm lata; inferus angustior, ruber, flammeus, tria inferiora rubroquealbo maculata, character variabilis, vel aliquando flava; androceum, filamenta quam perianthium breviora, antherae flavae, 7 mm longae; gineceum, stylus quam perianthium longius, stigma trilobum; fructus et tamquam semina trilobulatus, semina fusca, membranacea in D; folia 5-7 post anthesis exeuntia, anguste lanceolatae, acutae, 44-50 cm longae, 2.7 cm latae. Species colore valde variabilis, ut mihi videtur hibrida.

Perú: Departamento Puno, Province Sandia, near Oconeque, 1800 m., C. Vargas C., 16423, TYPE in CUZ, (Herbario Vargas, Cuzco). Under cultivation.

Amaryllis bukasovii Vargas, **sp. nova.**, [Fig. 8.]

Bulb subglobose, 6-8 cm long; *scape,* 38-40 cm long, 1 cm wide at the base, subterete; *bracts* 2 lanceolate exceedingly the ovary; *Umbel* 2-flowered, *pedicels* 4.5-5 cm long, 5 mm wide; *ovary,* purple 1.5 cm long 7 mm wide; *perigone,* 10 cm long, 12-14 cm diameter, *tepaltube* 8-10 mm long, *paraperigone* almost absent, only a few bristles, 6 mm long; throat with a large greenish white star; *tepalsegs* obovate, acute, narrow at the base, 3.5-3.8 cm broad at the middle, the lowest narrower dark red, greenish yellow at the tip to the tepalsegs, and about 2-2.5 cm at the superior tepalseg and 3 cm or more at the tip of the lowest tepalsegs; stamens shorter than the perigone, *anthers* yellow 6-7 mm long, slightly incurved at the middle; *style* as long as the perigone segments, *stigma* clearly trilobed. Leaves 5-7 after flowering.

Bulbus subesfericus, 6-8 cm longus. Scapus 38-40 cm longus, ad basim 1 cm latus, subteres; bracteae lanceolatae, ovarium superantes, albido-rubrae. Umbella biflora, pedicelli 4.5-5 cm longi, 5mm lati; ovarium purpureum, 1.5 cm longum, 7 mm latum; perigonium 10 cm longum, ad fauces 12-14 cm diam. tubus 8-10 mm longus; paraperigonium, pili hialini, 6 mm longi, stella longa albido-viridia; tepala obovata, acuta, ad basis angustata, 3.5-3.8 cm lata, in medium; inferus angustior, sanguineus, macula terminali sulphurea instructa, in tepalis superioribus 2-2.5 cm diam. et inferioribus 3 cm diam; androeceum, stamina quam perigonium breviora, antherae flavae 6 mm longae, curvatae; gineceum, stylus tanquam tepala longus, stigma trilobum; folia anguste lanceolata, 5-7 post anthesis exeuntia, 40-45 cm longa, 3-3.5 lata.

Perú: Department of Puno, Province of Sandia, bridge at San José, 1400-1800 m. C. Vargas C., 21882, type in CUZ, (Herb. Vargas, Cuzco). This species has been named for Dr. S. Bukasov, my good friend, and well known scientist and research worker with potatoes in Russia, Leningrad.

Amaryllis machupijchensis Vargas, **sp. nova.**

Bulb subglobose, 7 cm long, neck 7 cm long. *Scape* 22-25 cm long, (sometimes 80 cm long), clear greenish, brilliant, slightly angular toward the base and reddish; *bracts* 2, clear red, 7.5 cm long, lanceolate; *umbel* 2-flowered in the type, (but frequently 3-4 flowered), *pedicels* 4-4.5 cm long; *ovary* 18 mm long, 8 mm wide; perigone open to 18 cm, exterior greenish-yellowish, minutely spotted with red, interior, greenish-whitish as the stamens this one is wide toward the base, tube 4-6 mm long, *paraperigone,* whitish, transparent, slightly laciniate; *tepalsegs,* 3.4-3.8 cm wide, obovate, acute; *stamens* as long as the tepalsegs, greenish whitish, and red spotted, anthers incurved 6 mm long, *pollen* yellow;

style longer than the tepalsegs, *stigma* trilobulate; *fruit*, trigone, *pedicel* at maturity of the fruit 7-9 cm long, *seeds* D-shaped; leaves, 5-7, after flowering, 70 cm long, 2.7-3cm wide.

Bulbus subesfericus, 7 cm dim., collum 7 cm longum. Scapus 22-25 cm in typo ad 80 cm in alliis, longo, viride, ad basim rutilans; bracteae 2, rubrae, 7.5 cm longae, ovarium superantes, lanceolatae; Umbella biflora; ovarium viride, 18 mm longum, 8 mm latum; perigonium apertum usque virido-albidum, stella at basim lata, dense rubro

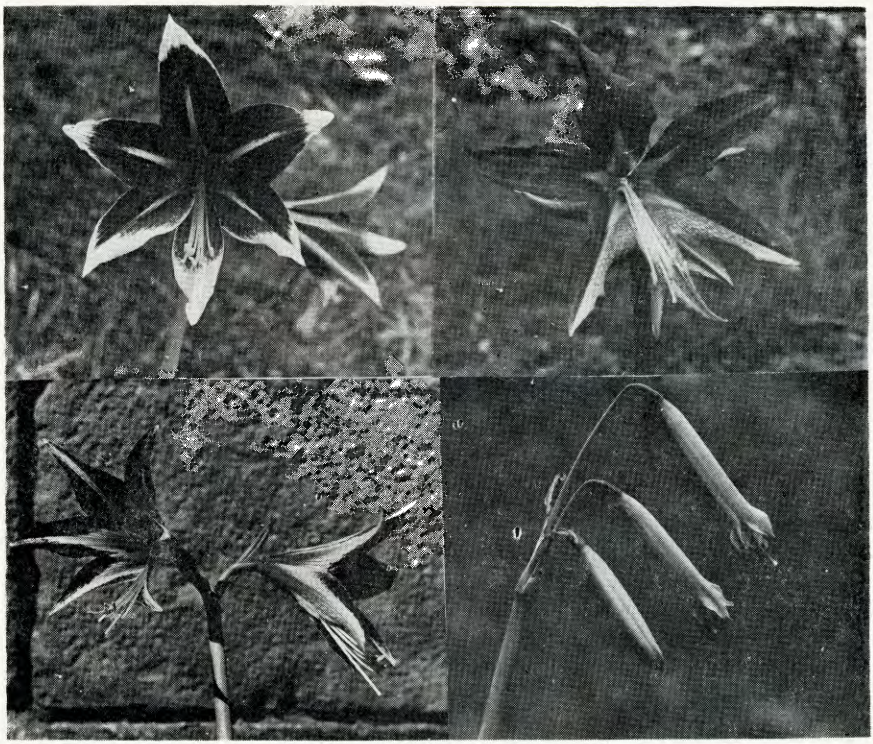

Fig. 8. Three new **Amaryllis** species—**Upper left, Amaryllis bukasovii** Vargas; **upper right, A. varigata** Vargas; **Lower left, A. cuzcoensis** Vargas; and, **lower right, Eustephia hawidei** Vargas.

maculata, variabilis; tubus 4-6 mm longus, paraperigonium albidum, hialinum, perpauce laciniatum; tepala, 3.4-3.8 cm lata, oval acuta, subaequalia praeter tepalum inferum majorem, plus rubro-variegatum; androceum filamenta tepala aequantia, dimidium inferum viride-album, altera tanta protio rubro-variegata; antherae incuravae, 6 mm longae, pollinae luteo; gineceum, stylus 8 mm longior quan tepala, dimidium album, dimidium alterum rubrum, stigma trilobum; fructus trigonus, semina in D, fusca, 18 mm longa, 14 mm lata; folia post anthesis 6-7,

usque ad 7 cm longa, usque ad 27 mm lata, lanceolata, acutaque, glauca.

Perú: Department Cuzco, Province, Urubamba, Pampak'wa, type, C. Vargas C., 17652, (also: 19983), 2250 m. Also collected at: Province, Convención, CVC, 21878, Sta. Rosa, 1000 m; Province, Calca, Lares valley, CVC, 22272, at San Pedro, 1500 m. Also collected by me at Machupijchu, 2000 m., in forest.

Amaryllis cuzcoensis Vargas, **sp. nova,** [Fig. 8.]

Bulb subglobose 5 cm long, neck 5.5 cm long. *Scape* subterete, 32 cm long, greenish-reddish at the base; *bracts* 2, green-reddish exceedingly the ovary in 30 mm; *umbel* 2-flowered, reddish, 2.5-3-4 cm long the pedicels; *ovary* greenish 18 mm long, 8 mm wide; *perigone*, almost always horizontally, 13-14 cm long, exterior dark red and greenish whitish, interior dark red, with large, greenish whitish star, very wide at the base, a white line bordering the tepalsegs which are oblong, lanceolate, 9-10 cm long 2.5-3 cm wide, *tube*, 3-4 mm long. *Stamens* shorter than the tepalsegs, (type specimen), *anthers* 4 mm long, *pollen* yellow; *style* as long as the tepalsegs, greenish-whitish, *stigma* trilobate; fruit pedicel 55 mm long; the *capsule*, greenish-reddish, trisulcate 22 mm long, and 30 mm wide, *seeds* brown, almost roundish. *Leaves*, 5-7, lanceolate, acute, narrow, 36 cm long, 17-18 mm wide at the middle.

Bulbus subesfericus 5 cm diam. in medium, collus 5.5 cm longae. Scapus subteres, 32 cm longus, viride, ad basim laeviter rubrum, bracteae 2, virides, perpaulo rubrae, 30 mm ovarium superantes, umbella biflora, bracteolas nullae, pedicelli 2.5-3-4 cm longi, viridi atque teretes; ovarium viride, 18 mm longum, 8 mm latum; perigonium horizontale, 13-14 cm diam. extus rubrum, postea albido-viridulum tanquam raquis, intus rubrum, stella magna, albido, viridula, quam apicem tepalorum attingens, tepala oblong-lanceolata cum margine albo 3536 mm latae, ad basimangustae, tubus 3-4 mm longus; androceum stamina tanquam tepala breviora, filamenta albida, antherae 4 mm longae, polline luteo; gineceum, stylus tanquam longius, albido-viridus, stigma paene trilobulatum. Folia 5-7 angustae, pallido-viridae, 35 cm longae, 17-18 mm latae in mediu.

Perú: Department of Cuzco, Province Calca, Type, C. Vargas C., 22395, (CUZ), Hacienda Vilcabamba, 2800 m. o s. 1.

THE KORSAKOFF AMARYLLIS HYBRIDS

William D. Bell, *Fairchild Tropical Garden, 10901 Old Cutler Road, Miami, Florida 33156*

A familiar sight greeted me one spring morning at the U.S.D.A. Subtropical Horticulture Research Station in Miami, known locally as Chapman Field. Flowering along the south end of a greenhouse was a bed of what had to be diploid amaryllis hybrids. Shades of salmon predominated and most had a pale yellow cast if not a bright yellow throat. The number of scapes per unit area was truly overwhelming.

Furthermore, these hybrids seemed to be well suited for culture on the coral limestone marl of South Florida.

Mr. Paul Soderholm, Horticulturist at the Station, said they had been sent by Alek Korsakoff, a former resident of the Miami area (see autobiography in PLANT LIFE vol. 25, 1969). Accession records indicated that they had been received from Mr. Korsakoff in 1968 as *Amaryllis starkii* x *evansiae* (later named 'Teddie Buhler'), *A. striata* x *evansiae* and *(A. mastersii* x *evansiae)* x *evansiae*. With Mr. Soder-

Fig. 9. Korsakoff **Amaryllis** hybrids growing at Chapman Field, Miami, Fla. Photo by Dr. William D. Bell.

holm's permission, I made a number of pollinations with other hybrids or species I knew had been in Mr. Korsakoff's collection to perpetuate and increase the "Korsakoff hybrids". Sufficient numbers of seedlings have been started that it appears that the Korsakoff amaryllis hybrids can be included in the Fairchild Tropical Garden plant distribution program for 1975. As an annual event, plants which are not readily available commercially are offered to members for a nominal sum. It may stretch the tradition of Dr. Fairchild a bit to offer hybrid plants, but we plan this to honor our late friend, Alek Korsakoff.

OVARY APEX ELONGATION IN **CRINUM** L.

HAMILTON P. TRAUB

In the past, the tepaltube in *Crinum* L. species was described as including everything beginning with the immediate more or less rounded apex of the enlarged part of the ovary and the base of the tepalsegs above. However, beginning with the report of the antenna-like ovarian projections above this point (Traub, 1958, 1962; Shirley 1963, 1964) in *Crinum* species, this concept had to be given up when

this condition is present. The actual tepaltube which dries up with the fading of the tepalsegs can easily be distinguished from the antenna-like ovarian projections, when present, because they live on as an integral part of the ovary and die only after the seeds have matured in the indehiscent ovary case. Then after the dead ovary case with projections have disentegrated sufficiently, the seeds are released.

If it is desired to make the descriptions true to nature, this condition has to be described as it actually is, indicating the actual lengths of the elongated ovary apex, and the lengths of the tepaltube above. In some cases the elongated apical ovarian projections are quite long as reported for *Crinum strictum* var. *traubii* Moldenke (Traub, 1958, 1962), or they may be shorter, or absent.

To make the subject quite clear, the apical ovarian projections were checked in the case of *Crinum* hybrid, 'Elizabeth Traub' (Traub 1931) (*Crinum scabrum* x *C.* clone 'Ellen Bosanquet'), which happened to be in flower when this note was written, as shown in Table 1.

Table 1. Variations in elongated ovray apices and tepaltubes in **Crinum** "Elizabeth Traub", in 1974.

Floret in umbel	Elongated ovary apex, cm	Length, tepaltube cm	Total length, cm.
Floret #1	0.0	9.0	9.0
Floret #2	0.6	8.7	9.3
Floret #3	2.0	7.0	9.0
Floret #4	2.2	6.6	8.8
etc. etc.			

In cases such as the above, if not the actual varying lengths of the elongated ovary apex and the tepaltube are indicated, then at least it should be reported that the condition is present.

LITERATURE CITED

Shirley, Mrs. Carl. Adventures with native *Crinums.* Plant Life 19 : 42-43, Fig. 11, 1963.

——. Further notes on American Crinums. Plant Life 20 : 41-43, Fig. 12. 1964.

Traub, Hamilton, P. Robust from of *Crinum americanum.* Plant Life 14; 51-52. Fig. 7. 1958.

——. Long lost American *Crinum* Found (C. strictum Herb.) Plant Life 18; 47-48. 1962.

ADDITIONAL NOTES ON **NOTHOSCORDUM MAHUII**

Hamilton P. Traub

This interesting dwarf species, *Nothoscordum mahuii,* was recently proposed (Traub, 1973), and information on its bulb was added the following year (Traub, 1974). This has to be amplified in this brief report on the basis of further information.

This tiny plant has greatly surprised the writer during the year 1974. It was assumed up to 1974 that the bulbs do not produce offsets,

but this observation was shattered in 1974 when the bulb split into 17 clove-like bulblets similar to those produced in Garlic, *Allium sativum* L. as recorded in Table 1.

Table 1. **Nothoscordum mahuii** Traub; number and size of cloves produced from one bulb under optimum pot culture in 1974.

Number of bulbs	length, mm	width, mm		length, mm	width, mm
1 very tiny	7	3	to	—	—
2 tiny	10	5	to	11	6
5 small	14	6	to	15	7
5 medium	18	8	to	20	9
4 "large"	20.5	9.5	to	21	10

Previously it has been reported that 3 to 4 flower scapes per bulb are produced each season, each umbel with three flowers. In 1974, the bulb outdid itself and produced up to 8 leaves and up to 11 flower scapes. The first 8 each had 3 florets per umbel, the 9th had 2 florets, and the last two 1 floret. This same bulb split later into 17 bulblets as shown in Table 1.

The plant can be grown in a 3-, to 4-inch pot, with a few bulbs in each pot. The plant appears in early winter and flowers until March, a little later it dies down and rests for the remainder of the year.

What makes this plant so valuable is the fact that it is easily handled in a class room, and blooms during the school year so that teachers and students may use it as an experimental object for chromosome, breeding, physiological, and other experiments. For the rest of the year it may be preserved in the small pots entirely dry until the next season when it should be repotted.

LITERATURE CITED

Traub, Hamilton P. *Nothoscordum mahuii.* Plant Life 24: 1973.
——. Amaryllid Notes, 1973 [Bulb of *Nothoscordum mahuii*] Plant Life 30: 86. 1974.

REGISTRATION OF NEW AMARYLLID CLONES

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

Mr. James M. Weinstock, *Registrar*
10331 Independence, Chatsworth, Calif. 91311

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 Nomenclature (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. 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; Ad-

dendum. 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. These may be obtained at $7.00 prepaid from: Dr. Thomas W. Whitaker, Executive Secy., The American Plant Life Society, Box 150, La Jolla, Calif. 92037.

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 sent to Mr. Weinstock at the above address. 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, 1974

Registered by E. P. Adams, 3833 Denver, Corpus Christi, Texas 78411

Amaryllis clone **'Juanita'** (Adams, 1974); A-1001; U-4 fld; April; 25″ h; perigone 3½″ long, 8″ across face, white flower with green throat and petal tips and margins brushed red. White portion without any markings. Evergreen, slight fragrance.

Registered by C. D. Cothran, 1733 N. Gibbs St., Pomona, CA 91767

Amaryllis clone **'Double Beauty'** (Cothran, 1974); A-1002; U-4 or 5 fld 18″ h; 9″ across face, white with pink veining along edges and tips, red picotee all segs. Vigor (2 scapes totaling 9 blossoms in second year of bloom), full double flowers, and lovely markings characterize this flower. Evergreen.

Registered by Mrs. Enoch Johnstone, 1016 Maxey Rd., Houston, Texas 77015

Amaryllis clone **'Beebe'** (Johnstone, 1974); A-1003; U-4 or 5 fld; 20″ h; perigone 3½″, 7″ across face, vibrant true pink with seg edges a bit lighter, upper segs dark rose line near light green throat. Firm substance, white stamens, fragrant, and deciduous.

Amaryllis clone **'Grandeur'** (Johnstone, 1974); A-1004; U-3 to 4 fld; 22″ h; perigone 2″ long, 9″ across face, blend of rose and white with light green throat, bottom seg almost white. Deciduous, fragrant, heavy-textured, light rose stamens.

Registered by Pearl H. Hammond, Route 1, Box 167, Angleton, Texas 77515

Amaryllis clone **'Nell Pickard'** (Hammond, 1974); A-1005; U-?; 28″ h; perigone 1½″ long, 9-10″ across face, rose opal with dark throat. Upper seg more than 3″ across, flower compact, round, and flat. Fragrant, spring bloomer, sheen, stamens same as flower.

Registered by Dr. John W. Hirschman, 752 Craycroft Rd., Tucson, Arizona 85711

Amaryllis clone **'Sweetheart'** (Hirschman, 1974); A-1006; U-4 fld; 22″ h; perigone 2½″ long, 7″ across face, solid light red. Evergreen spring bloomer with perfectly flat face. Not fragrant.

GEOGRAPHICAL DISTRIBUTION OF THE **AMARYLLIDACEAE**

MARVIN ELLENBECKER, *154 S. Hanover St., Carlisle, Pennsylvania 17013*

This paper will attempt to show the worldwide distribution of the *Amaryllidaceae*. It is not possible to deal with the family at the specific level in this paper so the accompanying map depicts location at the tribal and generic level.

The *Amaryllidaceae* are a family of perennial bulbous herbs that are mostly tunicated bulbs with leaves from the base of the stem or apex of the bulb. The leaves are usually linear and the flowers are showy, bisexual, mostly zygomorphic, and solitary to many in the umbel at the top of the scape. The umbel has an involucre of one or more membraneous bracts. The flowers have six segments in two series of three and a corona is sometimes present. The six stamens are opposite the segments (tepals) or lobes of the perianth, are usually free but are sometimes modified to form teeth, scales on the filaments and may be partially united to form a staminal cup. The ovary may be superior or inferior and the fruit is a dry dehiscent capsule or can be a fleshy berry and indehiscent. The seeds are solitary, few to numerous in each fruit, and have a fleshy endosperm and are round, angular or more often wing (D)-shaped.

The family has had an interesting and somewhat perplexing history in the hands of the taxonomists. The more conservative approach was to look upon the *Amaryllidaceae* as simply an artificial division under the *Liliaceae* (those species with inferior ovaries were considered amaryllids). The 19th Century saw two definitive works written on the family, *Amaryllidaceae* by William Herbert (1837) and *Handbook of the Amarylleae* by J. G. Baker (1888). Both works, though modified by later workers, established the majority of the then known genera to the species level. It was Hutchinson (1934) who finally broke with the traditional view of inferior vs. superior ovaries and considered all aspects of the organisms when classifying the *Amaryllidaceae*. Later workers studying the karyology of many of the genera have added more credulence to what Hutchinson did on the basis of gross morphology. This paper will take the newer approach and will be based on the key to the genera as described by Hutchinson (1934) and Traub (1963). There have been important revisions within the last 11 years and an attempt has been made to bring the family as a whole into its currently recognized status. Traub (1972) has removed the subfamily *Allioideae* and proposes that this group be recognized as the order *Alliales*. Traub (unpublished) is currently revising those genera placed in the subfamily *Ixiolirioideae* and *Leucocrinum* in the *Hemerocalloideae*.

The *Amaryllidaceae* presently consists of two subfamilies *(Hemerocalloideae* and *Amarylloideae)* with 16 tribes and 63 genera with a total of approximately 817 species.

Table 1 shows the family by tribes and lists the genera and number of species along with the known distribution of each genus. Figure 1 depicts the general vegetative areas of the world and the genera of the *Amaryllidaceae* appear on this map according to their distribution at the tribal level. By referring to the tribe number given on Table 1, the reader can quickly get an idea as to where that particular tribe is located by referring to that same number where it appears on the map. Table 2 deals solely with the distribution of the genus *Amaryllis*.

Rees (1972) deals at some length as to how bulbous plants (including the *Amaryllidaceae*) have dispersed in the various regions of the world in his book *The Growth of Bulbs*. Other references cited deal with the origins of several genera and reproduction and dispersal of plants in general with several amaryllids cited in particular.

ACKNOWLEDGEMENTS

The author expresses his appreciation to Dr. Peter Murphy and Dr. John Beaman, Department of Botany at Michigan State University, East Lansing, Michigan for their valuable criticisms in reviewing the original paper on distribution of the *Amaryllidaceae* and to Dr. Hamilton P. Traub for his corrections and suggestions on this condensed version of the paper.

TABLE 1. GENERA OF THE *AMARYLLIDACEAE* BY TRIBES

Family *Amaryllidaceae* Jaume St.—Hilaire

Subfamily 1. *Hemerocalloideae* Traub

Tribe 1. *Hemerocalleae* R. Brown

1. *Hemerocallis* R. Brown (17)

The 16 species are native to Asia especially the east central portion of the continent. Floral colors are primarily those which attract insect pollinators (yellow, pink and orange). The plants spread asexually by underground rhizomes forming large clumps. One additional species, *H. washingtonia* Traub is the first named colchicine-induced tetraploid species.

Subfamily 2. *Amarylloideae* Herbert

(Infrafamily I. *Amarylloidinae* Traub)

Tribe 2. *Traubieae* Moldenke

2. *Traubia* Moldenke (1). Native to Chile.

A single genus with one species comprises this tribe which is in the cool phase of the Austromalesian realm but bordering the dry phase of the Neotropical realm.

Tribe 3. *Zephyrantheae* Salisbury

3. *Rhodophiala* Pres. (33)
All were located in Central Chile and the western edge of Argentina until a new species was described by Ravenna (1970) in Minas Gerais State, Brasil.

4. *Haylockia* Herbert (3)
This genus was thought to have only one species but has now been found in Bolivia also.

5. *Pyrolirion* Herbert (10)
Endemic to Peru-Bolivia.

6. *Zephyranthes* Herbert (67)
The genus is found in both Central and South America (extending also into Texas and New Mexico and to the Atlantic Coast). The origin is debatable as to which area it spread to but more than likely it moved from some location in South America to Texas using Central America as a bridge. The taxonomy of this genus has been uncertain for years.

7. X *Sydneya* Traub (4)
An intergeneraic cross between *Zephyranthes* x *Habranthus* that indicates the closeness of the two genera.

8. *Habranthus* Herbert (23)
The same geographical distribution as for *Zephyranthes* except not found in southeast U.S. Both also occur in the West Indies.

9. X *Rhodobranthus* Traub (2)
Rhodophiala x *Habranthus* cross.

10. *Sprekelia* Heist. (2)
Native to Mexico, Central America and extending into South America.

11. X *Sprekanthus* (1)
Sprekelia x *Habranthus* cross.

12. *Famatina* Ravenna (3)
Newly recognized genus (1972) located in Central Chile and western part of Argentina.

Tribe *Zephyrantheae* has had considerable taxonomical rearranging and is still undergoing revisions and additions. Species described in the past have been lost or were improperly keyed. Perhaps because they bloom quickly after a rainstorm and then set seed and disappear as dry weather follows, has been the main obstacle to matching the leaves with the flowers. The tribe is confined exclusively to the New World.

Tribe 4. *Amarylleae* Endlicher

13. *Worsleya* Traub (1)
Endemic only to the Organ Mts. (Brasil) near the city of Petropolis. Traub says it evolved from common ancestral stock with *Amaryllis* L. but due to a long period of isolation, the two are now incompatible. *W. rayneri* has lilac flowers and a long aerial-necked bulb.

14. *Amaryllis* L. (76)
This genus which has been used so extensively as a showy ornamental

is discussed in great detail in Traub's *The Amaryllis Manual* (1958). When that work was published the number of species totaled 46. This indicates the wide diversity of the genus in many of the previously unexplored parts of South America. The 76 species have been pinpointed on the map and correspond with the numbers given in Table 2.

15. *Placea* Miers ex Lindley (6)

All species are endemic to Chile.

Tribe 5. *Lycoreae* (Traub and Moldenke) Traub

16. *Ungernia* Bunge (8)

The distribution center is in central Asia but one species is supposedly found also in Japan. The latter is based on one herbarium specimem and since no other known endemic plants of Turkestan are found in Japan this species is questionable.

17. *Lycoris* Herbert (18)

This genus is confined to eastern Asia, extending from Japan and Korea southward to upper Burma.

Tribe 6. *Narcisseae* Endlicher

18. *Sternbergia* Waldest. & Kit. (5)

Confined to the Mediterranean region, Asia Minor and Iran.

19. *Narcissus* L. (22)

Although the genus is found primarily in the Mediterranean region, it extends to the Canary Islands, Asia Minor, Kashmir and into China and Japan.

20. *Tapienanthus* Herbert (1)

Strictly endemic to Spain and Morocco.

The tribe *Narcisseae* lies between latitude 23° N. and 45° N. and appears to have an east-west distribution. Several or perhaps the majority of species are autumn and winter flowering types. This is due to their adapting to a climate which has its rains in the winter months and long periods of hot, dry months. Their habitat lies in an area where the wet-dry cycle and warm-cold cycle intermingle.

Tribe 7. *Galantheae* Salisbury

21. *Lapiedra* Lagasca (1)

Endemic to the eastern and southern part of Spain and to Spanish Morocco (International Zone of Tangiers).

22. *Hannonia* Braun-Blanq. & Marie (1)

Morocco in the area of the Promontory of Hercules and the Atlantic Ocean.

23. *Leucojum* L. (11)

Mediterranean region into Asia Minor and Iran.

24. *Galanthus* L. (13)

Mediterranean region of the world into Asia Minor and the region of Georgia S.S.R.

Tribe 8. *Crineae* (Pax) Traub

25. *Ammocharis* Herbert (5)
South to northeastern area of southern Africa.
26. *Crinum* L. (130)
The most cosmopolitan genus of the *Amaryllidaceae* with the greatest number of species. Almost all species are confined to littoral, island and marsh or stream locations.
27. X *Crinodonna* Region ex Traub (3)
Brunsvigia x *Crinum* hybrid producing sterile offspring.
28. *Nerine* Herbert (41). South Africa.
29. X *Brunsnerine* Traub. *Nerine* x *Brunsvigia.*
30. *Boophone* Herbert (2). Cape Province, South Africa.
31. *Cybistetes* Milne-Redhead Schweickert (1). Cape Province, South Africa.
32. *Brunsvigia* Heist. (17). South Africa to Tanzania.
33. *Carpolyza* Salisbury (1). Cape Province, South Africa.
34. *Strumaria* Jacques (7). South Africa.
35. *Hessea* Herbert (15). South Africa.

The tribe *Crineae* is endemic to the southern part of Africa with the exception of *Crinum,* a cosmopolitan genus. The seed dispersal of *Crinum* will be discussed later in this article.

Tribe 9. *Cyrtantheae* Salisbury

36. *Anoiganthus* Baker (2). South Africa.
37. *Cyrtanthus* Aiton (45). South Africa, Angola and Tanzania.

Tribe 10. *Clivieae* Traub

38. *Clivia* Lindley (4). South Africa.
39. *Cryptostephanus* Baker (5)
Namagualand, Southern Rhodesia, Angola and Southwest and East Africa.

The *Cyrtantheae* and *Clivieae* tribes are found only in Africa.

Tribe 11. *Haemantheae* Salisbury

40. *Haemanthus* L. (77). South Africa to Tropical Africa.
41. *Choananthus* Rendle (2). East Africa.

Tribe 12. *Gethylleae* Salisbury

42. *Gethyllis* L. (21). South Africa.
43. *Apodolirion* Baker (2). East Africa.
44. *Klingia* Schoenland (1). Namaqualand.

Both the *Haemantheae* and *Gethylleae* are confined to Africa, the majority of the species being found in the southern half of the continent.

(Infrafamily II. *Pancratioidinae* Traub)

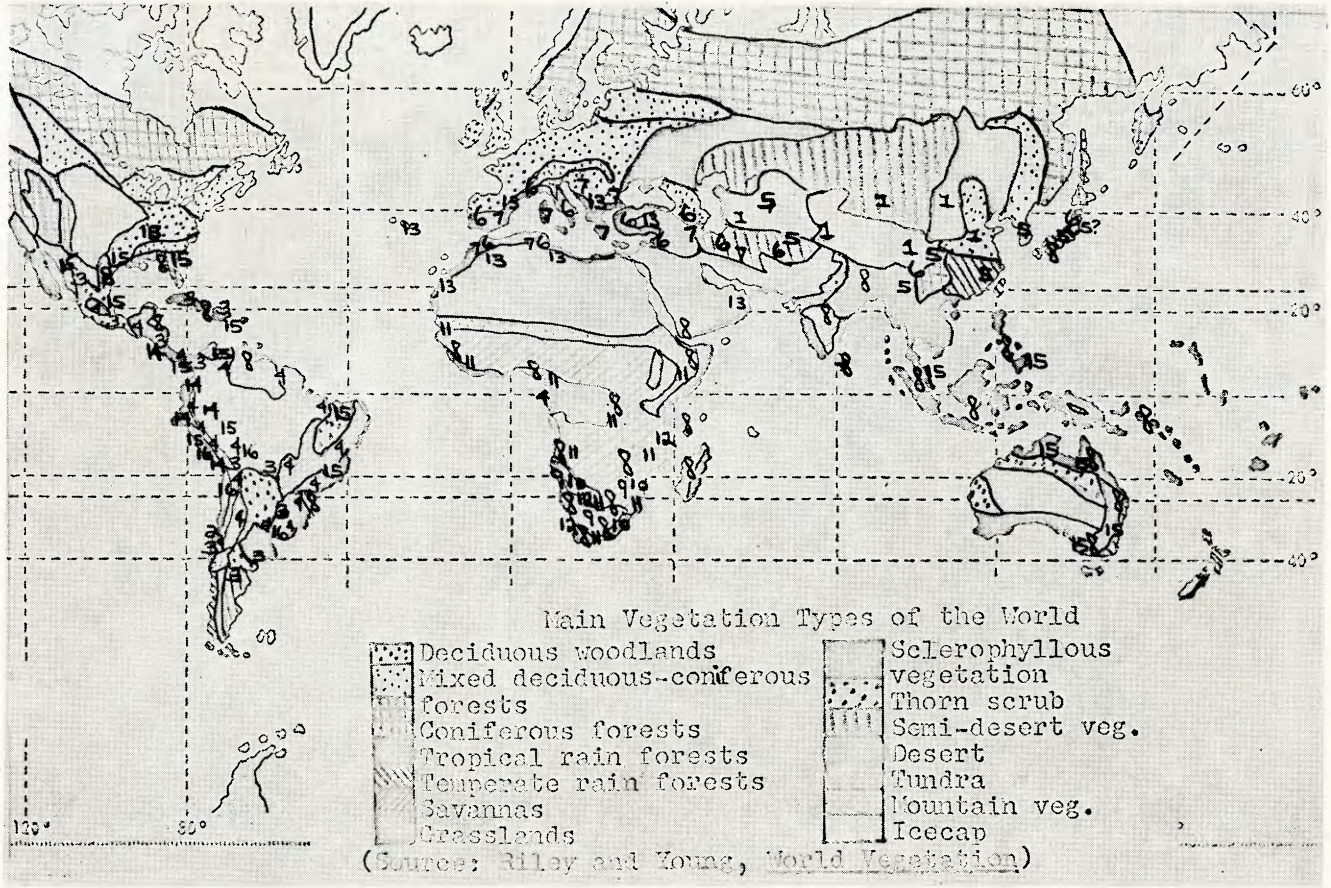

Fig. 10. Geographical distribution of the **Amaryllidaceae**—range of genera is indicated by the numbers preceding genera listed in the text.

Tribe 13. *Pancratieae* Salisbury

45. *Vagaria* Herbert (1) Asia Minor.

46. *Pancratium* L. (21)

Native to the Mediterranean rim to Asia Minor, Oman, Canary Islands, northern Africa to South Africa and into Tropical Asia. This genus has a counterpart in the New World, *Hymenocallis.*

47. *Chapmanolirion* Dinter (1). South-West Africa.

Tribe 14. *Stenomesseae* Traub

48. *Rauhia* Traub (1)

Jaen, Peru. The genus *Rauhia* remains unchanged because the General Committee on Botanical Nomenclature has voted that *Rauhia (Amaryllidaceae)* and *Rauia (Rutaceae)* should not be treated as variants under Article 75 of the Code.

49. *Stenomesson* Herbert (26)

Ecuador, Peru, Bolivia and northern Chile.

50. *Pamianthe* Stapf (2)

Temperate Zone of northern Central Peru. One of two species, *P. cardenasii* Traub, is an epiphyte.

51. *Paramongaia* Valarde (1). Ancash Dept., Peru.

52. *Phaedranassa* Herbert (8). Andes of Peru, Ecuador, Colombia to Costa Rica.

53. *Eucrosia* Ker-Gawler (4). Andes of Peru and Ecuador.

The tribe *Stenomesseae* is confined to the northwestern part of the South American continent and into Central America. Perhaps the orographic influence of the Andes has been responsible for the evolution of the several genera.

Tribe 15. *Euchareae* (Pax) Traub *(Urceolineae?)*

54. *Griffinia* Ker-Gawler (11)

Southern, eastern and central areas of Brasil.

55. *Urceolina* Reichb. (28)

Former genus *Eucharis* has been reduced to a subgenus of *Urceolina* so the range now is from Peru, Bolivia, Brazil and Colombia to Panama and Costa Rica.

56. *Hymenocallis* Salisbury (64)

A widely distributed genus ranging from the southeastern and south-central United States and Mexico through Central America to Peru and Venezuela in South America and in the islands of the West Indies.

57. *Eurycles* Salisbury (2)

Malay Peninsula, Philippines and northern Australia.

58. *Calostemma* R. Brown (3)

Endemic to Australia and found in New South Wales, South Australia, Queensland and the Northern Territory along the Gulf of Carpentia.

The *Euchareae* should be referred to as Tribe *Urceolineae* as *Eucharis* is now a subgenus of *Urceolina.*

Tribe 16. *Eustephieae* (Pax) Traub.

59. *Phycella* Lindley (7)
Peru, Chile, Argentina and Uruguay.

60. *Eustephia* Cav. (8)
Includes the genus *Eustephiopsis* now reduced to a subgenus—Peru, Argentina and Bolivia.

61. *Castellanoa* Traub (2). Argentina and Bolivia.

62. *Chlidanthus* Herbert (4). Mexico to Bolivia and Chile.

63. *Hieronymiella* Pax (1). Argentina.

The *Eustephieae* tribe seems to cluster mainly in central South America in areas of mountain vegetation, thorn scrub and grasslands. *Chlidanthus* has the greatest range.

In an attempt to correlate geographical distribution of the family to main world vegetation types, Figure 10 is used to illustrate the vegetation types. Members of the *Amaryllidaceae* occur with all vegetation types except the tundra and icecap. They would appear to be concentrated for the most part in the tropical rain forests, savannas and grasslands.

TABLE 2. DISTRIBUTION OF GENUS *AMARYLLIS*, TRIBE *AMARYLLEAE*

General range: Mexico and West Indies through Latin America to Argentina and Chile with one species extending to Prince's Island in West Central Africa. The majority are endemic to the great Rio Amazonas basin of Brasil, Bolivia and Peru, which is probably the center of species dispersal. Specific species and habitat locations are given and the abbreviated references are as follows: Traub = Traub, Hamilton P. 1958. *The Amaryllis Manual.* New York: The MacMillan Company.; *P.L.* = *Plant Life.*

1. *immaculata* (Traub & Moldk. syn. *A. argentina*); Tucumán Province, Argentina [Traub, p. 264; see also *P.L.* 26:53 (1970) and *P.L.* 28:11-12 (1972)]

2. *A. tucumana* (Holmb. T & U.; Tucumán Province (Salta), Argentina [Traub, p. 264; *P.L.* 26:53 (1970) and *P.L.* 28:11-12 (1972)]

3. *A. viridiflora* (Rusby) T. & U.; Manchuriza, Bolivia at alt. 1,067 meters; specimen only [Traub, p. 265; *P.L.* 16:36 (1960)]

4. *A. elegans* Sprengel; Five varieties from Northern Brasil, Guiana, Venezuela, Colombia, Peru and Ecuador (Traub, p. 265-267)

5. *A. vittata* L'Hérit.; Peru and Brazil with two varieties (Traub, 267-268)

6. *A. breviflora* (Herb.) Sweet; Campodo Massiambú and Palhoca, Santa Catarina State, Brasil (Traub, p. 269)

7. *A harrisonii* Lindl; Uruguay (Traub, p. 269)

8. *A. canterai* (Arech.) T. & U.; Rivera Dept., Region of Tanqueras, Uruguay (Traub, p. 270)

9. *A. damaziana* (Beauv.) T. & U.; Plateau of l'Itaculumi, Minas Geraes State, Brasil (Traub, p. 270)

10. *A. aglaiae* Castellanos; Salta and Jujuy, Tucumán Province,

Argentina (Traub, p. 271)

11. *A. striata* Lamarck; Four varieties found in southern and central Brasil (Traub, p. 271-273)

12. *A. crociflora* (Rusby) T. & U.; Guerratuma River, alt. 1,067 meters, Bolivia (Traub, p. 273)

13. *A. flammigera* (Holmb.) T. & U.; Misiones, Santa Ana Province, Argentina (Traub, p. 274)

14. *A. maracasa* Traub; Monte de Burro, municipio Maracas (alt. 9,296 meters), Bahia State, Brasil (Traub, p. 274)

15. *A. angustifolia* (Pax) T. & U.; Monte Agudo and San Pedro, Misiones, Argentina (Traub, p. 275—Mr. J. L. Doran says these villages do not exist but the species is found 30 km. south of St. Tomé)

16. *A. petiolata* (Pax) T. & U. (syn. A. argilagae); Monte Justo, Santo Tome Dept., Corrientes Province, Argentina (Traub, p. 275)

17. *A. leopoldii* T. Moore; Andes of Peru (Traub, p. 276)

18. *A. stylosa* (Herb.) Sweet; Guiana and Maranhao in northern Brasil (Traub, p. 277)

19. *A. scopulrum* (Baker) T. & U.; Sorata in the Andes of Bolivia (temperate region at 2,438-2,743 meters) (Traub, p. 277)

20. *A. reginae* L.; Mexico, West Indies to Venezuela, Brasil, Peru, Bolivia and West Central Africa. Collected in thick, shady primitive woods, alt. 930-1,219 meters on Prince's Island in the Congo Estuary (1853) with the collector noting it "seems thoroughly spontaneous and even indigenous; not cultivated anywhere in the island and not seen in the less elevated districts". This particular species is puzzling because of the great range in which it is found. (Traub, p. 277)

21. *A. andreana* (Baker) T. & U.; Rio Cauca, alt. 1,524-2,438 meters in central cordilleras of Colombia (Traub, p. 278)

22. *A. miniata* R. & P.; Andes of Peru (Traub, p. 279)

23. *A. evansiae* Traub & Nelson; Between Santa Cruz and Cochabama Depts., Bolivia (Traub, p. 279)

24. *A. espiritensis* Traub; Santa Teresa, alt. 900 meters in Espirito Santo State, Brasil (Traub, p. 280)

25. *A. vanleestenii* Traub; Paramaribo, (Traub, p. 281)

26. *A. ferreyrae* Traub; Forest area on Isla Santa Maria, near Yurimaguas, Huallaga Valley, Loreto Dept., Peru (Traub, p. 281)

27. *A. belladonna* L.; Four varieties ranging from Mexico and the West Indies to Chile, Bolivia, Brasil and found in British Guiana, Guadeloupe, Colombia, Costa Rica and is often confused with the Cape Belladonna, *Brunsvigia rosea.* This has led some workers to classify *Brunsvigia* as *Amaryllis* and *Amaryllis* as *Hippeastrum* which is incorrect. (Traub, p. 282-284)

28. *A. barbata* (Herb.) Traub; Suriname (Traub, p. 284)

29. *A. barreirasa* Traub; Confluence of the upper Rio Grande and Rio Ondas near Barreiras in Bahia State, Brasil (Traub, p. 285)

30. *A. traubii* Moldk.; Pucayacu near Tarapoto in San Martin Dept., Peru [Traub, p. 286; Doran gives more exact location in *P.L.* 29:27-29 (1973)]

31. *A. apertispatha* Traub; Cachoeiro de Itapemitim on granite rocks at alt. 366 meters, Espirito Santo State, Brasil (Traub, p. 286)

32. *A. mandonii* (Baker) T. & U.; Sorata in the Andes of Bolivia (temperate region, alt. 2,438-2,743 meters) [Traub, p. 287; altitude is corrected in *P.L.* 28:15-16 (1972)]

33. *A. fosteri* Traub; Amargosa at alt. 315 meters in Bahia State, Brasil (Traub, p. 288)

34. *A. calyptrata* Ker-Gawl.; Moist forests of Serra do Mor in southern Brasil north to Organ Mountains of Rio Janiero State and into Espirito Santo State, Brasil. It is an epiphytic species which mimics a green orchid (Traub, p. 288-289)

35. *A. kromeri* Worsley; Upper San Francisco River in Minas Geraes State, Brasil (Traub, p. 290)

36. *A. psittacina* Ker-Gawl.; Two varieties are found in southern Brasil and on the borders of Sao Paulo and Minas Geraes States (Traub, p. 290)

37. *A. correiensis* Bury; Two varieties found in the Organ Mountains, Brasil (Traub, p. 291)

38. *A. aulica* Ker-Gawl.; Central Brasil to Paraguay (Traub, p. 292)

39. *A. forgetii* (Worsley) T. & U.; Limatambo in Cuzco Dept., Peru (Traub, p. 292)

40. *A. oconequensis* Traub; Oconeque. eastern cordillera of Puno Province in south-eastern Peru (Traub, p. 293)

41. *A. moreliana* (Lemaire) Traub; Brasil—exact location unknown (Traub, p. 293; Doran has collected it on Mt. Atibaia, Estado São Paulo)

42. *A. pardina* Hook. f.; Andes of Peru (location unknown) (Traub, p. 294; Doran say Peru is wrong and this species is found in Apolo, Dept. Caupalacon, Bolivia)

43. *A. fusca* (Kraenzl.) T. & U.; In shrubbery between Sandia and Curyocuyo at alt. 762 meters, Peru (Traub, p. 294; Doran says also at Pampaccahua on railroad north of Cuzco 94-98 km.)

44. *A. cybister* (Herb.) T. & U.; Andes of Bolivia (Traub, p. 295; Doran says the Sao Paulo, Brasil location that Traub refers to is *A. angustifolia* not this species)

45. *A. reticulata* L'Herit.; Two varieties in southern Brasil (Traub, p. 296)

46. *A. blumenavia* (C. Koch & Bouché ex carr.); Ilha de Santa Catherina and wet meadows in Santa Catherina State, Brasil (Traub, p. 297)

47. *A. minasgerais* Traub; Santa Terezinha, municipio Ituiutaba, Minas Gerais State, Brasil [*P.L.* 14:30 (1958)]

48. *A. paranaensis* Traub; Parana and Jaquariahyua, Brasil [*P.L.* 14:31 (1958)]

49. *A. santacatarina* Traub; Burned over bog at alt. 900-1,000 meters west of Cacador Taquara Verde; Municipio Cacador, Santa Catarina State, Brasil [*P.L.* 14:32 (1958)]

50. *A. mollevillquensis* Cardenas; Mollevillque in Potosi Dept. of Bilboa Province, Bolivia [*P.L.* 18:29 (1962)]

51. *A. fragrantissima* Cardenas; Yungas of Corani, Chapare Province, Bolivia [*P.L.* 16:32 (1960)]

52. *A. starkii* Nelson & Traub; Santiago, Bolivia [*P.L.* 19:37 (1963)]

53. *A. chionedyantha* Cardenas; Antahiucana to Rio Salta in Cochabamba Dept., Careasco Province, Bolivia [*P.L.* 19:40 (1963)]

54. *A. umabisana* Cardenas; Umabisa in Cocabama Dept., Bolivia [*P.L.* 21:53 (1965)]

55. *A. incachacana* Cardenas; Incachaca in Cochabamba Dept., of Chapare Province, Bolivia [*P.L.* 21:55 (1965)]

56. *A. pseudopardina* Cardenas; Yungas near Corani in Cochabamba Dept. of Chapare Province, Bolivia [*P.L.* 21:55 (1965)]

57. *A. yungacensis* Cardenas; Solecama River, La Paz Dept. in Sud Yungas Province, Bolivia [*P.L.* 21:57 (1965)]

58. *A. escobaruriae* Cardenas; Yungas of La Paz, Bolivia [*P.L.* 25:41 (1969)]

59. *A. monantha* Rav.; Serra de Natividade, Goiás State and municipio Balsas in southern Maranhão, Brasil [*P.L.* 25:69 (1969)]

40. *A. restingensis* Rav.; Restinga near Yacarepagua, Guanabara, Brasil [*P.L.* 25:70 (1969)]

61. *A. papilio* Rav.; Santa Catarina State, Brasil [*P.L.* 26:83 (1970)]

62. *A. araripina* Rav.; Araripina, Pernumbuco State, Brazil [*P.L.* 26:84 (1970)]

63. *A. nelsonii* Cardenas; Rio Tumo Basin, 750 meters in La Paz Dept., Caupolican Province, Bolivia [*P.L.* 27:36 (1971)]

64. *A. doraniae* Traub; Island estuary of Rio Orinoco, Venezuela [*P.L.* 29:43 (1971)]

65. *A. blossfeldiae* Traub & Doran; Mogi das Cruzes, 50 km. east of Sao Paulo, municipio Ubataba, Maranduba Dist. Praia do Sape, Brasil [*P.L.* 27:44 (1971)]

66. *A. iguazuana* Rav.; Iguana National Park, Argentina and Parana State, Brasil [*P.L.* 27:63 (1971)]

67. *A. rubropicta* Rav.; Municipio Rio Blanco do Sul Santaria, Parana State, Brasil [*P.L.* 27:65 (1971)]

68. *A. anzoldoi* Cardenas; Yatibigua Canion from Charagua to Camiri, 800 meters in Santa Cruz Dept., Cordillera, Bolivia [*P.L.* 28:48 (1972)]

69. *A. divijulianus* Cardenas; Penon do San Julian near Tablas, alt. 1,800 meters in Cochabamba Dept., Chapare Province, Bolivia [*P.L.* 28:49 (1972)]

70. *A. caupolicanensis* Cardenas; Convent of Apolo, alt. 1,400 meters in La Paz Dept., Caupolican Province, Bolivia [*P.L.* 28:50 (1972)]

71. *A. neoleopoldii* Cardenas; Tumo River, alt. 1,200 meters in La Paz Dept., Caupolican Province, Bolivia [*P.L.* 28:52 (1972)]

72. *A. lapacensis* Cardenas; Puente Villa, alt. 1,700 meters in La

Paz Dept., Sud Yungas Province, Bolivia [*P.L.* 28:54 (1972)]

73. *A. leopoldii* forma *Whitakeri* Cardenas; Penon de San Julian, alt. 2,000 meters in Cochabama Dept., Chapare, Province, Bolivia [*P.L.* 29:36 (1973)]

74. *A. paquichana* Cardenas; Paquicha, Machariapare River at alt. meters in La Paz Dept., Caupolican Province, Bolivia [*P.L.* 29:38 (1973)]

The author is indebted to Mr. J. L. Doran, Burbank, California for his assistance in citing the references in this section and for his personal notes on several species.

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LATIN AMERICAN AMARYLLIDS, 1974

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[The present is the translation from the writer's recent articles on *Amaryllidaceae* and *Alliaceae*. Due to the limited space in this department, unnecessary paragraphs, such as introductions and others, are not included].

PUCARA, a new genus of Amaryllidaceae from North Peru; in An. Mus. Hist. Nat. Valparaíso 5.85-89, 1972.

Flowers regular ascending. *Ovary* inferior, trilocular, bearing many, superposed ovules. *Perigone* funnel-shaped, white. *Tepals* lanceolate or oblong-lanceolate, rather concrescent toward the base, the outer series minutely apiculate. *Staminal cup* deeply trilobed, the lobes bifid, crenate. *Filaments* filiform, the episepal very short, inserted on the very base of the cup, the epipetal longer, arising from the bifid part of the cup lobes. Anthers linear, erect fixed to the filaments in the lower third. *Style* filiform much surpassing the stamens. *Stigma* shortly trifid, its lobes recurvely spreading.

Bulbous vivaceous plants. Bulb subglobose covered by several, fragile, brownish coats; pseudoneck short. Leaves lanceolate or linear-lanceolate, subserotine, folded outwards in prefoliliation. Scape cylindrical, solid. Spathe bivalved; valves membranous, marcescent, free to the base. Inflorescence many-flowered.—Type-species: *Pucara leucantha* Ravenna.

A single species from the Departments of Cajamarca and Amazonas, in North Peru. The name *Pucara* (pronounced Pucára), has been adopted from the Ckechua term, which means a fortified place. It refers to the locality near the place where the species was found.

Generic relationships.—The inflorescence of *Pucara* suggests a relationship with *Rahuia*, a genus which inhabits the same region. Notwithstanding, the latter has thick, almost coriaceous leaves, and its flowers are quite different. On the other hand, only three genera exist in Peru with a trifid stigma; these are: *Amaryllis*, *Chlidanthus*, and *Zephyranthes;* they all differ, in every respect, from *Pucara*. Our genus shows some resemblance also with *Stenomesson*, but the morphology of perigone, androecium, and stigma, show fundamental differences. *Pucara* is placed in the tribe *Eustephiae;* the latter will be treated in a future work.

Pucara leucantha Ravenna, An. Mus. Hist. Nat. Valparaíso 5:86, 1972.

Plant about 15-50 cm high. *Bulb* globose or subglobose, 37-47.5 mm wide, with a 25-40 mm long pseudo-neck; outer tunics several, membranous, corrugated, brown. *Leaf* lanceolate or linear-lanceolate, acute, folded outward in prefoliation, not petioled (?), often solitary and not completely developed at anthesis, to 10-12 cm long, 20-30 mm, or more, broad. *Scape* cylindrical about 15-50 cm long, 5 mm broad at the apex. *Spathe* bivalved; valves lanceolate, membranous, marcescent,

subequal, free to the base, to 25-31 mm long; inner bracts very small, lanceolate. *Inflorescence* many-flowered. *Pedicels* ascending, about 3-6 mm long. *Flowers* white, funnel-shaped, about 12-14 mm in diameter. *Ovary* oblong-elliptic, to 3.8-4 mm long, 1.5-2 mm broad. *Tepals* lanceolate or oblong-lanceolate, concrescent for 4.5 mm; the outer 12-14 mm long, 4 mm broad, with a diminutive apicule; the inner 14 mm long, 5 mm broad. *Staminal cup* about 6.5 mm long, splitted in three lobes for 5-5.3 mm of its length; lobes notched, somewhat concave in the inner face, bifid for 2 mm. *Filaments* biseriate, the episepal 0.4 mm long, inserted on the very base, in the inside, of the staminal cup; the epipetal 1.8-2 mm long, arising from the bifid part of the cup lobes. *Anthers* linear, erect, to 3.6-5.8 mm long; pollen yellow. *Style* filiform, erect, 19.2-20 mm long. *Stigma* shortly trifid, its lobes linear, spreading but slightly recurved. *Immature capsule* globose-tricoccous. *Immature seeds* compressed, circular.

Range and habitat.—A native of North Peru. It grows on rocky slopes and sandy places of the Departments of Cajamarca and Amazonas, at about 990-1,650 m of altitude.

The specific epithet is formed by the greek terms *leuco*, white, and *anthos*, flower, alluding to the white flowers.

The discovery of this species shows the kind of oddities that are still hidden in certain less explored regions of Peru. Although its flowers are not very showy, the plant could be a worthy object for the bulb growers.

Contributions to South American Amaryllidaceae V; in Notic. Mens. Mus. Hist. Nat. Santiaga 189: 8, 1972.

I. **Habranthus schulzianus** Ravenna, Notic: Mens. Mus. Hist. Nat. Santiago: 8, 1972

Plant about 15-16 cm high. *Bulb* widely ovoid, 25-44 mm long, 23-26 mm in diameter, prolonged into a 17 mm long pseudo-neck and covered by brown, membranous coats. *Leaves* 1-2, present at anthesis, narrowly linear, to 6.5-11.5 cm long, 1.2-2 mm broad. *Scape* about 7.7 cm long (in the dry specimen). *Spathe* one-flowered, membranous, tubular for 26-27 mm, then bifid for 9 mm. *Pedicel* 35 mm long. *Ovary* obovate-oblong, about 6.5 mm long, 2 mm broad. *Flower* white, 38-43 mm long. *Tepals* oblanceolate, joined at the base for 2.8 mm, about 40 mm long, 6-7 mm broad. *Filaments* declined, the upper episepal to 9.8-11 mm long, lateral episepal 12.5-13 mm long, lower epipetal 14.5-16 mm long, lateral epipetal 18-18.8 mm long. *Anthers* about 5-6.5 mm long. *Style* declined to 24 mm long. *Stigma* lobes 4-4.2 mm long. *Capsue* globose, subtricoccous, about 11 mm in diameter. *Seeds* oval or broadly elliptic, black, to 4.3-4.8 mm long.

Habitat.—Chaco region, in the north-west of the province of Santa Fe, Argentina.

This species rather resembles to *Habranthus salinarum* Rav.; it differs, however, in its wider perigone, and in the longer stigma lobes.

The specific epithet was given in honor of Dr. Augusto Schulz, of

the Colonia Benitez Agricultural Station, province of Chaco (Argentina). Dr. Schulz has collaborated very much in the collection of critical material of the genus *Habranthus*. His sendings of living plants have been of much help.

II. The correct name of a **Zephyranthes** species

Zephyranthes americana (Hoffmsgg.) Ravenna, Notic. Mens. Mus. Hist. Nat. Santiago: 8, 1972.—*Sternbergia americana* Hoffmansegg, Verz. Pfl.: 197, 1824.—*Haylockia pusilla* Herbert, Edwards Bot. Reg. 16: tab. 1371, 1830.—*Zephyranthes pusilla* (Herb.) Dietrich, Syn. Pl. 2: 1176, 1840.—*Haylockia americana* (Hoffmsgg.) Herter, Estud. Bot. (Fl. Urug. VII-VIII): 224, 1956.

Recently (Ravenna 1971), I expressed the view that *Haylockia* be considered as a subgenus of *Zephyranthes*. In that work, I used the name *Z. pusilla* (Herb.) Dietr. for the type-species. Lately, however, I learned about the existence of a previous name in *Sternbergia*, a genus of the Old World.

Studies in the *Alliaceae;* in Notic. Mens. Mus. Hist. Nat. Santiago 198, 1973.

Nothoscordum entrerianum Ravenna, loc. cit. [Fig. 11]

Plant 15-31 cm high. *Bulb* ovoid or globose-ovoid, 27-28 mm long, 12-13 mm in diam., with a slight alliaceous smell, covered with a few, dry, pale brown coats; basal corm large; bulblets 3-5, probably more among the tunics, ovate-fusiform, a pale or dark brown, 6-6.8 mm long, 3.4-3.5 mm in diam. *Leaves* more or less prostrate, flaccid, a pale green, rather carinate and channelled, subobtuse, about 15-24 mm long, 3.7-6 mm broad, narrower toward the apex. *Scape* weak, to 28 cm long, 1.7-2.6 mm near the base. Inflorescence 7-10-flowered. *Spathe valves* marcescent, subequal, 6-7 mm long, joined at the base. *Pedicels* 13-16.5 mm long, when they bear flowers. *Flowers* infundibulate, erect or suberect, 7-7.5 mm long, 7.5-8.5 mm in diam., very fragrant, white, not purple-stripped, green at the concrescent part of tepals. *Tepals* lanceolate, joined for 1-1.2 mm, about 7 mm long; the outer 2.9 mm broad, subacute; the inner 2.2 mm broad, almost obtuse. *Filaments* narrowly lanceolate, narrowing gradually upwards, greenish near the base, white above; the episepal about 4.5 mm long, 0.9 mm broad at the base; the epipetal ca. 5.2 mm long. *Anthers* oblong or oblong-elliptical, versatile, 1.7 mm long before dehiscence, 0.7-0.9 mm long after it; *pollen* sulphur yellow. *Ovary* widely elliptical, almost tricoccous, a bright green, about 2.3 mm long, 1.8 mm in diam. *Style* filiform, white, about 3.2 mm long. *Stigma* capitate.

Hab.—Ravines above the Paraná river, near Hernandarias, in the province of Entre Ríos, Argentina. It grows in sandy clay.

Allied to *N. arenarium* and to *N. nudicaule* (see Guaglianone 1972,

Fig. 11. **Upper Nothoscordum serenense** Rav.; and **Lower, N. entreraianum** Rav. Photos by P. Ravenna.

p. 209), but readily recognizable by virtue of its small habit, and by the tepals not streaked with purple.

Apparently endemic in the ravines above the banks of the Paraná river, in the western side of the province of Entre Ríos.

In the fourth series of my "Contributions to South American *Amaryllidaceae*", the epithet *balaenense*, [See Fig. 12] which heads the original description of the species in *Nothoscordum* (See Ravenna 1971, p. 85), was misprinted.

Nothoscordum serenense Ravenna, in Notic. Mens. Mut. Hist. Nat. Santiago 198, 1973. [Fig. 11.]

Fig. 12. **Left, Nothoscordum nublense** Rav., and **right, N. balaenense** Rav. Photos by P. Ravenna.

Plant 30-45 cm high. Bulb ovoid or broadly ovoid, very bulbiliferous, 15-20 mm long, 9-19 mm in diam., prolonged into a 20-27 mm long pseudo-neck; outer coats membranous, fragile, a pale brown or whitish in nature, tinged purple after dried; basal corm small. *Leaves* 1-3, synanthious, linear, rather fleshy, moderately channelled, 9-21 mm long, 1-2.5 mm broad. *Scape* 22-33 cm long, 1.3-2.5 mm broad, an ashy green, pruinose. *Inflorescence* 3-12 flowered. *Spathe valves* lanceolate, marcescent, 5-10 mm long, joined at the base for 1-2 mm. *Pedicels* slender, 22-35 mm long, 0.4 mm broad. *Flowers* widely funnel-shaped,

8-9 mm long, 13-16 mm in diameter. *Tepals* whitish, with a difuse brownish-green streak in both outer and inner faces, lanceolate-elliptic, subequal, with a cucullate-concave apex; the outer acute, ca. 4 mm broad; the inner 3.8-3.9 mm broad. *Filaments* free, a dirty green, lanceolate-subulate, thickened, not complanate, narrowed in the lower forth; the outer 5.5 mm long; the inner 5.9 mm long. *Anthers* reniform after dehiscence, 1.3-1.4 mm long; *pollen* orange. *Ovary* elliptical, 2.2 mm long, 1.4 mm in diameter. *Style* 4.7 mm long, filiform, greenish at the base whitish above. *Stigma* capitate.

Hab.—Sandy hills near La Serena, and also at Salala, where the road from Ovalle joins the Panamerican highway. In the former place, it grows near *Leucocoryne coquimbensis, Sisyrinchium graminifolium* ssp. (Irid.), *Conanthera campanulata,* and Nolanaceae. Some of the *Nothoscordum* plants were here parasitized by *Cuscuta* sp. In the latter location, it was found near *Rhodophiala bagnoldii* and *Alstroemeria recumbens* Herb. (yellow form).

Nothoscordum serenense can be distinguished, from the rest of the species, on account of the cucullate apex of tepals. It is a very distinct species.

According to Mr. Carlos Jiles, who knows much on the flora of Coquimbo, it is quite common in the region of Ovalle, the town where he lives.

Nothoscordum nublense Ravenna, in Notic. Mens Mus. Hist. Nat. Santiago 198, 1973. [Fig. 12.]

Plant 10-30 cm high. *Bulb* ovate or subglobose, about 15-20 mm long, 13-18 mm wide, covered by whitish or brownish, rarely blackish coats; bulbiles whitish, ovoid or almost globose, 2.8-4 mm long; basal corm small; the pseudo-neck 10-35 mm long. *Leaves* present at anthesis, narrowly linear, thickened, moderately channelled but not carinate, a dark green, to 10-20 cm long, 1-2.5 mm broad. *Scape* pale green, 10-25 cm long, 1.3-2.3 mm broad. *Inflorescence* 3-7 flowered. *Spathe-valves* lanceolate, membranous, joined at the base for 2-2.5 mm, 13-15 mm long. *Pedicels* 15-30 mm long. *Flowers* widely funnel-shaped or often almost rotate, a snow white, about 5-9 mm long, 7-13 mm in diameter. *Tepals* subequal, linear-lanceolate, acute, joined at the base for 0.9-1.8 mm, 5.5-9 mm long, 2.5-3.2 mm broad, externally with a purple streak. *Filaments* lanceolate-subulate, thickened, white, the episepal 3.2-4.4 mm long, the epipetal 3.6-5.6 mm long. *Anthers* moderately versatile, after dehiscence 1.2-1.5 mm long; *pollen* orange. *Ovary* elliptical, a pale green, about 2- ? mm long, 1- ? mm wide. *Style* filiform, white, 2.7-4.8 mm long. Stigma capitate. Capsule subglobose, a bright green, about 4-4.5 mm in diam. Seeds ovate-oblong, angled, black, almost crustaceous, 2.3-2.5 mm long.

Habitat.—Fields and sea shores in the central-southern region of Chile, from the province of Nuble to Valdivia.

Nothoscordum nublense [Fig. 12.] differ from the rest of the Chilean species in its intensely white tepals with a purple streak on the outer face.

CHROMOSOME NUMBERS FOR SEVERAL SPECIES OF **HYMENOCALLIS**

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Salisbury established *Hymenocallis* as a genus in 1812, placing in it American taxa previously assigned to *Pancratium.* The latter genus is entirely an Old World one, its twelve or so species found chiefly in the Mediterranean area. *Hymenocallis* occurs in the warm parts of the New World, and perhaps is otherwise chiefly distinguished from *Pancratium* by its seed. While the seed of Pancratium are black, and angled by "mutual" pressure, those of *Hymenocallis* are usually comparatively large and fleshy, spherical to ovoid, green in color, and only two or a few per cell—although occasionally there are as many as eight seeds per cell.

Over the years there have been several attempts at monographing the genus *Hymenocallis.* In 1837 Herbert placed 14 or 15 species in the genus, although he included a total of 20 varieties under 6 of these different species. In addition, Herbert placed two species, *glauca* and *galvestonensis,* in the closely related genus *Choretis*—species which are now usually considered to be members of *Hymenocallis.* Herbert, also, considered 4 species to belong in another closely related genus, *Ismene*—which many workers now include with *Hymenocallis.* Baker (1888) considered 31 species under *Hymenocallis,* with 7 of these being placed in his subgenus *Ismene;* while three other closely related species were thought to deserve placement in the separate genus *Elisena.* Sealy (1954) considered 27 species to be included without question in *Hymenocallis,* with another 5 imperfectly known species probably belonging here. Traub (1962) listed 56 different species of *Hymenocallis,* with 41 of these being included in subgenus I. *Hymenocallis,* and the other 15 taxa being distributed among the subgenera *Elisena, Pseudo-Stenomesson* and *Ismene.*

The taxa of *Hymenocallis* are difficult to study. Material is apt to be difficult to collect, because a number of the taxa only bloom following periods of ample rainfall. As a result one may go into an area where a species has been reported and because of weather conditions, entirely fail to find the taxon. Further, the succulent material of this genus does not dry well, and the result is a paucity of herbarium material, and this of a generally poor quality. Chromosome information is not as valuable an aid here, as in many genera. Information on desired meiotic associations can only be obtained with great difficulty after removing buds from bulbs usually sacrificed in the process. The somatic chromosomes are comparatively large, but also comparatively numerous, and in some taxa the numbers are quite high.

The present author started studying several members of the genus about 1938. Since that time numerous accessions have been studied in the field, in the greenhouse, and in the garden. A total of 206 acces-

sions, 139 from native locations, have been studied. These include 46 from 12 Mexican states, 67 from 12 of the United States, 24 from the West Indies (Puerto Rico, Jamaica, San Saba, New Providence) and two from San Salvador. Somatic chromosome numbers have been determined for 89 accessions. These range from one accession having 38 chromosomes, to one accession having 98, and another 195 somatic chromosomes. More accessions have been encountered with a basic number of n = 23, than any other. Twenty-nine accessions have 46 somatic chromosomes, 3 have had 69, one has had approximately 92, while several with diploid numbers of 47, 48, 50, and 70 have been found—all of these probably being aneuploid numbers derived from 2X = 46 or 2X = 69.

Three very brief reports have been published concerning these cytological findings (Flory, 1950, 1973; Flory and Schmidhauser, 1957). This material is now being organized so that details of the data at hand can be made available to others. The present paper is a first effort in that direction, and the writer is indebted to Dr. H. P. Traub for the stimulus to prepare this material.

In his 1962 paper on *Hymenocallis,* Traub described six new species, and gave amplifications concerning thirteen additional species. A number of these notes were made from plants which the late Mrs. Mary G. Henry had collected at various places, especially in the southeastern United States. Material of several of these taxa was furnished the present author for the cytological studies which he and his students were making on the genus. Dr. Traub has now requested that chromosome information be furnished on several of these accessions. Accordingly, in the present paper numbers and descriptions of the chromosomes in seven different species of *Hymenocallis* are presented. Six of these are from the southeastern United States, and the seventh species is from Mexico.

CHROMOSOME DATA

In Table 1, information is presented on the source of the material studied, and on the somatic chromosome numbers found in the various accessions. The chromosome information is by this author, with the remainder of the table being prepared by Dr. Traub. As indicated in the table, voucher Herbarium specimens for this material have been prepared by Dr. Traub and will be found in the Traub Herbarium (TRA), La Jolla, California.

A brief discussion of the chromosome situations encountered in the several taxa is given below.

Hymenocallis kimballiae, of Traub's Caribaea Alliance, has 70 somatic chromosomes Fig. 13 (1). Of these, 68 have interstitial centromeres—and hence two arms each, while the other two are rod-like telocentrics (with a terminal, or essentially terminal centromere). Quite apparently this is essentially a triploid taxon in which one of the V-shaped chromosomes has split at the centromere, resulting in the two rod-like chromosomes in place of a 69th one with an interstitial centro-

mere.

Material of *Hymenocallis acutifolia* of the Littoralis Alliance, with 46 somatic chromosomes, has been available from two different locations in Mexico. One of these collection points was at Oaxtepec, in the State of Morelos, and the other was near Uruapan, in the State of Michoacan. Both of the accessions of this species have 46 somatic chromosomes, all with interstitial centromeres and two arms.

Table 1. Chromosome numbers of Genus **Hymenocallis** species of Subgenus **Hymenocallis**—the Caribaea, Littoralis, Caroliniana, and Henryae Alliances, according to Traub, PLANT LIFE 18: 55-72. 1962. Voucher herbarium specimens deposited in the Traub Herbarium (TRA).

Species	Accession Numbers		Habitat	Chromosomes		
	Flory	Traub		2n	M[1]	T[2]
CARIBAEA ALLIANCE						
kimballiae Small ex Traub	13309–56	T-261 (*523a & b)	Appalachicola River Estuary, west Fla.	70	68	2
LITTORALIS ALLIANCE						
acutifolia (Herb.) Sweet	210	T-176 (*245a, b & c)	Oaxtepec, Mexico	46	46	—
	235	T-264 (*246)	Uruapan, Mexico	46	46	—
CAROLINIANA ALLIANCE						
caroliniana (L.) Herb.	240	T-219 (*254a & b)	Covington Co., Ala.	52	(40	12?)
	225	T-213 (*244a & b)	Mammoth Cave, Ky.	54	38	16
	209	T-127 (*243a & b)	Conecuh Co., Ala.	54	38	16
rotata (Ker-Gawl) Herb.	227	T-220 (*250a & b)	Marion Co., S.C.	40	40	—
	234	T-260 (*281)	Altamaha R., near Baxley, Ga.	40	40	—
palusvirensis Traub	185	T-151 (*251a, b & c)	Brunswick Co., N.C.	40	40	—
HENRYAE ALLIANCE						
henryae Traub	204	T-130	Santa Rosa, Fla.	38	34	4
palmeri S. Wats.	214	T-230 (*244a & b)	Palm Beach, Fla.	48	44	4

*—refers to numbers of herbarium specimens
M[1]—metacentric chromosomes
T[2]—telocentric chromosomes

There are three different species listed in Table 1 belonging to Traub's Caroliniana Alliance. Two of these species, *H. rotata* and *H. palusvirensis,* each have 40 somatic chromosomes. The third species, *H. caroliniana,* has a 2n of 52 where collected at Opp in Covington County, Alabama, and a somatic number of 54 where collected at Evergreen in Conecuh County, Alabama, as well as from near Mammoth Cave, Kentucky.

The 54 somatic chromosomes of *Hymenocallis caroliniana* from Mammoth Cave, Kentucky, are drawn in Fig. 13 (2). A study of this figure will show that there are 38 two-armed chromosomes present, along with 16 elements with terminal centromeres, and which are sometimes

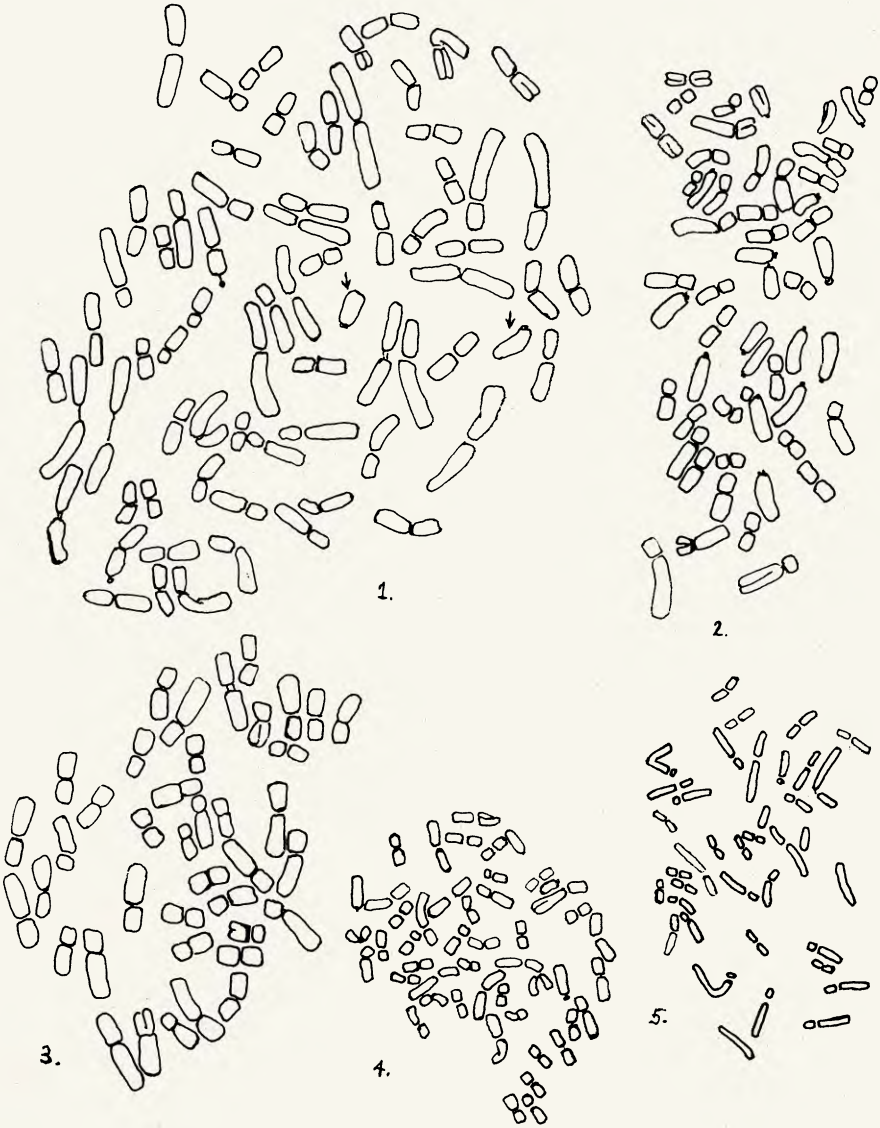

Figure 13. Chromosomes of five **Hymenocallis** species of S. E., U. S.—(1) **H. kimballiae** Traub (T-261; 13309-56). 2n=70. There are 68 chromosomes with centromeres located in median, submedian, and a few in subterminal positions. Two chromosomes (at arrows) are telocentric. X1950. (2) **H. caroliniana** (Linn.) Herb. (T-213; 225). 2n=54, with 38 two-armed chromosomes and 16 telocentric ones. X1950. (3) **H. palusvirensis** Traub (T-151; 185). 2n=40. No telocentric chromosomes. X1950. (4) **H. palmeri** S. Wats. (T-230; 214). 2n=48, with four chromosomes being telocentric. X1450. (5) **H. henryae** Traub (T-130; 214). 2n=38, with four chromosomes being telocentric. X1450.

called "T" chromosomes. Essentially this same situation with reference to "T" chromosomes can be seen to occur in the 54 chromosomes of the taxon from Conecuh County, Alabama. Likewise, the plants in the collection from Covington County, Alabama, have approximately 40 two-armed chromosomes, along with 12 telocentric ones—to make up its total of fifty-two.

Studies of the two collections of *H. rotata* show that both have 40 somatic chromosomes, all of which are two-armed. No telocentric chromosomes occur among the 40. This same situation occurs in *H. palusvirensis,* where again the chromosome number is 2n = 40 Fig. 13 (3), with all of these being two-armed, and none telocentric.

Two representatives of the Henryae Alliance are reported upon in this study. *Hymenocallis henryae,* collected at Santa Rosa, Walton County, Florida, has 38 somatic chromosomes Fig. 3 (5)—next to the lowest number known for any taxon in the genus. Of these, four have terminal centromeres, with 34 having interstitial centromeres. *Hymenocallis palmeri,* of the same Alliance, was collected at Palm Beach, in Palm Beach County, Florida. This representative had 48 somatic chromosomes Fig. 13 (4), of which four have terminal centromeres, and the other 44 are two-armed, with interstitial centromeres.

In 1956 the present author collected specimens of *H. palmeri* about 80 miles southwest of the collection point of the T-230 taxon referred to in the preceding paragraph. The 1956 collection was made in Dade County, 12 miles north of Park Motel, Homestead, Florida, on the east side of Florida State Highway 27, 8.7 miles south of the intersection of U.S. 41 and Florida 27. The bulbs collected here were growing in black sandy soil in pockets of oolite honeycombed rock. The *H. palmeri* plants collected in 1956 had 46 somatic chromosomes, none with terminal centromeres. In 1972, the 1956 collection point was revisited, but the area was now covered with housing developments. However, in 1972 additional bulbs of *H. palmeri* were secured several miles west of Homestead, Florida, along the edge of the Everglades National Park. These plants are presently in greenhouse culture, and will be studied cytologically when time permits.

LEGEND FOR FIGURES

The five drawings, in Fig. 13, are all camera lucida drawings of the outlines of chromosomes in complements at metaphase division in acetic-orcein root tip squash preparations from *Hymenocallis* species. All drawings made at table level, using 90X oil immersion objective, and either 15X or 10X oculars. Root tips were pretreated with .2% colchicine for from 2 to 5 hours.

DISCUSSION

Flory and Schmidhauser (1957) have earlier reported that the most frequent somatic chromosome number found in *Hymenocallis* is 46, and that accessions in which 2n = 40 are next in frequency. Telocentric chromosomes are found in the complements of many taxa in the

genus, but have never been found where the 2n numbers are 40, 46, or 69 (triploids based on n = 23). It was also reported that most numbers other than 46 (or 69) or 40 reduce to one of these, if half the number of telocentrics is added to the number of chromosomes with interstitial centromeres. This is seen to be the case with the chromosome numbers for the accessions reported upon here.

The present report presents chromosome information for 11 accessions, involving 7 species. The chromosome numbers determined for the several taxa (Table 1) have been 38 (1 taxon), 40 (3 taxa), 46 (2), 48 (1), 52 (1), 54 (2), and 70 (1). The number of two-armed and telocentric chromosomes for these same taxa are: 34 + 4 (2n = 38); 40 + 0 (2n = 40); 46 + 0 (2n = 46); 44 + 4 (2n = 48); 40 + 12 (2n = 52); 38 + 16 (2n = 54); and, 68 + 2 (2n = 70), respectively. It will be noted that 46 chromosomes with interstitial centromeres, and two arms each, have a total of 92 arms. Also where 2n = 48 with four telocentrics, there is a total of 92 chromosome arms in each complement. The same is true where 2n = 52 with 12 telocentrics, and where 2n = 54 with 16 telocentrics—there is a total of 92 arms in each complement. Hence, in each of these cases—whether the 2n number is 46, 48, 52, or 54—the total number of arms involved in each complement is 92. Likewise, where 2n = 70—in *H. kimballiae*—with two telacentrics being present, there is a total of 138 arms present. This is the same number of arms which occurs, of course, in triploids having 69 somatic chromosomes, all with interstitial centromeres and, hence, two arms. The exact explanation for the chromosome situation in *H. henryae* is still to be deciphered.

It was long thought (tracing from Nawashin, 1916) that all centromeres were interstitial, and that when telocentic chromosomes arose through misdivision they were either converted into isochromosomes or were lost.

The studies of Marks (1957) put a different light on the problem, and showed that at least some kinds of telocentric chromosomes have centromeres similar to those of metacentric chromosomes. Marks presents a good case for his statement that "There is no evidence that a telocentric chromosome is unstable because its centromere is terminal."

In the case of *Hymenocallis* the occurrence of varying chromosome numbers, often due to variations in the number of V-shaped and rod-shaped chromosomes present, appears to have played a significant role in speciation, at least in connection with certain taxa. This is not the place to discuss the relative merits of arguments for centric fusion versus centric fission (re the so-called 'Robertson's law,' based upon Robertson, 1916). In *Hymenocallis* it is evident, however, that either the decrease in chromosome numbers due to centric fusion, or the increase due to centric fission, has occurred and has played an important role in the phylogeny of the group.

SUMMARY

Table 1 lists chromosome numbers for 11 accessions of *Hymenocallis*

involving 7 different species. These numbers range from 38, through 40, 46, 48, 52, and 54 to 70. Where numbers of 40 and 46 occur, all chromosomes have interstitial centromeres. Telocentric chromosomes occur in the complements having other somatic numbers. It is pointed out that if half the number of telocentrics are added to the number of metacentric chromosomes, for any given complement, that the sums will be 46 or 69 (or in certain other cases, 40) in each case, except for *H. henryae* where the number would be 36. Two different chromosome numbers are reported here for *H. caroliniana,* 2n = 52, and also 2n = 54; this is due to differing numbers of telocentrics in the different accessions, and the total number of somatic chromosome arms equals 92 in each case.

ACKNOWLEDGEMENTS

Several students and colleagues have aided and collaborated, at different periods, in the study of *Hymenocallis,* particularly of its chromosomes. Especially to be mentioned here is the work of Dr. Thelma Ficker Schmidhauser who, as a graduate student at the University of Virginia during the 1950's, examined a rather large number of accessions, both cytologically and morphologically. Figures 4 and 5 are reproduced from her drawings. Dr. Ray Flagg aided the study while a postdoctoral Associate at the Blandy Experimental Farm at the University of Virginia. Additional valuable assistance has been rendered by Mrs. Rina Varma and Dr. Ruth Phillips. Dr. Hamilton P. Traub not only provided the material studied in the present work, but has supplied considerable additional material and has encouraged the study in various ways.

At different times the *Hymenocallis* study has had the support of Grants B3296, G11080 and GB1767 from the National Science Foundation, as well as grants from the Research and Publication Fund of Wake Forest University.

Sincere appreciation is expressed to all these persons and institutions.

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AMARYLLID NOTES 1975

Hamilton P. Traub

Quitoensis Alliance, Subgenus *Hymenocallis,* Genus *Hymenocallis,* Salisb. (Amaryllidaceae), *Alliance nov.,* ovulis per locula 18—20, flore per umbella uno, staminibus incurvatis, et chromosomatibus diploideis 2n = 24. Typus: *Hymenocallis quitoensis* Herb.

Crinum asiaticum f. *cuperfolium* f. nov. Forma a forma typica speciei foliis aeneo-cupreo-rubris et floribus purpureo-coloratis recedit. Holonomenifer: Traub Nos. 621a and 621b (TRA), July 12, 1958; cult. Calif.; originally obtained from Hawaii, and apparently native to southeast Asia.

PLANT LIFE LIBRARY—continued from page 26.

EAST AFRICAN VEGETATION, by E. M. Lind, M. E. S. Morrison and A. C. Hamilton. Longmans, Inc., 72 5th Av., New York City 10011. 1974. Pp. xvii + 257. Illus. $17.50.—In this generously illustrated book, the major types of vegetation of Uganda, Kenya and Tanzania are described from the ecological view point. The regions are considered under the headings of forests; rangelands; inland aquatic vegetation; the vegetation of the sea coast, and high mountain vegetation. The factors affecting vegetation, climate and soils are discussed; and a brief history of the overall vegetation region is presented. A bibliography and plant name index complete the volume. Highly recommended.

TREE FLORA OF MALAYA, VOL II, edited by T. C. Whitmore. Longmans, Inc., 72 5th Av., New York City 10011. 1972. Pp. (vii) + 444. Illus. $40.00.—Subtitled, **A Manual for Foresters**, Vol. I was previously published in 1972, comprising 28 families. Vol. II. covers a further 30 families which takes the work to over half way. The keys are based on leaves and twigs as far as possible since they are usually available for identification. Recommended to foresters, professional botanists and others interested in tree flora.

THE INDIGENOUS TREES OF THE HAWAIIAN ISLANDS, 2nd edition, by Joseph F. Rock, and addenda by Derral Herbst. Chas. E. Tuttle Co., Rutland, Vermont. 1974. Pp. xx + 548. Illus. $22.50.—The **1913** edition had long been out of print, and due to popular demand, this excellent beautifully illustrated 2nd edition has appeared. Following the informative Introduction by Dr. Carlquist, and the preface by the author, the key to the 43 families to which the trees were referred, is provided. Then follow the descriptions of the forest regions, and the scientific descriptions of the families, genera and species of the Hawaiian tree flora. Addenda by Derral Herbst bring the scientific nomenclature up-to-date. An index of the scientific names completes the volume. The illustrations are so outstandingly beuatiful that they merit special mention. The book is very highly recommended to all interested in tree flora.

SOIL ORGANIC MATTER AND ITS ROLE IN CROP PRODUCTION, by F. E. Allison. Elsevier Scientific Publ. Co., 52 Vanderbilt Av., New York City 10017. 1973. Pp. v + 637. Illus. $52.00.—The final and important contribution by an eminent soil scientist will be welcomed. The author emphasizes the major role of organic matter in determining the microbiological, chemical and physical aspects of soil fertility. The subject is developed under the following headings—the soil and living matter in it; formation and nature of organic matter of mineral soils; sources and possible fate of nitrogen in mineral soils; function and possible effects of organic matter in mineral soils; some organic matter and crop management problems in mineral soils; and organic soils. Very highly recommended to students of soil science and all engaged in crop production.

AQUATIC PLANTS OF AUSTRALIA, by Helen I. Aston. International Scholarly Book Services, Box 4347, Portland, Oregon 97208. 1973. Pp. xii + 368. Illus. $34.65.—Based on original research by the author, this is the first comprehensive guide to the aquatic plants of Australia. It is illustrated with more than 130 excellent pen-and-ink drawings. The main text includes more than 200 species with full descriptions and details of habitat and geography, and synonyms. Appendices on the water Hyacinth pest, distribution chart, six maps showing locations, rainfall and altitude. Bibliography and plant name index complete the volume. This is an indispensable guide for the professional botanist, student, water trusts, irrigation authorities, conservationists and farmers. Highly recommended.

FLORA OF THE U.S.S.R., VOL XVII. UMBELLIFERAE (continued), translated from the Russian; compiled by E. P. Korovin, et al. International Scholarly Book Services, Box 4347, Portland, Oregon 97208. 1974. Pp. xviii + 285 + Map. Illus. $28.00.—In this volume the text of the **Umbelliferae** is completed, and is followed by that of the **Cornaceae.** Following the systematic index to the species in Vol. XVII, and the brief Preface indicating that Vol. XVII deals with the remainder of the **Umbelliferae** and the **Cornaceae,** the genera and species of these groups are described in detail. Indices to the genera and species of the **Umbelliferae** and **Cornaceae,** and families of the Archichlamydeae, list of the Vegetation Regions of the USSR, abbreviations for Russian institutional publications and a Map of the USSR, complete the book.

BOTANY IN THE LABORATORY, by Maynard F. Moseley and William K. Purves. John Wiley & Sons (Hamilton Publ. Co. Div.) 605 3rd Av., New York City 10016. 1974. Pp. x + 196. Illus.—There are sections on the use of the microscope, cell structure and physiology of the plant; the divisions of the plant kingdom—**procaryotes,** bacteria, etc., and **eucaryotes,** fungi, algae, bryophytes and vascular plants. A section on pollutants in the environment, and an index complete the volume.

PLANT LIFE LIBRARY—continued on page 72.

3. GENETICS AND BREEDING

BREEDING AND CULTURE OF AMARYLLIS

JOHN M. CAGE, *1041 Ruth Avenue, Yuba City, California 95991*

In Plant Life for 1972 and 1973, the writer proposed the liberal use of inbreeding and eventual outcrossing in a rational program of *Amaryllis* improvement. Experiments in such a program, covering a span of about 35 years, have been very rewarding, especially in consideration of the modest facilities available for the work. The results are consistent with the experience of those breeders who have developed F:1 hybrids of many vegetables and flowers.

Some of the opinions and findings expressed below are controversial, and it is to be understood that they are given with modesty and open-mindedness.

It appears that continued inbreeding and selection steadily give greater uniformity of those genetic characters selected, provided that

1. Sterility problems can be overcome.

2. Sufficient numbers of seedlings of a given inbred are grown to permit a significant selection. Some inbred crosses or selfs may have to be repeated long enough to find one or more improved seedlings, especially during the early generations, for inbreeding brings out many freaks and weaknesses in genera that have long been crossed randomly.

3. The traits selected for improvement by inbreeding do not depend upon the combination of *dissimilar* genes, i.e., heterozygosity. Inbreeding can only make a strain more *homozygous*. If successive inbreeding continues to give seedlings of widely varied types, you will know you are on the wrong approach.

After an *Amaryllis* species has been crossed into an inbred strain, only two or three generations of additional inbreeding seem to be required to eliminate all those species traits that are *not* desired, perhaps because species are already so uniform genetically. For instance, the dotted color pattern of *Amaryllis lapacensis* Cardenas has been easily transferred into two inbred strains of large whites.

Sterility in inbreds has been discussed in the writer's previous papers. Gibberellins and other chemicals are helpful, and usually one can successfully eliminate sterility by resorting to either sibling crosses or back crosses on good ancestors, rather than continued selfing. This compromise does not reduce the degree of inbreeding very much, especially if a selfed generation is introduced as often as feasible.

Another conclusion drawn from the writer's projects is that crosses between two inbred strains tend to exhibit remarkable hybrid vigor, or heterosis, unless a damaging chromsomal incompatibility exists between those particular strains. Parents with seven-inch blossoms regu-

Fig. 14. Dr. Cage Amaryllis—**Left,** pure white outbred, 9-inch diameter flower; **Right**, a red-and-white tricolor reproduced from seeds, 8-inch diameter flower.

larly produce offspring with nine-inch blossoms, for instance—all solid dark red, front and back of segs, and all with flat leopoldii form.

Of course, inbreeding cannot stabilize or improve qualities of a plant line that do not exist genetically in the breeding stock. Barring mutations, endless inbreeding will not produce red blossoms if none of the genes of the inbreeding stock tend to produce red pigmentation. That is to say, a major (probably *the* major) aspect of the art of inbreeding and outcrossing to obtain *quality* in the uniform seedlings is the selection of breeding stock initially. Undesired plants are not rewarding, no matter how uniform.

If one lacks good stock that is not known to be inbred to some extent already, then a good starting point is a few beautiful specimens that have many of the qualities desired. Self the individuals or cross siblings and try to identify those lines having qualities that become more uniform each new generation. Stated another way, if one does not desire the qualities that tend to become more uniform in an inbred line, start anew with new parents.

Sometimes, it may appear to the breeder that an inbred line could be improved by breeding in one or more of the traits of a species, another inbred, or a mixed hybrid. Some of the worst problems arise at this point. The inbred line may be either diploids or tetraploids, and the chosen plant to be introduced may be diploid, tetraploid, triploid, or aneuploid. An even more subtle incompatibility may exist to produce distorted offspring or sterility. Very often the planned cross is between a tetraploid and a diploid (for example, when a breeder attempts to introduce the yellow color of a small diploid species into a large white tetraploid line) and troubles abound. If seedlings are produced, they are probably triploids. They may be quite sterile. If not, what does one do next? The genes for yellow color have already been seriously diluted by the tetraploid genes, and anyway, triploids seldom can be selfed. If the diploid species is crossed back upon the triploid, and if fertile seeds are luckily produced, they would appear to be diploids, and in the writer's experience, the desired traits of the large white tetraploid are almost totally lost. On the other hand, if the original tetraploid white, or another one, can pollinate the triploid, perhaps same tetraploids are produced, but now the yellow genes are diluted enormously, and it is very difficult to select out the plants that have *any* yellow genes for further inbreeding. The requirement now: thousands of seedlings, large facilities, and a lifetime of work.

Dr. Bell (Plant Life, 1973, p. 59) has discussed the above problem and others in an excellent paper. Triploids apparently *can* play an important part in the synthesis of desired genetic characters into a single strain, but the work is difficult. As stated earlier, the writer has almost surely transferred the dots of a diploid species into two fertile tetraploid lines by way of triploid hybrids.

However, to eliminate the triploid phase, it is proposed that the doubling of chromosomes of some of the diploid species and inbred

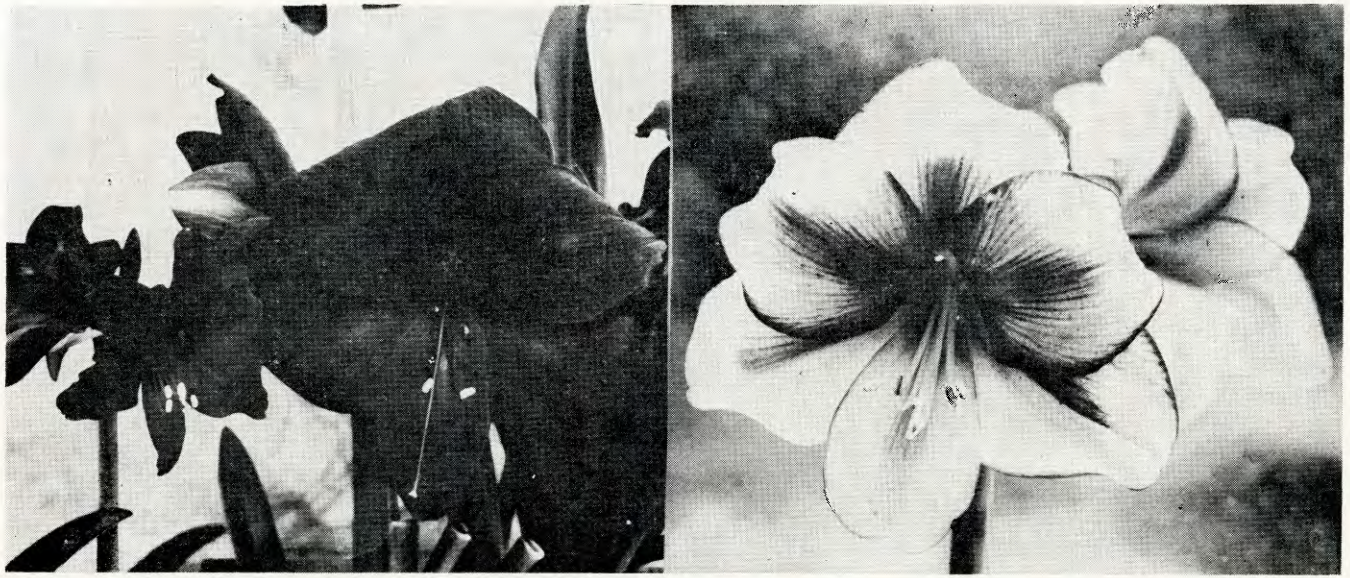

Fig. 15. Dr. Cage Amaryllis—Left, large red, 10-inch diameter flower; inbred, fairly uniform from seeds. Compared (at the left in same photo) to a good Amaryllis gracilis red clone. Right, A large flushed hybrid, a striking and novel strain.

lines would be an enormously important contribution to the breeding of excellent new types of hybrids. These new tetraploids would presumably cross easily with established tetraploid hybrids without dilution and sterility problems. A tetraploid *A evansiae* should be extremely valuable.

Apparently, many of the Dutch and South African named clones have resulted from considerable inbreeding, whether the breeders were conscious of the fact or not. For instance, the seedlings of Ludwig's "It" show much variation in growing traits, but the wine color is consistent enough to indicate inbreeding. Similarly, "Nostalgia" gives uniform seedlings with hybrid vigor when crossed upon some of the writer's inbred red strains. Therefore, it is felt that one approach to the growing of superior commercial seedlings is to cross selected Dutch clones with severely inbred lines that show dominance in vigor, color, and ease of growing.

Whether one has the time, wish, and discipline to develop uniform inbred strains or not, it is recommended that one should breed *Amaryllis* with an objective as clear as one can devise. And severe, ruthless discarding (in the shredder, not to friends) is advocated for all except those seedlings that advance toward one's objective. Further, it is felt that too many simultaneous projects are fatal to the success of the amateur.

While a general discussion of the culture of *Amaryllis* is too broad a subject to add to this paper, some cultural procedures that have been especially useful in the writer's breeding work might be worth describing.

Seeds from carefully recorded crosses are planted as quickly as convenient after they are dry enough to be easily removed from the capsules. If planting is to be delayed for a few weeks or even a few months, seeds are stored in clean paper envelopes in a cool, dry place. The seeds are usually planted in small flats that are from one to three inches deep, in an equal mixture of milled sphaguum moss and vermiculite. Finely shredded peat moss with an equal amount of vermiculite or sand or perlite is also effective. The dry mixture is poured almost to the top of the flats, unless they are deep, and then it is leveled and wet thoroughly with a watering can. Seeds are laid flat, as close together as possible, with only enough space between rows to identify the different crosses with short labels. After seeds are barely covered with milled sphaguum or clean sand or both, the flats are gently watered again and placed in plastic bags, which are closed by twisting the open end.

If clean materials have been used, the enclosed flats can be placed in a warm, shady place (65° to 80°F) and ignored until the cotyledons appear. Then the plastic bag is removed, the flat is given a very light sprinkling of 1% Disyston granules (Systemic Pesticide Granules) and watered gently. If the systemic granules are not available, one teaspoon per gallon of water of a fruit-tree spray powder containing

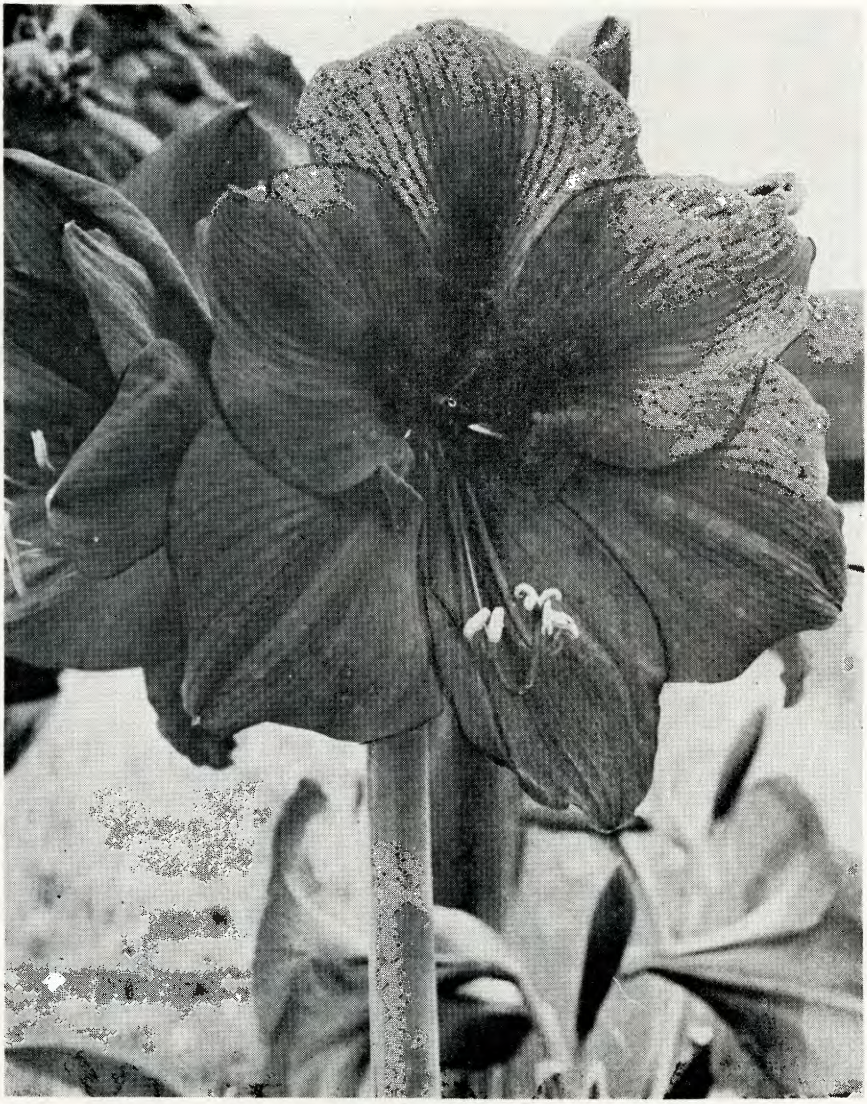

Fig. 16. Dr. Cage **Amaryllis**—9-inch diameter flower; inbred red to reproduce seeds for vigorous pure reds. Photo Palo Alto (Calif.) Times.

methoxychlor, Captan, and malathion is used in this first watering. An insecticide is usually not really required at this stage, but the use of one is good insurance. A week solution of complete fertilizer is used in later irrigation (for instance, one-half teaspoon per gallon of Rapid-Gro about one time per week).

The seedlings are grown in the seed flats until they are crowded but not long enough to get matted roots. They can then be easily separated and the strong ones are planted either in six-inch-deep boxes on four-inch centers or four or five in a five-inch pot. In the deep boxes the bulbs are grown until they bloom; in the pots, the bulbs are shifted once, without separating them, to an 8-inch pot, or a 2-gallon rose liner can, depending on the size of the strain. A growing mixture of

50% Mica Peat or Jiffy Mix
25% fine perlite or agricultural pumic or sand
25% leaf mold

but many good potting mixes are available. Soluble fertilizers are probably best for the amateur, 25% of recommended strength and used twice as frequently as recommended on the label. A formula high in potassium and rather low in nitrogen seems best, but the formula does not seem to be critical.

The growing media of all bulbs are drenched every three months with a fungicide, usually alternating between Benlate (1 tsp/gal) and Truban (5 tsp/gal). A new fungicide with long residual systemic action is Banrot (Mallinkrodt, 1 tsp/gal), and this has produced excellent results in its first trial when used exclusively. Captan and Terrachlor are also valuable in most situations. Rots of roots, bulb, leaves, and scape have apparently been eliminated by the drenches, but use of the fungicides simultaneously with other chemicals *can* be disastrous.

Most strains bloom from seeds in from 14 to 18 months in a glasshouse with night temperatures of about 60° most of the year.

It is probably a painful decision for anyone to destroy all plants exhibiting the symptoms of mosaic virus, especially when most symptoms can be made to disappear temporarily by treating the soil with iron, magnesium, and a weak acid solution to maintain a pH of about 5.8, but the decision can eradicate the disease. This decision is regretfully recommended as being worth the effort. After this sad note, let the paper close with the opinion that the writer has apparently *cured* virus disease in three bulbs by gradually increasing the concentration of iron chelate in the soil over a period of several weeks until the roots showed injury. Then the bulbs were dried and kept completely dormant, without roots or leaves, for more than a year. Either morning dew or a light mist of water moistened the bulbs nearly every day to keep them from dying, but they were dry during most of each day, resting on a board. Temperatures varied from 50° to 95°F. during the year. One hopes the experiment will be tried by others. Virus can apparently be kept from spreading by treating the soil around the infected plants continually with a systemic insecticide and avoiding the handling of any part of the plant.

Although this long breeding project, following one of the modern professional techniques, has brought much personal joy, it is fervently hoped that commercial growers or experienced amateurs will take up the work while the complete breeding records and plant material (and the breeder) are still intact.

THE MOST BEAUTIFUL FLOWER IN THE WORLD

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My hobby has been hybridizing Amaryllis since about 1953, when I purchased my first bulbs, potted them and watched them grow and bloom. My first cross involved the Warmenhoven clone 'Sweet Seventeen' and a Howard & Smith bulb. I then crossed a seedling from that cross with 'Ludwig's Scarlet'. I have added no new bulbs to my breeding program since then, using only my best seedlings. I have been breeding toward round, flat faces with no green in the throat. I succeeded in eliminating the green throat rather early, and then just this year a seedling bloomed for the first time with what I would call perfect form. When viewed from the side, it is absolutely perfectly flat, and the segs are broad and the face is round. I am not very good at describing colors, but I would call it a light red color. I crossed it this spring with another seedling that bloomed for the first time. It is a very beautiful dark red, deepening to a still darker throat, with broad segs and a round face. It is my favorite. As you can see, the form of the flower is very important to me.

I still believe what I said when I saw my first Amaryllis in flower, which was, "Its the most beautiful flower in the world."

PLANT LIFE LIBRARY—continued from page 64.

THE EDIBLE ORNAMENTAL GARDEN, by John E. Bryan & Coralie Castle. 101 Productions, 834 Mission St., San Francisco, Calif. 94103. 1974. Pp. 192. Illus. $7.95., Paper, $3.95.—The authors have combined the vegetable and ornamental gardens in the interests of food and beauty. Following sections on general plant culture, and cooking with flowers, leaves and herbs, the main body of the book is devoted to selected plants from **Artichoke** to **Violet and Garden Pansy.** It is remarkable that the Daylily, **Hemerocallis,** is omitted, which is a classical example of plant in this class cultivated in China. Recommended to interested amatuer gardeners.

TOMATOES—THE MULTI-PLANT METHOD, by Leopold Klein. William-Frederick Press, 55 E. 86th St., New York City 10028. 1974. Pp. 90. Illus. Paper, $3.95.—Following a brief autobiography of the author and foreword, the author describes his new method of growing tomatoes in detail ,including 100 step-by-step photographs, showing how the planting of four plants in a large plant box or similar rectangular ground unit (with four plants each) simplifies culture for one watering and feeding that satisfies four plants at one time. It is a method that many interested persons will want to take up to grow their own tomatoes. Very highly recommended.

PLANT LIFE LIBRARY—continued on page 101

4. AMARYLLIS CULTURE

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

FLOWERING OF DRY, DORMANT AMARYLLIS BULBS

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Usually an article of this kind would have the word *forcing* in its title. I do not object, but have chosen a different approach, for I think the concept of "forcing" *Amaryllis* bulbs can be misleading. That is to say, tulip or daffodil bulbs are naturally dry and rootless during their dormant season, and one can either let them develop roots in the ground in winter and bloom in their normal spring season, or one can "force" them to bloom somewhat earlier.

A few *Amaryllis* species and hybrids behave in a similar manner, but not many. Even in deep dormancy, most *Amaryllis* bulbs retain their roots under optimum growing conditions and some even retain leaves. They can be transplanted with very little harm during dormancy, into a potting mix similar to those described by Doran (Plant Life, 1974) if the roots suffer little damage. However, if bulbs have been stored out of soil, roughly handled, dried, or perhaps shipped long distances, they usually retain very few roots—and much fewer leaves.

Therefore, while one may indeed wish to "force" dry bulbs into bloom at a particular time, I think the main problem is to achieve excellent bloom at *any* time from virtually rootless bulbs. I have increased my study of this problem during the past year.

One approach was to purchase samples of all obtainable "pre-planted" or "pre-potted" hybrid *Amaryllis* bulbs from dealers. Those potted bulbs are sometimes attractively packaged and in general bloom better than those offered a few years ago, but they still leave much to be desired in quality of bloom. Those that bloomed and rooted most normally were planted in pure vermiculite, but the bulbs were from a mediocre strain, and they usually toppled over in the loose mix. Bulbs planted in a mixture of sphagmun peat and vermiculite or perlite were nicely packaged and of fair quality, but some rotted, some bloomed briefly on short scapes, and none performed like an established bulb of good quality. Watering seemed to be critical. The best and worst performances came from bulbs potted in straight sphagnum peat, perhaps with chemical additives. Some rotted, but some bloomed fairly well, even though the peat moss was rather soggy.

In preparation for the study, I had stored some mature bulbs in dry sawdust in the fall of 1973. As many roots as possible were retained, and bulbs were soaked for 30 minutes in a suspension of 6 tbs. of 25% Captan per gallon of water (or for 10 minutes in 1½ tbs. of

Lysol Disinfectant per gallon of water) and dried in shade before storage. After from three to five months of dormancy, I cut all remaining roots from half of the bulbs. The following treatments, based upon ideas developed over many years, were studied.

1. Some of the dry bulbs were soaked for one hour at 70° F. in a solution of Benlate, the bases dipped in a rooting powder, allowed to dry in open air, and planted in a mix of equal parts of sphagnum peat moss, vermiculite and fine perlite. The potted bulbs were stored for one week to two months and then were kept moist at 70° F. All bulbs bloomed better than controls that had no Benlate soak, and all bulbs bloomed better than the commercial bulbs described above. The blooms were larger and lasted longer. No bulbs rotted. Liquid fertilization was started while bulbs were in full bloom, and those that were kept are still growing well. Again, refer to Doran's paper in Plant Life, 1974, for optimum feeding. Healthy new roots were found on all bulbs examined.

2. Other fungicides having some systemic action were tried on a small scale in the manner described above under item 1. These were Mertect 160 (60% Thiobendazole, Merck, 1 tbs./gal. water) and Banrot (Mallinskrodt, 1.5 tsp./gal. water). These produced good blooms compared with the control bulbs, but more tests are needed for significance. A few bulbs soaked in Banrot suspension at *beginning* of dormancy, started well after 120 days of dormant rootless storage, without further treatment.

3. I have developed a paint-like material in which clean bulbs may be dipped or brushed prior to storage. A rather heavy film of the paint adheres well to the bulb and seems to protect it during storage and "forcing" from fungi, insects, and excessive loss of moisture. Bulbs were stored in open, ventilated bins, at about 50° F. and planted without removing the coating. The paint also contains a rooting hormone. Application for a patent has been made, and future reports will be written. Arrangements can be made by commercial growers and shippers for trials of the material.

ELIMINATION OF MOSAIC VIRUS FROM **AMARYLLIS** L. PART II. VIRUS ASSAY

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INTRODUCTION

Plants of *Amaryllis* L. recovered from virus diseased bulbs *via* shoot-apex culture were assayed for the presence of *Amaryllis* mosaic virus. Both infectivity tests and electron microscopic methods pro-

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vided no evidence of Amaryllis [syn.—Hippeastrum] mosaic virus being present in symptomless plants grown for 12 month in the greenhouse.

This paper gives the ultimate results of the experiment described in Plant Life 1974, where the production and culture of shoot apices *in vitro* were reported.

MATERIALS AND METHODS

Plants of *Amaryllis* obtained *via* shoot-apex culture and grown in the greenhouse for 12 months were assayed for the presence of *Amaryllis* mosaic virus using direct negative staining (5**) and infectivity tests.

Infectivity tests were done by triturating with a mortar and pestle leaves of amaryllis with 0.025 M phosphate buffer pH 7.2, and 600 mesh carborundum, and inoculating with the fingertip *Gomphrena globosa* and *Chenopodium quinoa,* proved earlier to be local lesion hosts for *Amaryllis* mosaic virus.

The inoculated plants were examined daily for a period of one month for possible signs of virus transmission. The infectivity tests were carried out twice within a period of two months. Leaves of symptomless and diseased amaryllis plants were used as control and comparison in all conducted tests.

RESULTS AND DISCUSSION

The amaryllis plants obtained *via* shoot-apex culture were investigated under an electron microscope. The quick dip method of negative staining failed to provide evidence of *Amaryllis* mosaic virus particles being present in the symptomless plants grown for 12 months in the greenhouse.

Infectivity tests likewise proved the amaryllis plants to be free from the virus, since the inoculation of their cell sap did not produce the local lesions characteristic of the symptoms caused by preparations from HMV infected amaryllis plants; therefore, these plants derived from shoot-apex culture were concluded to be freed from *Amaryllis* mosaic virus.

The plants are under periodical observations for macroscopic symptoms of mosaic disease, and after 22 months of greenhouse culture plants remain free from the mosaic disease.

SUMMARY AND CONCLUSIONS

A number of bulbs of Hybrid *Amaryllis* clone 'Wedding Bells' showing mosaic symptoms in their leaves were investigated for the presence of a causal agent of the mosaic and found to contain Hippeastrum mosaic virus.

Shoot apex culture was investigated as a means of recovering virus-free subclones. Bulb cuttings maintained in a water-saturated atmosphere were used to provide large numbers of clonal shoot-apices. A modified Murashige and Skoog (15) liquid nutrient medium, as defined

** Literature review in Plant Life 1974 pp. 112-113.

for asparagus shoot-apex culture permitted satisfactory growth of amaryllis shoot-apices cultured on filter-paper bridges in 25 x 150 mm 'Pyrex' tubes. Plants were large enough to be grown in normal greenhouse culture after approximately 8 weeks of culturing in tubes.

The assay of plants surviving a period of one year of greenhouse culture showed a large percentage of subclones to be free from Hippeastrum mosaic virus.

A significant quantity of virus-free amaryllis plants can be produced by a combination of bulb cuttage to provide a quantity of shoot-apices, and excision of these at an early stage with subsequent culturing on an artificial medium until large enough to grow conventionally. This should provide the means of recovering Hippeastrum mosaic virus-free stock plants for further vegetative propagation. Subsequently, control measures such as rogueing of secondary infected plants, weed and insect control, and maintaining the plants under insect-proof screens, should enable the stock plants to remain free from *Amaryllis* mosaic virus.

HABRANTHUS TUBISPATHUS (L'HERIT.) TRAUB

Hamilton P. Traub

Habranthus tubispathus (L'Herit.) Traub, formerly known as *Habranthus andersonii* Herbert, is a variable species in minor characters of value only in distinguishing forms within the species in flower size, color, plant size, etc.

Herbert (Amaryll. 1837, p. 168) listed six varieties. (1) *aurea,* golden; (2) *cuprea,* coppery; (3) *obscura,* dark, especially in bud; (4) *brevilimba,* short-flowered, with broader leaves; (5) *parvula,* small flowered (Herb. Amaryll. 1837, Pl. 26, fig. 4. 1837), and (6) *texana,* tepals roundish, obtuse. Others have named other varieties.

Under present day taxonomic practice, such minor differences are usually not considered important enough to require naming because the category, *variety,* is no longer used. It is either a sufficiently great variation that can be included under the category, *subspecies,* or a lesser variation which can be accommodated under the category, *forma,* that are recognized. However, this latter category is usually used to distinguish *lesser variations that are important horticulturally.* Thus most minor variations should be included under the species, and forma descriptions should be used sparingly.

One of these is the rose-colored form, which the writer distributed widely, as a variety, is quite distinct in color from the usual forms.

Habranthus tubispathus forma *roseus* Traub, *forma nov.* Flos roseus. Holomenifer in Traub Herbarium.

Another form, proposed by Ravenna as a variety appears to be worthy of naming.

Habranthus tubispathus forma *bicolor* (Rav.) Traub, *comb. nov.* Syn.—*Habranthus tubispathus* ssp. *variabilis* var *bicolor* Rav. Plant

Life 26: 103. 1970. Tepals white stained fulvous at the apex.

Other variations such as larger flowers and most of those recognized by Herbert in 1837 should be included in the parent species.

Ravenna has recently studied this species in detail and he is to be commended for bringing order out of chaos. His treatments are to be found in Plant Life 26: 99-103, fig. 25. 1970, and Plant Life 30: 49-50. 1974. When he has completed his study a realistic picture will be presented.

1974 ZEPHYRANTHEAE REPORT

Mrs. Marcia Clint Wilson, *2719 Palm Circle West, Galveston, Texas 77550*

Several genera among the Zephyrantheae know no season for bloom, even though they are supposed to be programmed for bloom during set seasons of spring, summer or fall. In the literal sense, certain *Zephyranthes* and *Habranthus* species and hybrids might, with no special treatment, have isolated bloom any month of the year in a warm climate (or in a greenhouse situation). Since this may vary among different clones from year to year, I have long suspected that some of the unscheduled flowers are from offset bulbs blooming for the first time. While this is not a complete explanation, we may now add *Sprekelia* to these unpredictable genera (see special *Sprekelia* section in this report).

In another sense, there are batches of Rain Lilies blooming somewhere in the world at all times, under normal growing conditions and schedules. Interest in these bulbs is still keen the world over. In Australia, the seasons are directly opposite to ours. See Lindsay J. Forbes' separate report in this issue. In England, one collection is being successfully grown in sandy beds under glass, with temperatures in winter kept at least above 32° F. Some growers in our coldest climates in this country use flats, or any synthetic substitutes like styrofoam chests, which may be placed in a basement for the cold period. A great number of the *Zephyranthes* and *Habranthus* maintain root and leaf growth during fall and winter months and go dormant or semi-dormant in the spring (they may flower without leaves). While most can stand forced dormancy by being dug and dried off for several months, I'm sure that many evergreen Zephyrantheae would need small amounts of extra attention once root and leaf growth is reestablished in the spring. I would be interested in learning more on this subject—which species and hybrids store and later perform best, etc.

The Zephyrantheae are also still high on the list of desirable plants for various scientific studies. Apomixis has been studied among certain species and this subject is now being broadened to include other crossing incompatibilities between species and closely related genera. Cytological work still continues with both newly introduced species and hybrids among species and between genera—the more complicated the hybrid,

the more interest in studying it. Taxonomic studies are currently more concentrated in South America, with the dedicated work of Sr. P. Ravenna. Plant collecting expeditions are continuing and individual reports appear from time to time in PLANT LIFE. Other expeditions made by public and private funded institutions (and individuals) may not always receive wide publicity, but amaryllids that are found usually reach the proper people for study and possible introduction. Several of the current scientific studies have been aided in one way or another by members of APLS.

The late Alex Korsakoff set a good example with careful record keeping with hybridizing attempts among Zephyrantheae. He kept his record system simple enough to keep current at all times. Partially because of built-in handicaps such as apomixis, hybridizing among *Zepryranthes* and *Habranthus* species and between the two related genera is still in an "infant" state. Mr. Korsakoff left a legacy of successful hybrids for both scientific study and public enjoyment. All of my correspondence indicates that everyone is keeping careful records of crosses . . . keep it up! One never knows when a certain set of circumstances will produce a hybrid when all others have failed.

Please note that the plant species known familiarly as *Habranthus andersonii* (and varieties *cupreus, roseus* and *texanus*) is now *Habranthus tubispathus* (L'Her.) Traub. (See Dr. Ravenna's "Contributions to South American Amaryllidaceae", PLANT LIFE 1970 and 1974.) Somehow this change to a prior correct name missed my attention and I am pleased to recommend a thorough reading of the reference material mentioned. This is a most variable species in both color and size. Even the Texas Copper Lily (Syn. *Hab. texanus,* etc.) thought to be introduced many years ago from South America, varies in degree of coloration between collecting sites of College Station and Corpus Christi, Texas. The most distinct flower is forma *roseus,* which Dr. Traub has distributed widely with seeds. A number are blooming in my garden as I write and they popped up almost without a bud stage. Ravenna classifies this (1974 PLANT LIFE, page 49) as *Habranthus variabilis* (Rav.) comb. nov. [See also the brief note by Dr. Traub on *Habranthus tubispathus* which precedes this report.]

SYNONYMS—COOPERIA

What question would you expect to be asked most often about Zephyrantheae? From the experience of others and my own, it is "What is the difference between *Zephyranthes drummondii* and *Cooperia drummondii*?" While both are white *Cooperias,* they are not the same species and their main differences may be easily determined.

Zephyranthes drummondii D. Don (Syn. *Cooperia pedunculata* Herb.) is extremely robust, with comparatively large bulbs and wide (somewhat flat) grey-green leaves that grow quite long. The fairly large white blooms usually appear following spring rains and are borne on tall stout scapes. Flower petals are usually rather broad and may

have a slight crepe texture. This species may be found in Texas, New Mexico and northern Mexico, usually in limestone hills. The long-necked bulbs usually grow quite deep, even in a garden situation.

Cooperia drummondii Herb. (now *Zephyranthes herbertiana* D. Dietr.) (See Dr. Traub's note later in this section and Table I.) has a medium-small bulb with narrow somewhat thick green leaves, slightly channeled. Although variable in size and form within one field or between localities, the flowers are usually rather small with pointed concave petals that may not open wide. This species is probably the most fragrant of all *Cooperias.* It was their size, poor form, fragrance and ubiquitousness that prompted my family to nickname them "little stinkers." Later they saw—under perfect blooming conditions—some really beautiful forms. These were not only growing around Rio Hondo, Kingsville and Corpus Christi, but in Brownsville too. The white flowers usually appear from mid-summer to fall. Of all Zephyrantheae, this hardy species has the widest natural distribution. It is mostly found in Texas, adjoining states of Louisiana and New Mexico and in a number of spots in Mexico; however, it also extends as far as north as Kansas and down to South America. I have personally collected several specimens of this species in northeast Texas and was surprised to find that the bulbs were growing less than three inches in the soil. I have also grown the South American form (*Z. brasiliensis* Traub) from two different sources and have found it strikingly similar to our Texas native.

The above two species should not be confused with another white *Cooperia Zephyranthes traubii* (Hayward) Moldenke (syn. *Cooperia traubii* Hayward). This species may be found close to the Texas Gulf Coast from north of Corpus Christi to Galveston. Bulbs that I have collected in Galveston have been smaller than *Z. herbertiana* D. Dietr., with more narrow leaves. The scapes are tall and slender and the flower tube is quite long. The flowers may vary in size, but I would call them refined "open stars." The petals are rather narrow and evenly arranged. The diameter of the stigma is quite small and its length is as exaggerated as the flower tube, extending well beyond the erect, clustered stamens. Field variations in length and diameter of style and size of stigma may occur. While delicate in over-all appearance, the flowers last as well as any relative. In our area, the bulbs grow deep and the necks are long. Under ideal conditions, this species has the longest bloom span of all *Cooperias;* however, heaviest bloom usually appears with *Z. herbertiana* in the wild. So many of the *Zephyranthes* and *Habranthus* described as "white" are often flushed with pink in the bud stage—this may be more pronounced upon withering. One exception that quickly comes to mind is the cute little white *Z. albiella* from northern South America.

The need for changes in names of *Cooperia drummondii* and *Cooperia pedunculata* began again in our lifetime when Dr. Traub reclassified the genus *Cooperia* as a subgenus of *Zephyranthes* (See Amaryllid Notes page 41, 1951 PLANT LIFE and page 82, 1952 PLANT

LIFE). Because of the close crossing relationship (both natural and controlled) and many physical similarities between *Zephyranthes* and *Cooperia,* Dr. Traub did not feel the differences represented a distinct enough gap to warrant a separate generic designation for *Cooperia.* This meant that he had to rename all *Cooperias* as *Zephyranthes;* i.e., *C. traubii* to *Z. traubii, C. smallii* to *Z. smallii,* etc.). All was easy until it came to *C. pedunculata* Herb. It seems that this species had been named by D. Don as *Z. Drummondi* one year before Herbert described his *Cooperia pedunculata.* Going by interpretation of one of the rules of botanical nomenclature, *pedunculata* had to revert to the prior name assigned it by D. Don. This left *C. Drummondii* Herb. as an invalid name under Traub's subgenus and thus it became *Z. brazosensis* Traub in 1951. When Dr. Traub reviewed an early draft of this report, he pointed out that Dr. R. O. Flagg found an earlier name for this species under the genus name, *Zephyranthes herbertiana* D. Dietr. With Table 1, Dr. Traub asked that this correction be made.

Because I lack easy access to rare individual source material, I have secured permission to quote some interesting historical passages from Dr. R. O. Flagg's PhD Dissertation, INVESTIGATIONS IN THE TRIBE ZEPHYRANTHAE OF THE AMARYLLIDACEAE (The Alderman Library, University of Virginia, May 1961, page 25.). Dr. Flagg's present position is that of Director of Botany with the Carolina Biological Supply Co. The change in spelling of *Drummondi* to *drummondii* is one of those small developments of agreement in international botanical nomenclature. Some botanists prefer to use a capital in a species name honoring an individual person or a geographical location. Some of the morphological differences of *Cooperia* are also mentioned below.

"*Cooperia.*—This genus was established by Herbert (Feb. 1, 1836) with the description of *Cooperia Drummondi,* the type species, and a brief note on *C. chlorosolan.* The generic name honored Joseph Cooper, the gardener who brought him a flowering bulb of *C. drummondii.* The bulbs of this group had been sent from Texas to England by Thomas Drummond in 1834 (date *fide* Hume, 1938)."

"March 1, 1836, without having seen a living specimen, D. Don gave the name *Zephyranthes Drummondi* to another taxon from Drummond's collections. Shortly thereafter, R. Graham (1836) named the same plant *Sceptranthes Drummondi* in the belief that it was distinct from both *Zephyranthes* and *Cooperia.* Herbert (1837) dubbed this plant *Cooperia pedunculata.*"

"In monographing *Cooperia* Hume (1938) . . . stated, "While *Cooperia is* related to *Zephyranthes* so closely that the two frequently have been confused and hybrids between them have been secured, it is to be separated from the latter genus by the longer perianth-tube, very short filaments, erect, not versatile anthers, scented flowers, and night-blooming habit." (It may be pointed out that some current workers—as Flory in his 1968 Zephyrantheae paper in THE NUCLEUS—still concur with Herbert and with Hume, and others, in considering *Cooperia*

different enough in critical characters to warrant its continued generic separation from *Zephyranthes.*)

I used Dr. Flagg's PhD Dissertation (Table 12, page 74 and Appendix II, II-I) as a reference in compiling the synonomy presented in Table 1. After Flagg, I omitted *C. miradorensis* Kränzl (1925). This was studied by Drs. Flory and Flagg in its native habitat of Vera Cruz, Mexico and found to be a *Zephyranthes* (as is the type specimen in the Herbarium of the University of Copenhagen). From information in a later publication by Dr. Walter S. Flory, *C. albicans* Sprague (1928) was deleted. This is confirmed by Flory as *Pyrolirion albicans* Herb. (1837). This paper, *Chromosome Diversity in Species and in Hybrids, of Tribe Zephyrantheae,* THE NUCLEUS, 1968, was also used as a reference for Table 2—along with some personal help by the author in interpreting certain somatic chromosome ranges.

TABLE 1. The recognized species of Genus **Zephyranthes,** Subgenus **Cooperia** (Herb.) Traub and synonymy.

Genus **Zephyranthes,** Subgenus **Cooperia** (Herb.) Traub	Synonyms
Zephyranthes brasiliensis (Traub) Traub (1951)	**Cooperia brasiliensis** Traub (1945)
Z. drummondii D. Don (1836)	**C. pedunculata** Herb. (1837)
	Sceptranthes drummondii R. Graham (1836)
	C. oberwettii Percy-Lancaster (1936) **nomen nudum**
Z. herbertiana D. Dietrich (1840)	**C. drummondii** Herb. (1836)
	C. chlorosolen Herb. (1836)
	C. mexicana Herb. (1837) **nomen nudum**
	C. drummondiana Herb. (1837)
	Z. chlorosolen (Herb.) D. Dietr. (1840)
	Z. brazosensis Traub (1951)
	Z. brazosensis var. **chlorosolen** (Herb.) Traub (1952)
Z. jonesii (Cory) Traub (1951)	**C. jonesii** Cory (1950)
Z. kansensis (Stevens) Traub (1951)	**C. kansensis** Stevens (1938) *
Z. mirrisclintii Traub & Howard (1970)	
Z. smallii (Alex.) Traub (1951)	**C. smallii** Alexander (1939)
Z. traubii (Hayward) Moldenke (1951)	**C. traubii** Hayward (1936)

* Some workers consider **Cooperia kansensis** synonymous with **Zephyranthes herbertiana** D. Dietr. (1840).

Somatic chromosome numbers reported for *Cooperia* are presented in Table 2. It will be noted that the numbers vary from a low of 24, in *Z. traubii,* to a high of 72—which is encountered among forms in several species. It will also be noted that the somatic chromosome numbers vary somewhat in one and the same species, in several cases. Particularly in *Z. herbertiana,* the range is from 48 through 55, 56, 58, 59, 60, 68, to 72. The number 48 is involved in about half of the taxa. It is also a common number throughout the genus *Zephyranthes.* It is evident that the numbers 24, 48 and 72 form an euploid series. The numerous anueploid numbers (53, 55, 56, 58, etc.) have probably developed from or are involved with either one or both of two separate phenomena: (1) apomixis; or (2) mitotic crowding. In at least some cases the higher chromosome numbers are apparently responsible for some of the stabilized "specials" or "superiors." An example is the popular large form of *Z. smallii* (Clint's collection number T-56) which

has 72 somatic chromosomes, rather than the 54 of the more usual, smaller-flowered type. In certain cases, where duplicate numbers have been noted by different individuals, the earliest reference is used.

TABLE 2. Somatic chromosome numbers for taxa of Genus **Zephyranthes,** Subgenus **Cooperia** (Herb.) Traub.

Species	2n	Reference
Zephyranthes brasiliensis	69+1f	Traub, 1945
(Traub) Traub	70	Flagg, 1961
Z. drummondii D. Don	48	Flory, 1939 a
	ca. 70-72	Flory, 1939 a
	72	Flagg, 1961
Z. herbertiana D. Dietrich	48	Flory, 1939 a
	55, 56, 58, 59	Coe, 1953
	48, 60, 68, 72	Flagg, 1961
Z. jonesii (Cory) Traub	48, 72	Flagg, 1961
Z. kansensis (Stevens) Traub (=**Z. herbertiana?**)	ca. 48	Flory, 1939 a
Z. morrisclintii Traub & Howard (1970)	unknown at present	
Z. smallii (Alex.) Traub	54	Flory, 1939 b
	53, 58, 70, 72	Flagg, 1961
Z. traubii (Hayward) Moldenke	24	Flory, 1939 a

SPREKELIA

When several people complained of slow growth of hybrid seedlings, poor bloom performance, etc., with certain *Sprekelia* forms and hybrids, I contacted my mother in Brownsville: "I'm surprised that your trouble queries came from California and the north. I thought it was just us southerners who had difficulties with *Sprekelia formosissima.* Remember that *Sprekelias,* which are native to Mexico and on to South America, choose a very special environment. They are nearly always high up in the mountains, or at least most of them we have seen. Apparently they don't normally bloom heavily in the wild or we would have seen more of them."

"Since we couldn't bloom them well here in the garden, yet bloomed them magnificently at the farm, I would say it is probably necessary to give them plenty of water and food during the late spring and summer growing season—even into the fall in warm areas." (Because of a salt problem which developed in the shade house at the Clint "farm", tile drainage was installed, with use of elevated beds and a special soil mix.) "Actually, at the farm we bloomed some of our hybrids during every month of the year by keeping them in good healthy growth through water and food (the bulbs got huge, which seems to be a necessary requisite here for frequent bloom)."

"Some wild forms are better bloomers than others and hybrids among these are superior. The one from Peru and 'Harrisons Orientred' are the best for this climate. Bulbs collected in the mountains near San Vicente, Hidalgo, Mexico bloomed very easily and were mostly evergreen. Those found just north of Jacala, Hidalgo, for some reason, did not thrive and were poor bloomers. We found this strange because these areas are just a few miles apart. We did not personally collect either of these and perhaps natural environment might be quite different. The worst performers here are the ones which natrually go

dormant in winter. These include *Sprekelia var.* 'Superba' and several I received from the late Len Woelfle in Ohio. Others are the one from Cuernavaca, a Guadalajara form and those from Morelia. The ones that do well do not necessarily thrive everywhere—this is particularly true of the Peruvian form."

When the Clint "farm" (experimental gardens) had to be abandoned, my mother "sifted sand" (literally, in many instances, in order not to miss some very small backward Zephyrantheae). The various bulbs, many without labels— only clues from locations dug—were planted in specially prepared beds adjacent to her home. Her *Sprekelia* are making a remarkable comeback. During the summer of 1973, Brownsville enjoyed an unusual abundance of rain which helped keep the soil temperature cooler. While a good mulch is a great garden aid in very hot climates, the cooling effect of the rainfall prompted my mother to shift many *Sprekelia* bulbs to a location with filtered sun. Please note what Dr. Howard has to say about soil temperatures further along in this section.

Dr. Thad Howard recently wrote to me on the outstanding performance of some *Sprekelia* hybrids. "My own hybrids from 'Harrison's Orientred' are very similar to this parent for the most part. The flowers have a bit nicer form to them and there are minor differences in the markings in the throat. I am convinced that if one wants to hybridize *Sprekelias,* 'Orientred' should be one of the parents. It gives more vigor and free flowering qualities than anything else. The Clint hybrids of Peru X 'Orientred' are wonderful too. These give the dark red shades and nice form plus free flowering. Mine yield the bright red shades in color contrast." (As if to prove itself, a bulb of 'Orientred' was in bloom for our Thanksgiving visit to Brownsville! Following good showers, this same group bloomed again in January and February.)

"I should someday like to see *Sprekelias* assume their place alongside *Amaryllis* in flower shows, with quality standards being set for the various classes on a point scale. There is enough variety among various clones (both species and hybrids) in *Sprekelia* to allow for this. Some good quality *Sprekelias* are show flowers and should be grown as such. They run through all the red shades, from pink through brick red, scarlet, crimson and even stripes. There are formal and informal types, giants and miniatures and they deserve recognition as such."

A while back I was lucky enough to receive a bulb of Howard's dwarf *Sprekelia.* (See cover of 1970 PLANT LIFE.) The bulb was no larger than a medium-sized *Zephyranthes* and the leaves were equally dwarf—narrow and only fairly long. When it went dormant in late December, it was mulched with peat like the rest of the Zephyrantheae. I checked for firmness periodically following minor cold spells, but it had completely disappeared by spring. The reported loss of the dwarf *Sprekelia* prompted some helpful cultural practices from Dr. Howard:

"Actually, this small bulb is an easy thing to grow in the warm

Fig. 17. **Sprekelia formosissima, right,** clone 'Papa Gallo', and **left,** a dark red form received from Peru. Photos by Dr. Thad M. Howard.

months. Wintering over in the ground is rough, even in warm areas. It is cold sensitive and bulb mites attack it. The best thing to do is winter inside in a flat or pot, or dig and store. Personally I think it is more apt to flower if kept in soil over winter; however, protection from bulb mites is more sure if dug and stored with a dusting of sulfur and Sevin powder mix."

"The dig-and-store method works on ALL *Sprekelias,* but not all require it. Hardiness with them depends on their point of origin. The northern forms are found at high altitudes, but as one goes southward below Mexico City, they are found at lower and much warmer altitudes and thus are cold-sensitive. In the wild, they bloom sporadically from late April through July, depending on rainfall. One would expect to find them in full bloom in May in San Luis Potosi or Hidalga States, but early July might be normal for them in Durango or Nayarit. Apparently the rains come later on the Pacific side than they do on the Gulf side of Mexico."

"Flowering *Sprekelia* can be simple or frustrating. The simple part is that good culture will result in large bulbs which will produce embryo flowers. The bulbs thrive in porous soil, rich in humous, with ample moisture supplied that can drain off quickly. The frustrating part is that some clones will abort their embryonic buds for one reason or another and rarely flower. Dig any non-flowering clone with a large healthy bulb and dissect it. You will find dried, black aborted buds in the outer coats and embryo buds forming toward the center. Just what prevents their flowering is a puzzle, but it could be that hot soil temperatures during the active growing season may be a reason. In areas with hot dry summers (like ours) and with soils that quickly bake, a good mulch could be beneficial. Or, it might be a reverse problem with cold winter soil temperatures during the dormant period. This might explain why some of these bloom better in colder climates where summer temperatures are a few degrees cooler and they are protected from cold soils by digging and storing. Whatever the reason, almost anyone can flower at least one or more of the many forms available from the various geographical areas where the genus is found. The solution is to grow as many clones as one can find and discover what does best in that particular garden."

PRELIMINARY REPORT ON COLOR CLASSES OF HYBRID **NERINE** CLONES

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At the request of Dr. Hamilton P. Traub, I am making this preliminary report as a member of the Nerine Committee in order to start the movement towards the elimination of the chaotic condition with reference to the great number of unevaluated hybrid Nerine clones. Dr. Traub's suggestion is summarized in the article in the 1974 PLANT

LIFE, page 88. The following is a preliminary contribution toward the evaluation of the clones now in my collection. An attempt will be made to evaluate all the clones added in the future. As suggested by Dr. Traub, the members of the Nerine Committee are expected to take the lead in evaluating the reported Nerine clones so that only the highest rating ones may be preserved and propagated, unless the inferior clones are of value in further breeding. Thus, the other members of the Nerine Committee are expected to evaluate the clones in their collections. Out of this he expects that the final list of high quality clones grouped by color classes will be obtained.

At present, I have about 324 Nerine clones, but only 224 of these are named clones.

Many of the clones bloomed this season (1973). I determined the color of the flowers but noted also the length and thickness of the flower scape (stem), and the number of flowers in the umbel. I used the Royal Horticultural Society, London, *Horticultural Colour Chart* (abbreviated, HCC). Only clones without virus infection were placed in color classes.

The results of the 1973 evaluations are listed in Tables 1 and 2. Clones recently received from New Zealand and not evaluated are listed in Table 3.

Table 1. Highest quality clones in each color class selected from listings in Table 2 as of 1973. Eventually, from 5 to 10 clones in each color class will be retained.

Light pink—'Mithras', 'Stephanie', 'Diana', 'Molly Dent'
Medium pink—'Lady Stirling Maxwell', "Stephanie x 'Mrs. Vivian' "
Deep pink—"Stephanie x Lady Foster", 'Miss Carrington'
Light red—'Fay Trussler', 'Rotherside', 'Somerhill', 'Fothergillii Major'
Medium red—'Corusca Major', 'Lady Llewellyn'
Deep red—'Miss Cator', 'Timoshenko'

Table 2. Nerine clones in the writer's collection evaluated in 1973. See Table 1 for high quality clones.

Ia. **LIGHT PINK**

'African Queen'; 'Audrey'; 'Bunty'; 'Constance Cripps'; 'Countess Altmont x Mrs. Clark' (Norah Hamilton); 'Diana Oliver'; 'Hon. Mrs. Wynn x Miss Willmott x Bowdeni'; "Horsa'; 'Jackie Wren'; 'Julia'; 'King of the Belgians'; 'Mrs. Frith'; 'Miss Battye'; 'Miss Willmott'; 'Mithras'; 'Molly Dent'; 'Mrs. B. Battye'; 'Mrs. Stanton'; 'Mrs. Kingscote'; 'Pink Frills'; 'Saudersonii'; 'Stephanie' and 'Sheila'.

Ib. **MEDIUM PINK**

'Blenheim'; 'Doris'; 'Felicita'; 'Fuchine'; 'Lady Stirling Maxwell'; 'Stephanie x Mrs. Vivian'; and 'Stephanie x Curiosity'.

Ic. **DEEP PINK**

'Alma Moldenke'; 'Anne'; 'Bennet Poe'; 'Cape x Curiosity'; 'Miss Carrington'; 'Nena'; 'Rushmore Star'; 'Sarniensis'; and 'Stephanie x Lady Foster'.

IIa. **LIGHT RED**

'Aerolite x Lionel'; 'Arnhen'; 'Ben Hills'; 'Bowdeni'; 'Capel'; 'Cephus'; 'Desdemona'; 'Eddy'; 'Ethel Smith'; 'Fay Trussler'; "Fothergillii Major'; 'Lady Havelock Allen'; 'Mansellii'; 'Mrs. Barkley'; 'Mrs. Hooker'; 'Mrs. Kingscote x Curiosity'; 'Nancy Lashy'; 'Paula'; Rotherside' and 'Somerhill'.

IIb. **MEDIUM RED**

'Afterglow'; 'Angela Limerick'; 'Corusna Major'; 'Curiosity'; 'Gaby Deslys'; 'Hon. Mrs. Wynn'; 'Lady Llwellyn'; 'Mrs. Bromley x Countess Altmont'; 'Mrs. Cooper'; 'Queen Mary'; 'Sarniensis' and 'Alynis Londeon'.

IIc. **DEEP RED**

'Henrietta'; 'Hon. Mrs. Wynn x Mrs. Cooper'; 'Lady Eleanor Keane'; 'Lady Lucy Hicks Beach'; 'Lady Montague'; 'Lady St. Aldwyne'; 'Miss Cator'; 'Purple Prince' and 'Timoshenko'.

IIIa. **LIGHT ORANGE**

None.

IIIb. **MEDIUM ORANGE**

None.

IIIc. **DARK ORANGE**

'Stephanie x Mrs. Elliott x Lady Rankin'; and 'Viscountess Grey x Aurora'.

IVa. **WHITE**

'Lily White'; 'Chaste White'; 'Solent Swan' and 'Vestal'.

IVb. **WHITE WITH PINKHEART**

'King of the Belgians x Inchmary Kate'.

IVc. **GREYISH WHITE**

'Flexuosa Alba'.

These evaluations are only the first uneasy steps. In the future other features besides color will be taken into consideration such as flower stem length and thickness, number of flowers per umbel, blooming season, ruffling of florets, flower size, dormant season (vernalization), vs. evergreen plants, etc.

Table 3. Named Hybrid Nerine clones from New Zealand not evaluated to date.

'Rose Haze'; 'Battle Flag'; 'Snow Maiden'; 'Cheery Ripe'; 'Salmon Decor'; 'Pink Satin'; 'Pink Ice'; 'Rose Glow' 'Orange Brilliance'; 'Star Gaze'; 'Sunset Frills'; 'Cheerfulness'; 'Brushfire'; 'Dazzler'; 'Peach Beauty'; Flame Brilliant'; 'Spectacular'; 'Rosy Glisten'; 'Flicker'; 'Pink Perfection'; 'Flamenco'; 'Tango'; 'Frilled Lass' and Lovely Lady'.

AREA DEVOTED TO NERINE CULTURE IN THE NETHERLANDS

G. A. M. Zuidgeest, *Netherlands*

During the "boom" in the growing of cut flowers from bulb plants in the Netherlands for some years past, the emphasis has been mainly on Lilies, Iris, Gladiolus and Freesias. During these same years, Nerine cut flowers were of only moderate importance. However, within the past five years, the Nerine cut flower trade has multiplied

by a factor of ten. In 1973, more than 2.5 million Nerine cut flowers were marketed. They are forced and cut for market the year round, with naturally the greatest quantity in the autumn months.

The area devoted to Nerine culture in the Netherlands is about 40 hectares, and this promises to rise to more than 100 hectares in a few years. The present area by Nerine clones cultivated is as follows:

30 hectares *N. bowdenii*
6 hectares 'Pink Triumph'
2 hectares *N. undulata (crispa)*
1 hectare *N. corusca major*
1 hectare other clones and species

AN APPRENTICESHIP IN ZEPHYRANTHEAE

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In the 1974 Year Book, one of our new Committee men, Richard E. Tisch, stated in the introduction to his report that *Zephyranthes* are easy in cultivation for reasons of easy shifting, good seed setting, fast germination, and for the short period from seed planting to flowering.

There may be many readers who wonder if he has over simplified the situation and so for the benefit of anyone who is considering whether or not they should start growing Rain Lilies, I thought readers might like to hear of some of my early experiences in trying to establish *Zephyranthes* is south eastern Australia—to be exact in Melbourne. In writing what I do I risk repeating what may have been written before. I am sure though, that there are many people, like myself, who take on a new interest and have very great difficulty in locating useful information which has been written in years gone past. I am a firm believer in periodical repeats of basic information, even though it may be elementary, in the hope of encouraging more interest for possible new adventurers in the Rain Lily field.

It was not so long ago that I had the opportunity of purchasing from the late Mr. Alek Korsakoff, a substantial number of *Zephyranthes* species and hybrids and a smaller number of *Habranthus* species and hybrids. At that point I realised I was just a novice without any help or local guidance and would have to provide their cultivation needs by trial and error (fortunately none of the latter occurred). I had several problems at that stage. The first was to get to know the bulbs—their growing habits—their growing cycle—their needs—their dislikes. In suddenly having over 100 different types of bulbs to look after, I found that it took a season or two until I could confidently give a name to the flower without referring to the label, and also to feel that I knew each variety for its own particular individuality. Not having a greenhouse my next problem was to risk planting the bulbs into garden beds,

knowing that they would not have the same natural growing conditions as they would have in their wild state in North and South America. I decided that it was a reasonable risk due to the fact that Melbourne's climate is a moderate one and we are not bothered by heavy frosts. Perhaps our climate is not quite warm enough, or humid enough to give perfect growing conditions, but results have shown that the climate is good enough. I had a nice sunny, warm and open position in which to plant them and I am fortunate in having light sandy loam which does away with any drainage problem—an important factor in any bulb growing.

After giving the bulbs a settling down period to acclimatize to their new seasons, I waited for flowers to appear. Sure enough after an early summer thunder storm, they were true to their name of Rain Lilies and I found some buds appearing. Another week found them out in flower and I was hurriedly taking notes of flowering dates and also recording descriptions when they were lacking from my records. I well remember the exciting experience of examining closely the first flower to open. It was *Z.* x *flaggii* 'Betsy'. This is a cross obtained by Dr. R. O. Flagg between *Z. atamasco* x Z. sp. K484 (from San Luis Potosi. Mexico-Hayward). Mr. Alex Korsakoff gave the grex name *flaggii* and named the individual special varieties resulting from this cross 'Betsy', 'Cathy' and 'Rick' for the Flagg children. Korsakoff later repeated this cross with good results. Perhaps I am prejudiced because this was the first bulb to bloom, but it is still one of my favourite *Zephyranthes* on account of its colour, being a beautiful soft shell pink, and on account of its study habit, good textured flower, and because it gives repeat blooms throughout its flowering period for about three months.

Having decided that I could really grow Rain Lilies in the southern hemisphere, I took confidence and decided to give them a healthy meal in reward for their first flowers. A liberal dressing of bone flour and farmyard manure did wonders and the leaves took on a very healthy and vigorous appearance.

I also found that without any assistance, many flowers set seed and I was obligated to keep a daily watch on their ripening progress, otherwise the pod would have burst and the seed would have been lost. At the first sign of yellowing, the pod was picked, carefully labelled and brought indoors to be placed in water for these last few extra days until the pod started to split.

The seed was then planted in an open potting mix comprising equal parts of loam, coarse sand and leaf mould. In later experience, the mix was also given a liberal dash of bone flour which forced young seedlings along beautifully. The pot was then placed in a warm sunny position for germination. Using fresh seed and having hot climatic conditions, almost complete germination took place within a few days. As the season progresses and the weather becomes cooler, pods take longer to mature and seeds can take up to three or four weeks to germinate.

The growing on of seedlings is a matter of ones own gardening instinct or preferred method. I prefer to plant out young seedlings within the maternal clump as soon as possible, but still bearing in mind climatic conditions.

Seed germinating in mid summer soon results in seedlings 2″/3″ high and at this stage of growth they transplant so easily that it is difficult to note any setback in their continued growth. As summer gives way to fall, growth of freshly germinated seed is slower and in this case I prefer to leave planting of the seedlings until the beginning of next seasons growth. I found that *Zephyranthes* are better transplanted when in growth rather than when dormant. This observation is made in respect of bulbs grown in the open garden. Perhaps with greenhouse culture, transplanting when dormant may be equally satisfactory as one then can control the water during the stage the bulbs are lying dormant without a useful root system.

When I plant out the young seedlings the ground is given a liberal dose of bonemeal and the plants really thrive. I have had flowers from seed in 13 months. Again this is according to garden culture. Greenhouse cultivation may produce even better results.

Returning now to the mature bulbs already growing in an established fashion, I can report on a constant succession of flowers throughout the flowering season, which is from October to April in Australia. With the advent of fall, one can note that the bulbs have given up vigorous growth and they prepare to go into dormancy. In some cases all leaf growth dies away completely (e.g. *Z. atamasco* and *Z. verecunda*), while at the opposite extreme (e.g. *Z. candida* and its many hybrids) the bulbs are virtually evergreen.

By spring the growth is ready to start again for yet another season of feeding, flowering, taking notes, seed collecting, seed raising and seedling transplanting. I am sure no one will dispute the claim by Mr. Richard Tisch that *Zephyranthes* are easy to grow. The only weakness so far noted is the greed with which slugs, snails and other kindred kind devour their luscious foliage. There are good preparations on the market in these days to put a speedy end to these.

I believe that by now I have well passed my apprenticeship as a novice—a very pleasing experience indeed, as *Zephyranthes* are little known in the state of Victoria.

My thoughts now revolve around what I can do next in the post-novice stage. I know that some eminent bulb growers in the U.S.A. have spent many years in hybridizing *Zephyranthes,* and much success has been achieved in this field, as well as in the field of bi-generic crosses with related genera. Some of these results are already in my own possession and they are indeed excellent plants. I have very much admired the work of these growers in developing good healthy free flowering hybrids in the yellow/copper tones, and some which I am glad to own are—'Desiree', 'Kitty Clint', 'Sunburst' and 'Texas'.

In spite of the good work of the past I have been tempted and have succumbed to the idea of indulging in some hybridizing of my own. I

have a vivid imagination and in the seedlings I can already see many "Hybrids of the Year" emerging. I hope that when the plants do eventually bloom I will not have to lose confidence in my imagination. I will certainly not have to wait long due to the very accomodating nature of these charming little bulbs, *Zephyranthes.*

ZEPHYRANTHEAE PROPAGATION BY CUTTAGE

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Using methods described in Plant Life and other related periodicals, you can propagate your choice Zephyrantheae bulbs by cuttage, without fear of disastrous loss. The techniques of asexual propagation by bulb cuttage have been refined to a point where losses of the cut bulbs are minimal. Increases in stocks of individual clones are accelerated to where the process is now economically feasible.

The practice of bulb cuttage in general reaches far back in history. Possibly the first knowledge of the phenomenon came about through accidental cutting of bulbs while digging. Surely there were not many changes in methods for many, many generations. Hollowing out the bulb up through the basal plate, criss-cross cuttage through the basal plate, halving and quartering the bulb through the basal plate, and partial slicing of the bulb from the top or side were all popular methods. Tradition, without experimental variation, seemed to govern the regional practices, the actual restrictive parameter being bulb loss from infectious rotting.

I. SOME PRIOR TECHNICAL REPORTS

Within the past 50 years the development of more effective fungicides and revised techniques for their usage have permitted changes in bulb cuttage practices. A review of some of the literature regarding cuttage of Amaryllids indicates that the importance of preventing fungous infection was possibly considered so widely accepted that some reports placed more emphasis on the control of other conditions.

In reviewing some of the reports along the route to today's practices, I have assumed that all experimenters considered this posture and took what they considered necessary precautions to prevent contamination of the subject growing matter. In this report I plan to point up some milestone reporting of experiments, then summarize elements of them which I consider important, and then describe some of my own experiments and results. Omission of other reports is not intentional; this report is not intended to be exhaustive.

In 1934 Traub reported (1) that cutting bulbs so that some were partially quartered half way through the root base and some were quartered the full way resulted in no significant differences. The cut areas were covered with paraffin, and the segments were placed in half sphagnum peat and half sand in flats.

Heaton, in 1934 (2), found great variation in individual seedling

clones' reactions to cuttage.

Both Traub (3) and Luyten (4) made important reports in 1935 on *Amaryllis* cuttage, with detailed step-by-step descriptions of the techniques used. Traub's report included his opinion that the best time for *Amaryllis* cuttage is after the bulbs have made their full growth following flower production—July through November. Luyten, in addition to her excellent coverage of the single-scale technique, which does not use all the basal plate along with the scales, stressed that maintenance of a constant flat or pan temperature at 86°F results in optimum bulblet production.

In 1936 Traub reported (5) that he had found the best medium for after-cuttage growth of *Amaryllis* to be granulated German peat, coarse sand and broken rock (¼″ mesh) in equal proportions, plus good drainage. In 1937 he reported (6) on stem cuttage of *Ismene,* which resulted in formation of bulblets by 67% of the cuttings.

Also in 1937, Hume and Watkins, reporting on *Zephyranthes* propagation (7), stated that their experiments, performed when bulbs were in full leaf, included cross-cut, scooped, oblique-cut halved, quartered and eighthed bulbs. Although they concluded that cross-cutting and scooping had no particular value because bulbs so treated produced very few bulblets, they noted that cross-cut bulbs produced root systems more abundantly than they did before being lifted and cut, and suggested that such treatment might be valuable for rejuvenation.

Klotzbach, in 1957 (8), discussed hydroponic culture of *Amaryllid* bulbs, including the growth of cut bulbs in gravel.

In 1958 Davis reported (9) on the use of a modern fungicide for soaking cut sections of *Amaryllis,* and the use of vermiculite as a propagation medium. Hayward summarized (10) in a thorough analysis most of the then-recognized problems and potential solutions. He made special note of the fact that variations in growth rates and inherent vigor of individual *Amaryllis* clones are apparent in the survival of cut segments. He also stated that lower temperatures slow the propagation rate.

In 1959 Stewart described (11) a method of providing bottom heat electrically by thermostatically-controlled soil cable, set for ON at 69-70°F and OFF at 82-83°F. He used concrete sand, dipped the *Amaryllis* bulbs in Bordeaux mixture for a few hours, then cut the bulbs by the "twin-scale" method, with two layers of the scale attached to a fraction of the basal plate. Cuttings were soaked in water with vitamin B-1 added. The flats were sprayed regularly with insecticide and fungicide.

Corbett, in 1967 and 1968, reported (12) (13) on cuttage of *Lycoris.* Loss of segments occurred due to rotting even though they were dusted with a 2:1 mixture of Hormodin #1 and Fermate and allowed to dry for two days to promote conversion of the cut surfaces into corky tissue.

Cothran reported in 1973 (14) on the availability of Benlate, a

systemic Benomyl fungicide, casting a glow of hope over the segment-loss problem. Also in 1973 Ticknor described (15) his technique for twin-scale propagation of *Narcissus*. Two important elements of his work seem to rise up out of the rest of the report: he soaked the cut segments in a solution of Benlate (Benomyl); he sealed the treated segments in plastic bags with damp vermiculite, held at 72°F. He stated, "The magic ingredient in this experiment was, I believe, the fungicide Benlate." He also included in the bags some segments which had no piece of basal plate attached. Of these he said, "Although these slivers remained white with heavy substance, not a one of them formed a bulblet." On 109 segments placed in bags July 15, by September 22 there were 101 bulblets.

II. CUTTAGE EXPERIMENTS

Having performed many bulb cuttage operations over the past 50 years, since watching the skilled Dutch growers in my native Michigan scoop out Hyacinth bulbs and X-notch Daffodil bulbs, I knew that the chance of total loss by rotting became a restraining factor when you had a one-of-a-kind bulb. Only the more intrepid growers dared nick such a bulb to try to stimulate offset production; and usually that was done only out of desperation, if the bulb had failed to divide or produce offsets by inself.

Lately, however, the cited articles have convinced me that my chances of getting offsets from a one-and-only bulb were very good, provided I took reasonable care. That included the following steps: disinfection of all tools and hands (I don't smoke, so the danger from that source is lessened.); careful pre-sterilization of the medium in which the segments are to be placed; neat, clean slicing of the bulb and meticulous cutting of the slices so that each segment has at least two scales and a portion of the basal plate; soaking of the segments in a fungicide solution; placing the segments in the pan at about a 45° slant, with the concave surface downward; covering all but the tips with the growing medium; watering-in with more of the fungicide solution; maintenance of bottom heat at about 80°F, with ambient temperature at about 72°F, and with a moisture-retaining plastic lid or film covering; patience and prayer.

A. *Zephyranthes drummondii* D. Don. Through June and July of 1972 seedlings which had flowered were lifted and dried. In early August they were cut either into quarters or halves, base-cut up through the basal plate and partially into the bulb with two cross-cuts or a single cut, or side-cut with a single cut partially into the bulb and basal plate (see Fig. 18). Prior to cutting, my hands and the knife blade had been sterilized in a Captan-containing fungicide solution. A plastic pan contained two layers of growing medium: an all-soil layer in the bottom and then a layer of half soil, half vermiculite, each about 1½" thick. The cut bulbs were soaked for about one hour in the fungicide solution, then placed atop the second layer so the pieces were standing upright, as when growing. A two-inch layer of vermiculite

was hand-sifted over the pieces, and all was again soaked with the fungicide solution. The pan was placed on one of my screenhouse tables, with two forty-watt Gro-Lux lamps two feet above, and covered with an inverted clear plastic shirt box. Bottom heat was not provided; ambient temperature ranged from 70-90°F daytime maximum to 55-65°F nighttime minimum.

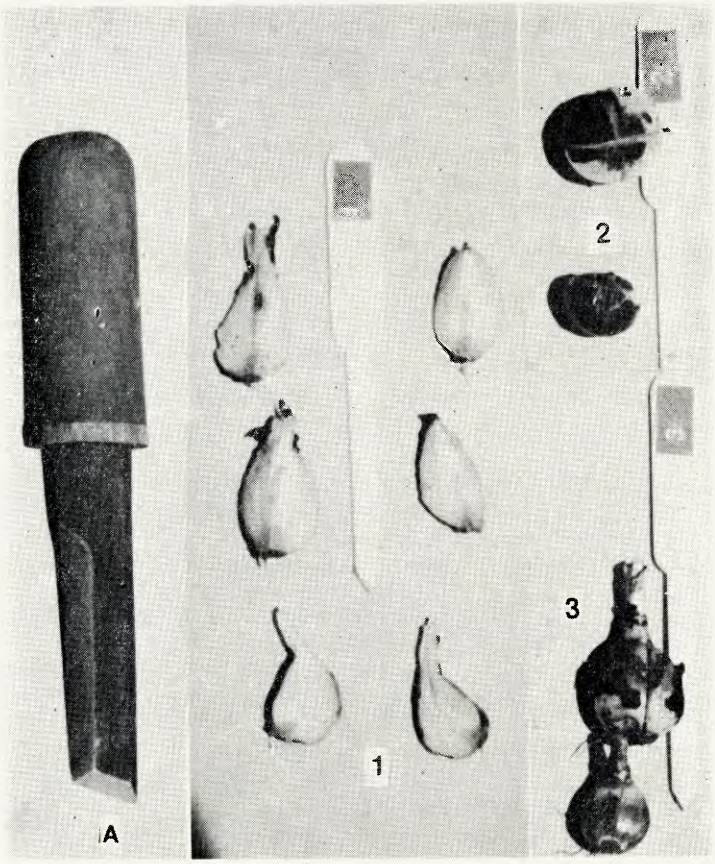

Fig. 18. Propagation of Zephyrantheae: **(A)** Bonasi knife used for cutting. **(1) top,** four quarters; **bottom,** two halves; **(2)** cross-cut up from base; and **(3)** side-cut part way through base.

By August 27 leaves were showing in four places. Surprisingly, a flower scape came up from one of the base-cut bulbs. In October the screenhouse panels were re-installed, and a thermostatically controlled electric heater was activated. Temperatures at tabletop level ranged from a high of 92°F to a low of 64°F.

On November 24 the segments and bulbs were lifted, examined and photographed (see Fig. 19). Results were as tabulated below. Two of the side-cut mother pieces did not develop bulblets.

Type of Cut	Mother Pieces	Bulblets
Segments	22	62
Base-Cut	8	43
Side-Cut	9	11

Normally the next step would have been separation of the bulblets and planting in a standard growing medium. In this case I wanted to see what would happen if they were replaced in the pan under the same propagation medium. Growing conditions were maintaind the and only the segments and base-cut specimens were replaced in the same propogation medium. Growing conditions were maintained the same as before lifting.

On May 14, 1973, when the heater was turned off and the screen-house panels removed, the specimens were again lifted, examined and photographed (see Fig. 19.). Of the 62 bulblets on the segments, only 44 remained; the mother segments had withered; only three still had leaves; 12 segments had only one bulblet; some of the bulblets had continued to grow and were very large. The base-cut specimens had increased the number of bulblets from 43 to 48; the mother segments had withered so that it was difficult to determine which groups of bulblets belonged together; six still had leaves; one specimen which held together had eight bulblets.

B. *Zephyranthes* X 'Marcia'. One bulb, described as Howard's hybrid Z. X 'Ruth Page' X Z. "sp. Valles", was sent to me by Marcia C. Wilson for use in cuttage experimentation. On October 15, 1973 the bulb was base-cut crosswise two places, dusted with a Captan-containing fungicide and set in vermiculite over a layer of soil-vermiculite mix in a plastic pot. Thermostatically controlled bottom heat from a cable was maintained around the clock, and two 20-watt Gro-Lux lamps were lighted 16 hours per day at 18 inches above the pot. On March 17, 1974 it was lifted and examined. No photograph was made, and my usually complete notes say merely, "Many offsets." Mother and bulblets were planted outdoors as a group. They were lifted and examined just now (July 17, 1974): the mother bulb had withered; there remains a hardened corky basal plate "crown" with strong roots, plus eight healthy rooted bulblets. All were separated and replanted, with the crown just below the soil surface.

C. *Zephyranthes* X 'Percy The Great'. One bulb, described as a Flagg hybrid which flowers frequently, was sent to me by Marcia C. Wilson for cuttage experimentation. On November 11, 1973 the bulb was treated the same as specimen B. above. On December 14, because there was no sign of leaf growth above the medium, it was lifted and

examined. There were signs of rot inside the cut area, so it was washed, re-dusted and laid on top of the vermiculite, exposed to the air. In the middle of one of the cuts, a bulblet starting to form was noted after washing the bulb. In January of 1974 a leaf was starting up from the mother bulb, so it was replaced in the propagating medium. On March 17 it was lifted, examined and photographed. The mother bulb had split and was beginning to deteriorate; one large bulblet had formed in the cut area, and four smaller bulblets were forming at the base of the large one. Mother and bulblets were planted outdoors as a group. They were just now lifted and examined: the mother bulb has

Fig. 19. Propagation of Zephyrantheae: results from **(A)** quarters and halves after 39 weeks; **(B)** base cuts after 39 weeks; **(C)** quarters and halves after 16 weeks, and **(D)** side cuts after 16 weeks. Photos by R. E. Tisch.

withered, and there are seven small to medium-sized bulblets, all growing leaves; there is no longer one bulblet exceptionally larger than the others. They were separated and replanted.

D. *Sprekanthus cagei.* In late November of 1973 Dr. Cage sent me two large bulbs, each with small offsets starting. Having had successes prior to then with cuttage of *Zephyranthes,* and having read and re-read the cited reports, especially Ticknor's report (15) on Daffodil cuttage, I was confident that cuttage could be performed successfully on a rare and valuable bulb such as these. (I did not inform John Cage

of my intent, feeling that there was no value in having more than one person worried about the outcome.) Being already convinced that a growing bulb was more likely to start producing bulblets without damaging delay. I potted the bulbs in sandy soil in plastic juice pitchers to start their normal growth. By January of 1974 leaves were showing above the soil, so the bulbs were lifted and examined. They looked healthy, with strong new roots well formed.

Taking all the usual precautions, but using a Benomyl systemic fungicide solution in the manufacturer's recommended proportions, I cut the largest bulb per the twin-scale method. I also washed my hands frequently: Ticknor had reported, "I will add at this point that I didn't wear rubber gloves but that I did wash my hands every 5 minutes." As much as feasible I handled the cuttings with a surgeon's long-nosed forceps. The fungicide solution was nearby in a glass bowl, and into it each cutting was placed. Cutting the bulb consumed about one hour, and the cuttings were soaked for another hour. Possibly because of its fresh new-growth condition the bulb was tender, and I ended up with 17 twin-scale cuttings and 38 single scales (cuttings which had separated).

Vermiculite was wetted with the fungicide solution and placed in a transparent plastic bag, then the cuttings were carefully distributed throughout the vermiculite, that bag inserted into another clear plastic bag, and the bag openings closed over and stapled closed. The package was placed directly on the top Floracart tray in my study. The tray's sets of two 40-watt Gro-Lux lamps were turned on for 16 hours per day, with the top tray 12 inches below its lamps. A thermometer set on the top tray near the package indicated an ambient temperature of from 80°F during the daytime to 70° at night. The higher daytime temperature resulted from the slight heat generated by the lamps suspended just below the top tray.

It was noted that extensive exudation of fluid occurred from the cuttings as soon as cuttage began. This bleeding apparently continued while the cuttings were soaking, because the fungicide solution was noticeably thicker after removal of the cuttings. There is no evidence to suggest that this bleeding was detrimental, unless it weakened the single scales by bleeding from the severed ends where they were torn loose.

On March 18 (60 days after cutting) green growth could be seen through the plastic bags, so they were opened and the contents examined and photographed. The 17 twin-scale cuttings were all forming bulblets, between the scales only, with two cuttings forming two bulblets each and one forming three bulblets, for a total of 21 bulblets. On the single scales there were no bulblets starting.

The bulblets, with scales still attached, were planted in a standard Rain Lily soil mixture in a plastic pan, which was placed on the same tray in order to provide bottom heat. The single scales were returned to the inner plastic bag, which was replaced on the tray. Since the

leaf growth on the removed bulblets was very pale, the outer plastic bag was removed to increase light transmission to the scales. In another 30 days the bag was reopened and the contents examined: there was no evidence of the formation of the scales, which had shriveled markedly. These scales were discarded. In May the pan containing the bulblets, which by then were sending up strong leaves, was moved to the screenhouse with no supplemental heating, but with Gro-Lux lamps two feet above the pan. In mid-July the 21 healthily growing bulblets were lifted from the pan, photographed and transplanted to an outdoor bed.

E. *X Sydneya 'Easterlyi'*. From seeds received in 1969 from Russell H. Manning several vigorous clones were grown and used in breeding experiments. In March of 1974, following the technique suggested by Klotzbach (8) five representative clones were soaked in a Benomyl solution, cut and laid at close to a 45° slant barely below the surface of a coarse-fine gravel mix in a plastic pan. All pieces were placed with the concave surface, the point of the wedge, or the flat face downward. The pan had a solid bottom except for one drain hole drilled in one corner. The pan was placed in the screenhouse, with no supplemental heating, but with Gro-Lux lamps two feet above the pan. Sticks were placed under one end and one side of the pan so that it was tilted enough to drain out the single hole into a bucket below the table. The pan was initially and subsequently watered with a solution of 7-6-19 Hyponex in tap water. On July 16, 1974 all were lifted, examined, cleaned of withered and dried scales, and photographed.

1) *XS6901*. Soaked 10 minutes. Quartered and sectioned one large bulb into eight pieces. Halved one small offset. Some roots were left on outer pieces as well as on inner pieces. Result: all bulblets small; five of 10 pieces produced a total of 12 bulblets.

2) *XS6902*. Soaked five minutes. Quartered and sectioned one small bulb into eight pieces. Roots were left on the inner pieces only. Result: all bulblets very small; three of eight pieces produced a total of three bulblets.

3) *XS6903* (vigorous grower and prolific producer of offsets). Soaked 10 minutes. Quartered one large bulb and two medium-large bulbs; did not section. Halved three medium sized bulbs. Result: most bulblets large and strong; 18 of 18 pieces produced a total of 71 bulblets.

4) *XS6905XL* (extra large leaves, scapes and flowers; does not normally produce many offsets). Soaked 35 minutes. Halved two large bulbs and one medium-large bulb; did not section. Result: bulblets medium-large; five of six pieces produced a total of nine bulblets.

5) *XS6907* (good grower and bloomer, but does not normally produce many offsets). Soaked 30 minutes. Quartered and sectioned one large bulb into eight pieces. Quartered three medium sized bulbs; did not section. Result: bulblets medium small, with three very small

bulblets; 11 of 20 pieces produced a total of 24 bulblets.

III. CONCLUSIONS AND SUGGESTIONS

As usual, my experiments involve limited-size experimental lots and do not include comparative "control" specimens treated differently in some significant respect. Nonetheless, I do see trends which confirm the data previously reported by other experimentors and suggest that future expansions of these experiments will be valuable.

A. The use of a systemic fungicide such as Benomyl apparently increases bulblet production markedly by reducing the incidence of rot on the cuttings. Treatment of the propagation medium, the experimentor's hands, cutting tool and cut specimens seems to deter rotting until after the specimens have produced bulblets.

B. Base-cut bulbs may be placed in the propagation medium at normal planting depth. Segments and scales should be placed just below the top surface, slanted, with concave or cut surfaces downward. Once lifted from the propagation medium, bulblets should be separated from the cuttings if large enough, or cuttings with small bulblets attached should be planted in either a fresh sterile propagating medium or in a sterile growing-on medium.

C. The twin-scale technique seems best for maximum bulblet production; there should be two or more scales to each cutting, attached to a piece of the basal plate. The base-cross-cut technique seems adequate for stimulating growth from a bulb which has come to a standstill or seems reluctant to produce offsets. The mother bulb is thus not immediately destroyed, and leaf growth continues.

D. Luyten's emphasis (4) on the criticality of temperature control for mamixum bulblet production and fastest growth, also discussed by Stewart (11) is readily confirmed. Low temperatures result in reduced bulblet production and in accelerated rotting of cuttings. Bottom heat of 70-80°F seems best, with ambient temperature of 65-75°F advisable.

E. Currently I prefer vermiculite for the propagation medium, with a soil-vermiculite mixture under the vermiculite if the cuttage specimen already has growing roots. Watering with a fungicide solution is recommended, with use of a nutrient solution withheld until active leaf growth is evident. I'm not sure that the use of a fungicide solution precludes the addition of growth stimulating chemicals such as Rootone, or Vitamin B1 as used by Stewart (11).

F. More work is needed to determine the best time in the life cycle of various plants for cuttage. My results indicated that the best time to cut Zephyrantheae bulbs is during a period of foliage growth, usually prior to flower production.

G. Traub's coating of cut surfaces (1) suggests a possible approach toward reduction of bleeding which occurs after cutting the bulb. Dusting and drying of cut surfaces as described by Corbett (12) (13) might well be tested on some pieces of a bulb versus other pieces of the same bulb not so treated; possibly the use of Benomyl powder would

prove more effective than the powders he used. Further, a valuable investigation might be one which incurred the use of a "cauterizing" agent on the cut surfaces.

H. As Heaton suggests (2), evaluation of techniques should include the consideration that clones differ in the natural production of offsets and in their reaction to cuttage. These are not the same consideration: frequently one might want to cut a bulb which naturally does not produce offsets readily; however, that bulb, normally reluctant to divide or produce offsets, may produce many strong bulblets from its cuttings. For experimental purposes, it might be well to compare the results of different clones, using identical techniques and conditions. Ticknor reported (15) the results of cuttage simultaneously on five different varieties of Daffodils, with identical treatment, which indicated that his method was successful on all five types.

I. My experiment with cuttings grown hydroponically in gravel did not include bottom heat or ambient temperature control. Nor did I rinse the cuttings periodically with a fungicide solution after setting them. This type of experiment should be repeated under better conditions. Possibly the use of glass beads or marbles should be rechecked; when I last used small beads (1/64 inch diameter) they stayed too wet, which might not occur with larger ones. Full-sized bulbs of *X Sydneya* which are in gravel in plastic pitchers are flourishing.

J. Experimentation with different gaseous atmospheres, plus different pressures, might yield valuable information. The test equipment could be small and relatively inexpensive. Possibly rotting can be further reduced by use of a sterilizing or neutral gas. Carbon monoxide baths, for example, might accelerate the formation of bulblets and the start-up of root and leaf growth.

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SUNSET BOOKS PUBLISHED IN 1974: All are priced at $1.95 and generously illustrated. These may be obtained from Lane Magazine and Book Co., Menlo Park, Cal. 94025. **HOUSE PLANTS.**—This book provides the latest information on the aesthetics and care of indoor plants. A comprehensive selection guide alphabetically lists over 150 plants that can successfully be grown indoors. An informative text identifies each plant, its growth habits and care requirements. **SUNSET IDEAS FOR HANGING GARDENS,**—Over 150 kinds of plants that grow attractively in containers are listed for easy reference by both their botanical and common names. Included are a wide selection of house plants, as well as common outdoor landscape and bedding plants. There are tips on how to care for each plant. **HOW TO GROW ANNUALS,**—With the help of this book you can select just the right plants to bring maximum color to your garden in minimum time. The encyclopedia section describes the popular annuals and some attractive lesser-known types. Information on each annual includes planting times, cultural requirements, flower descriptions, and suggestions for using and combining them in the garden or containers. **LOW MAINTENANCE GARDENING,**—This is here defined as planning the initial stages so that the end result will be a source of pleasure and relaxation. The required techniques are here explained, such as mulching to keep down the weeds and watering, and planting to minimize pruning, disease and plant failure. **GARDEN POOLS, FOUNTAINS AND WATERFALLS.**—The colorful water lilies and goldfish can be raised in your backyard pond as explained in this book. The bulk of book is concerned with many ideas for using the water garden to create a cool retreat for all the family and guests. Location, design and installation are

discussed. A special chapter is concerned with the building and maintenance of waterfalls, and pools. **ATTRACTING BIRDS TO YOUR GARDEN,**—Thirty-three popular garden birds are described and pictured. Directions are given on how to attract them, and maps provided showing their ranges. Birds that occasionally visit the garden are described. There are sections on supplementary feeding and care; bird houses, plants that birds like the most, and a suggested reading list, and an index. All of these profusely illustrated books are highly recommended.

BEAUTY RECIPES FROM NATURAL FOODS, by Anne Marsh. Sterling Publ. Co., 419 Park Av. So., New York City 10016. 1974. Pp. 48. Illus. $3.50.—This book is concerned with simple ingredients which when used alone or in combination with others, will produce beauty aids ranging from tooth powder to shampoo, and hair preparations. The needed ingredients are to be found in the well stocked kitchen; the needed herbs and flowers may be gathered in the garden. Recommended to all interested in cosmetics.

CORN-HUSK CRAFTS, by Margery Facklam & Patricia Phibbs. Sterling Publ. Co., 419 Park Av. So., New York City 10016. 1973. Pp. 48. Illus. $3.50.—The authors give directions for the use of corn or maize husks in the manufacture of dolls, small christmas trees, ceremonial masks, wreaths, mats, baskets, birds, lambs, dogs, and flowers. Highly recommended to all interested in home crafts.

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MOSSES: UTAH AND THE WEST, by Seville Flowers; edited by Arthur Holmgren. Brigham Univ. Press, 205 Univ. Press Bldg., Provo, Utah 84602. 1973. Pp. xii + 580. Illus. $14.50. This generously illustrated text contains the lifetime research of the late Dr. Flowers in bryology. The introduction deals with morphology, ecology and distribution, collecting, herbarium and study methods. The rest of the book consists mainly of the descriptive catalog. Following the key to the families and genera of the Class Musci, 18 families, 77 genera and 258 species are described in detail. A map of Utah, glossary, and genera and species index complete the volume. Very highly recommended to all interested in mosses.

ISLAND BIOLOGY, by Sherwin Carlquist. Columbia Univ. Press, 562 West 113th St., New York City 10025. 1974. Pp. ix + 660. Illus. $25.00—This fascinating book with 400 illustrations deals with the evolutionary patterns of island life, based on the author's direct observation and experimentation. Beginning with the citation of the twenty-four principles of dispersal and evolution, the author discusses long-distance dispersal; adaptive radiation; radiation in the Hawaiian Islands and other oceanic islands, and in southwestern Australia, and continental islands areas; insular woodiness, loss of dispersibility in island plants and animals, equatorial highland biota and selected island topics. Indices of biological names, and subjects complete the volume. This is surely an indispensable reference source for students and research workers in these areas of the biological sciences. Very highly recommendd to all biologists.

PLANT LIFE

VOLUME 31

[Nos. 2-4, incl., Apr., Jul. & Oct.]

1975

GENERAL EDITION

EDITED BY
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GROWING AGAVES IN PENNSYLVANIA

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Agave Havardiana Trel. #2323 and #2324

This *Agave* is an endemic to the Big Bend region in Texas. When my mother Mrs. J. Norman Henry (Mary G.) first found it there, she admired the decisive glaucous blue foliage as well as the distinctive and bold character of the growth. It appealed to her so much that she could not resist bringing back a young plant or offshoot. It was not likely that it could weather our Pennsylvania winters, but then she forever believed in trying. Upon her return, I went down to the "desert" with her to set the young plant in the new and foreign environment. As she placed the start in the gritty mixture, she turned to me and said with a twinkle in her eye, "Well, it should be fun to see what it will do. Wouldn't it be a joke if it ever bloomed. Certainly, I will never see it flower but then, dear, you may".

How sad it is that she never lived to see the giant asparagus-like stalk rise from the rosette of wicked foliage to bloom. At times it rose as much as fifteen to twenty centimetres from the leaf mass between one day and the next. It was so exciting to watch the progress and finally, when the buds began to show and spread out in a series of flat umbels in candelabra manner, our impatience grew. In time the sulfur yellow flowers of the upturned inflorescence opened on a glorious blue-sky day. Our breaths were really caught! Not meaning to demean so remarkable a display, it must be admitted that I was reminded of yellow bristled scrubbing brushes placed bristle side up in the sun to dry. We all admired this remarkable contribution from Texas, as did numerous visitors, and wondered daily as it continued to grow until it reached the astonishing stature of four metres and forty centimetres! No doubt the excessively heavy rainfalls of the summer of 1972 gave the impetus for such a height in this climate. In Correll and Johnston's book *Manual of the Vascular Plants of Texas* they give the height in Texas as up to five metres.

Alas, I finally caused the already leaning column of near telegraph pole dimensions to crash by taking down an unwanted *Robinia* nearby which turned and caught one of the flower branches. The basal rosette, of course, had been improverished and expended at the end of its life cycle. There was a wild rush to prop the stalk up so it could continue to stand. Several weeks later we severed and placed the whole stalk under cover outside the barn where it would be in some measure protected from severe extremes in temperature at night as the seasonal chills of autumn descended. With members of this family there is enough food stored in their stalks to support the development of the seed. Luckily, this was the case! Some of the seed finally ripened, and we now have four young making a start for who knows what!

Agave Virginica #1395

This *Agave,* #1395, was planted in our Rock Garden about 1939 and has flourished happily ever since, seeding with adequate generosity to give the impression that *A. virginica* was an original resident. In fact, although it does not give a colorful display, the tall, slender spikes of modest green bloom lend grace to the scene as well as upward accents in contrast to the great rounded boulders of Baltimore gneiss. It is never in the way and not invasive, and it is a simple matter to rogue out those not wanted where the seed alighted successfully. Originally these were purchased through the Clement's Nik Nar Nursery. They collected them near Turkey Creek, South Carolina.

The blossoms are sparsely spaced along the spike, and each individual lasts but a day or two. Being green, the petals themselves offer little in the way of ornamental beauty, but the stamens and stigma show a bit more. At the approach of dusk the scent increases to entice the night flying pollinators. It is too bad to have this blessing so far from a house, but then perhaps the daytime display is not adequate to feature upon a terrace where the evening breeze could bring it to your attention. The foliage consists of a basal rosette which is rather close to the ground. Each leaf is broad at the base and tapers the length. Some of those here bear leaves which are spotted brown, and this is indeed a handsome feature to so otherwise drab a plant. In addition, the margins are rougher. As the seed capsules mature, their roundness is attractive, indeed more so than the flowers.

Agave SP. #632

There is another *Agave* species without a name and without a source which has resided for some thirty years in our Rock Garden, but in all that period it has never even attempted to bloom. At one time my mother had all the offsets cut free of the larger rosette in the hope that efforts would be concentrated on the production of a flower spike in the central rosette. This was to no avail. The rosettes are relatively prostrate and very glaucous and rigidly spiny. It has decorative value, but heaven help one while weeding about the beautiful foliage!

Two other species of small *Agaves* from the southwest, one from Texas, have been tried in the Rock Garden, but they have both failed. However, another trial of more from the southwest will be made. Should it be possible to have them get a good start one season, there is a better chance. Should a humid summer follow their planting out and either a wet winter or an unusually frigid one ensue, there is scant chance of their being happy enough to survive.

Agave SP. #2325

Another *Agave* growing here, #2325, is slightly larger than the foregoing one, #632. It has lived for some fifteen or so years in our "Desert Garden" in company with *A. havardiana.* This appears to

increase in size slowly as time passes so there is a chance that we may have another surprise. This one receives winter cover against excessive rain and wet.

SAPONINS ABSENT IN **HEMEROCALLIS** L.

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Recently Traub (1973, 1974) separated the usually saponin-free Order Amaryllidales [see Hegnauer, 1963, Amaryllidaceae, pp. 56, 67; Alstroemeriaceae, pp. 52-53; Hypoxidaceae, pp. 235-236; Velloziaceae, p. 448; Pontederiaceae, p. 421; Haemndoraceae, see Table 1. Traub experiments in present paper with *Anigozanthos viridis* Endl.; and Philydraceae, see Gibbs, 1974, Vol. III. p. 1931] from the more or less closely related orders usually containing steroidal saponins and sapogenins—*Liliales* (see Hegnauer, 1963, Lilioideae, pp. 277-279; Scilloideae, pp. 329-330); *Dioscoreales* (see Hegnauer, 1963, pp. 136-144); *Agavales* (see Hegnauer, 1963, pp. 27-31); and *Alliales* [see Hegnauer, 1963, Alloideae, pp. 315-316; 323; and Traub (1972) for the presence of laticifers and other characters of importance in delimiting the Alliales].

Table 1. Testing for steroidal saponins by the **stable-foam** method (See Gibbs, 1974, **Vol.** I. pp. 78-79).

Species	Order	Depth, ml. stable foam	Presence of saponins
Beschorneria sp.	Agavales	4.0	positive
Hesperaloe parviflora Torr.	Agavales	4.0	positive
Tulbaghia violacea Harv.	Alliales	0.5	doubtful *
Urginea scilla Steinh.	Liliales	0.3	doubtful *
Xanthorrhoea sp.	Liliales (?)	0.0	negative
Amaryllis divifrancisci Card.	Amaryllidales	0.0	negative
Hemerocallis washingtonia Traub clone 'Golden Ring'	Amaryllidales	0.0	negative
Anigozanthos viridis Endl.	Amaryllidales	0.0	negative

* Apparently a more refined method is required to determine if minor amounts of saponins are present.

The monotypic Family Hemerocallaceae (type,—*Hemerocallis* L.) could not be placed because no reports on the presence or absence of saponins were known to the present writer previous to 1974. The purpose of the present paper is to place this group in its proper order—*Liliales* or *Amaryllidales*—on the basis of the presence or absence of saponins.

Using the *stable-foam* test for saponins described by Gibbs (1974, Vol. I. pp. 78-79), an attempt was made to supply the missing information as far as possible at this time. This *stable-foam* test is here standardized further:—0.25 gm. of fresh plant material (leaves in this case, but other parts may be used as required) was finely chopped, placed in a 25 ml. pyrex glass volumetric flask; 5 ml. water were added and the contents were boiled for 1 minute, and cooled. The liquid was poured into a small glass-stoppered 10 ml. test tube (with an ap-

proximate 1 cm. inside diameter, and graduated in ml.) and shaken vigorously for 1 minute and set aside for 5 minutes.

A *stable-foam* 2 cm. or more in depth is considered to be positive for steroidal saponins. A lesser amount remaining after the 5 minute interval is considered doubtful, and no stable foam to be negative for steroidal saponins. The results obtained from the experiments are given in Table 1. The plants tested other than *Hemerocallis* are included as controls, particularly species of *Agavales* which are very rich in saponins.

According to these experiments, the genus *Hemerocallis* L. belongs with the saponin-free Order Amaryllidales as indicated in Table 1.

AN URGENT APPEAL

As is shown in the above example, a concise text devoted to the standard physical and chemical methods of analysis—"Standard Lineagic Methods"—for the lineagicist is very urgently needed so that our work may be built upon a common basis. The term *lineagic* (see Traub, 1964) is used since it implies that underlying all our work are the unifying principles of organic evolution. We are not classifiers or taxonomists (terms used also in other fields) of things in general, but are first of all evolutionary biologists and our groupings grow out of our relevistic insights into the evolution of living things, the evolution of very gradually changing lineages with time.

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BOMAREA, A NEGLECTED SUBJECT

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It would seem that *Bomarea* and *Alstroemeria* should be more frequently encountered as cultivated ornamentals. Both have showy flowers and foliage which is sufficiently attractive that the plants are decorative even when not in flower.

Fig. 20. Bomarea rosea as grown at Fairchild Tropical Garden, Miami, Florida. Photo by Dr. William D. Bell.

The foliage is not only of interest for display purposes, but may be unique botanically. We observe in the study of leaf stomata that most plants have pores or stomates on both the upper (adaxial) and lower (abaxial) leaf surfaces. In most cases, usually a higher count of stomates can be found on the lower surface than the upper. A much smaller group, including citrus, have stomates only on the lower or abaxial surfaces. We then are told that the striking exception to the rule is the water lily (example: *Nymphaea*) where the stomates are found only on the upper or adaxial surfaces.

Observe the leaves of either *Bomarea* or *Alstroemeria* carefully. When the stems are upright, one finds a 180° twist in the petiole of each leaf. Thus, what is developmentally the adaxial surface, that formed closest to the stem axis, becomes the lower leaf surface. In terms of leaf morphology, however, it remains equivalent to the upper surface of other leaves. The twist in the petiole results in this adaxial surface being functionally the lower surface.

Next, check for the presence of stomates (Bell and Stiles, PLANT LIFE, 1974). Leaf impressions of either genus show a surprising pattern of epidermal cells fitted together in delightful jigsaw configurations. Anyone with access to a microscope should be pleasantly surprised trying leaf impressions of these plants. Moreover, I found stomates only on the lower surfaces. Considering the 180° twist in the petioles, the stomates are located on what is developmentally the adaxial surface! These alstroemerids rank with *Nymphaea* as exceptions to a rule.

For 2 years, I had attempted to grow *Bomarea rosea* as a pot plant providing conditions under which my collection of amaryllids thrived. Only one of several potted bomareas had even survived by the time I moved from Gainesville to the Miami area. At Fairchild Tropical Garden, Mrs. Charmian Brooks, greenhouse manager, accepted the challenge to grow this plant which had never been grown at the Garden. Transferred to a tree fern basket with a light potting mix containing sphagnum and watered daily, a small plant in fair condition became a specimen plant within a matter of 4 or 5 months (Fig. 20). Cultural conditions for ferns, gesneriads or begonias in hanging baskets seem well suited for *Bomarea rosea.* Renewed interest in the use of baskets for plant culture should suggest to others that they try this and perhaps other species of *Bomarea.*

One further point to note is that this method of culture allows some stems to trail from the culture container. Leaves on such stems seem to have a tendency to reorient themselves. Perhaps the alstroemerids should also be given more attention in investigations of the geotropic responses of plants.

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CHEMOTAXONOMIE DER PFLANZEN, by R. Hegnauer. Vol. 6. Dicotyledoneae: Rafflesiaceae—Zygophyllaceae. Birkhauser Verlag, P. O. Box 34, OH—4010, Basel, Switzerland. pp. 882. Illus. 1973. Swiss francs 178.—. Volumes 1 through 5 have been reviewed in previous issues of PLANT LIFE. This 6th volume lives up to the high standard of the previous volumes in this important series and is concerned with the 60 families of **Dicotyledoneae** from **Rafflesiaceae** through **Zygophyaceae,** which are considered in detail with reference to systematic arrangement of the plant groups on the basis of anatomical characteristics and chemical composition. The copious and indispensable literature citations appear in the text following the subject matter discussed. Information which has become available since the publication of vols. 1—5 is included in a supplement. A comprehensive index completes the volume. This important book is a mine of information for the plant taxonomist and cannot be too highly recommended.

CHEMOTAXONOMY OF FLOWERING PLANTS, by R. Darnley Glbbs. 4 Vols. McGill-Queens' University Press, 1020 Pine Av., West, Montreal, Canada. 1974. pp. xx + 2372. Illus. $135.00 (set of 4 vols.). We are privileged to bring to our readers' attention another valuable text on chemotaxonomy. The first part of the work (pp. 1—80) is concerned with a brief history of chemotaxonomy, the restriction of distribution of chemical constituents to plant categories, and parts of plants, chemical evolution, and rapid tests used by the author, and some results given in Tables 1 and 2. The second part (pp. 83-873) is concerned with the various plant constituents which are arranged alphabetically from **acetylenic compounds** to **waxes,** and the listing under named compounds of the occurrence in the various plant families and species. This information alone is worth more than the price of the whole work for nowhere else can he find such a summary! In compiling his section on the Families of Flowering Plants (pp. 880—1162), the author in search of relationships begins with Linnaeus and following workers up to the present time. The mountain of detail, mainly of historical interest, obscures the actual **families** recognized today. Fortunately, in the section on **Orders** of Flowering Plants (pp. 1165—1980), he has followed Engler (12th Syllabus ed. by Melchoir, 1954) with marked increase in clarity. He discusses the comparative chemistry of the **Families** under the **Orders.** The author's conclusions are based on the evidence presented in tabular form. Volume IV. is devoted to the very valuable **Bibliography** and **Index (pp. 1983—2302)** and an **Addendum** (pp. 2303—2372). These valuable contributions will be greatly appreciated by all workers in the field of chemotaxonomy, and the set is recommended to all interested in plant taxonomy.

PHYTOCHEMICAL METHODS, by J. B. Harbone. John Wiley & Sons (Halsted Press), 605 3rd Av., New York 10016. 1974. Pp. i + 278. $15.50 Subtitled, **A Guide to Modern Techniques of Plant Analysis,** this important new book has been writen as a "simple guide to modern methods of plant analysis for students in the plant sciences and which should also be of value to those interested in biochemistry, pharmacognosy, food science and 'natural products' organic chemistry." The seven chapters are devoted to methods of plant analysis; phenolic compounds; terpenoids; organic acids, lipids and related compounds; nitrogen compounds; sugars and their derivatives; and macromolucules. Highly recommended to those working in plant physiology, plant pathology, plant ecology, paleobotany, plant genetics, and plant systematics.

FUNDAMENTALS OF NUCLEAR SCIENCE, by P. N. Tiwari. John Wiley & Sons (Halsted Press), 605 3rd Av., New York. 10016. 1974. Pp. xi + 167. Illus. $7.95. Subtitled **With Applications in Agriculture and Biology,** this concise text will be welcomed. Part I. is devoted to basic nuclear science—the atom, nucleus, radioactivity, interaction of nuclear radiation with matter, nuclear radiation detection and measurement, and radiation protection. Part II is concerned with applications of nuclear science in agriculture and biology. Highly recommended to workers in agriculture and biology.

TRANSPORT OF NUTRIENTS IN PLANTS, by A. J. Peel. John Wiley & Sons (Halsted Press) 605 3rd Av., New York City 10016. 1974. Pp. (iv) + 258. Illus. $15.00. Dr. Peel presents a balanced, up-dated account of developments in the field of long distance transport physiology. The first four chapters are concerned with cellular pathways of transport, and the chemical solutes which are moved in the xylem and phloem. The following seven chapters deal with the nature of phloem transport and the ultrastructure of sieve elements, particularly the control of movement, solute-loading and unloading mechanisms, etc., and the movement of endogenous growth regulations and hormone directed transport. Highly recommended to advanced undergraduates and research workers in plant physiology, horticulture and agriculture.

STRUCTURE AND FUNCTION OF PLANT CELLS IN SALINE HABITATS, translated from the Russian by A. Mercado, edited by B. Gollek. John Wiley & Sons (Halsted Press) 605 3rd Av., New York City 10016. 1973. Pp. vi + 284. Illus. $30.00. The present work is concerned particularly with the changes in the function and structure of plant cells in saline habitats in the hope that this approach might help to clarify the mechanisms by which salt affects the plant and thus help to reveal the nature of salt tolerance. The chapters deal with salt tolerance in isolated tissues and cells, effect of NaCl and dextran on nitrogen and carbohydrate metabolism, plastidal and soluble pigments, metabolism of organic acids, conversion of sulfur, nucleic acid and protein metabolism, subcellular structures, intermediate products of nitrogen metabolism, and chemistry of necroses. Highly recommended to plant physiologists, agriculturists, horticulturists, particularly those concerned with growth of crops on saline soils.

THE PHYSICAL BIOLOGY OF PLANT CELL WALLS, by R. D. Preston. John Wiley & Sons (Halsted Press) 605 3rd Av., New York City 10016. 1974. Pp. xiv + 491. Illus. $35.00. The author presents a comprehensive and up-to-date account of the present day knowledge of the physical biology of plant cell walls. Beginning with an outline of the types of molecular bonding in an array of polysaccharides, proteins and lipids which form the cell wall, the author continues with accounts of the physical and chemical methods used in investigating cell wall structure; the detailed architecture of algal cell walls; a contrasting account of higher plant cell wall structure; physical properties of plant cell walls; the primary cell wall and the impact of its structure on cell and plant growth; and biosynthesis of cell wall materials. Highly recommended to plant scientists, biochemists, biophysicists, and those confronted with biological problems in the timber, paper and food industries.

QUATERNARY PLANT ECOLOGY, edited by H. J. B. Birks and R. G. West. John Wiley & Sons (Halsted Press) 605 3rd Av., New York City 10016. 1974. Pp. x + 326. Illus. $44.50. Based on papers presented in a symposium at the Brit. Ecological Society, Univ. of Cambridge, 1972, which are designed to discuss and assess various approaches in the field of quaternary plant ecology, particularly methodological problems; pollen dispersal and sedimentation; pollen representation; plant macrofossil assemblages; vegetational and community development; limnological history. A summary—an ecologists viewpoint—and author and subject indices complete the volume. Highly recommended to ecologists, geologists, archae-

ologists, and paleobotanists.

PLANTS AND ENVIRONMENT, 3rd Edition, by R. F. Daubenmire. John Wiley & Sons, 605 3rd Av., New York City 10016. 1974. Pp. vii + 422. Illus. Subtitled **A Textbook on Plant Autecology,** this 3rd edition of an outstanding text will be welcomed. Autecology is the study of the interrelations between the individual organism and its environment. The author first discusses the various factors—soil, water, temperature, light, atmospheric, biotic (other plants and animals), and fire—singly as they interact with the plant. Next he considers the **environmental complex—** the multiplicity of interacting factors and the complexity of plant requirements; and finally, the end result, **ecologic adaptation** which shapes the course of **biologic evolution.** Highly recommended to all biologists, particularly plant biologists, horticulturists and agriculturists.

PLANTS: A SCANNING ELECTRON MICROSCOPE SURVEY, by J. H. Troughton and F. B. Sampson. John Wiley & Sons, 605 3rd Av., New York City 10016. 1973. Pp. x + 158. Illus. The invention of the electron microscope has made it possible to view three-dimensional aspects of plant structure at high magnifications. This new tool has stimulated research in biology revealing heretofore unseen aspects of plant structure. The authors present a fascinating selection of scanning electron microscope photographic reproductions covering procaryotic and eucaryotic plants or plant parts in this new perspective. The 163 plates show the shape and surface details of bacteria, diatoms and vegetative and reproductive features in fungi, lichens, seaweeds, mosses, psilophytes, lycopods, horsetails, ferns and conifers. In the plates devoted to the flowering plants, pollen structure, cell types, stems, root and leaf structure, seed and fruit are revealed. A valuable bibliography and index complete the volume. This outstanding book is recommended as a stimulating supplement to introductory courses in biology from high schools, to colleges and universities. It should also prove attractive to art students and general readers. This excellent book cannot be too highly recommended.

PLANT PHYSIOLOGY, 5th edition, by Merion Thomas, S. L. Ransom & J. A. Richardson. Longmans, Inc., 72 5th Av., New York City 10011. 1973. Pp. xv + 1062. Illus. $23.50. This 5th edition of an outstanding text will be welcomed. It is designed for undergraduate students, covering plant physiology and metabolism. Part I is devoted to the cell as a whole; in Part II the enzymatic partial reactions of metabolism are considered; Part III deals with absorption, translocation and elimination of water solutes and gases; Part IV is concerned with nutrition and metabolism; and Part V is devoted to growth, growth substances, and the effects of light and temperature on plant development and movements. Appendices I through III give background information on the chemistry of plant products, some relevant physical chemistry and notes on chemical and physical techniques. Appendix IV provides a comprehensive bibliography, and indices of authors and subjects. Highly recommended.

SOIL CONDITIONS AND PLANT GROWTH, 10th Edition, by E. Walter Russell. Longmans, Inc., 72 5th Av., New York City 10011. 1974. Pp. xviii + 849. $23.50. This 10th edition of an outstanding text will be welcomed because it incorporates the new contributions in this field since 1961 necessitating the complete or extensive rewriting of nearly all of the chapters. A new chapter on water-logged soils, and the effect of soil conditions on the growth of padi rice has been added. Otherwise, the same topics are discussed as in the 9th edition. However, some of the material has been rearranged. This excellent text is very highly recommended to students and research workers in soil science, and plant physiology, and workers in the fields of agriculture and horticulture.

PLANT LIFE LIBRARY—continued on page v.

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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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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. $7.00 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. $7.00 postpaid.

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