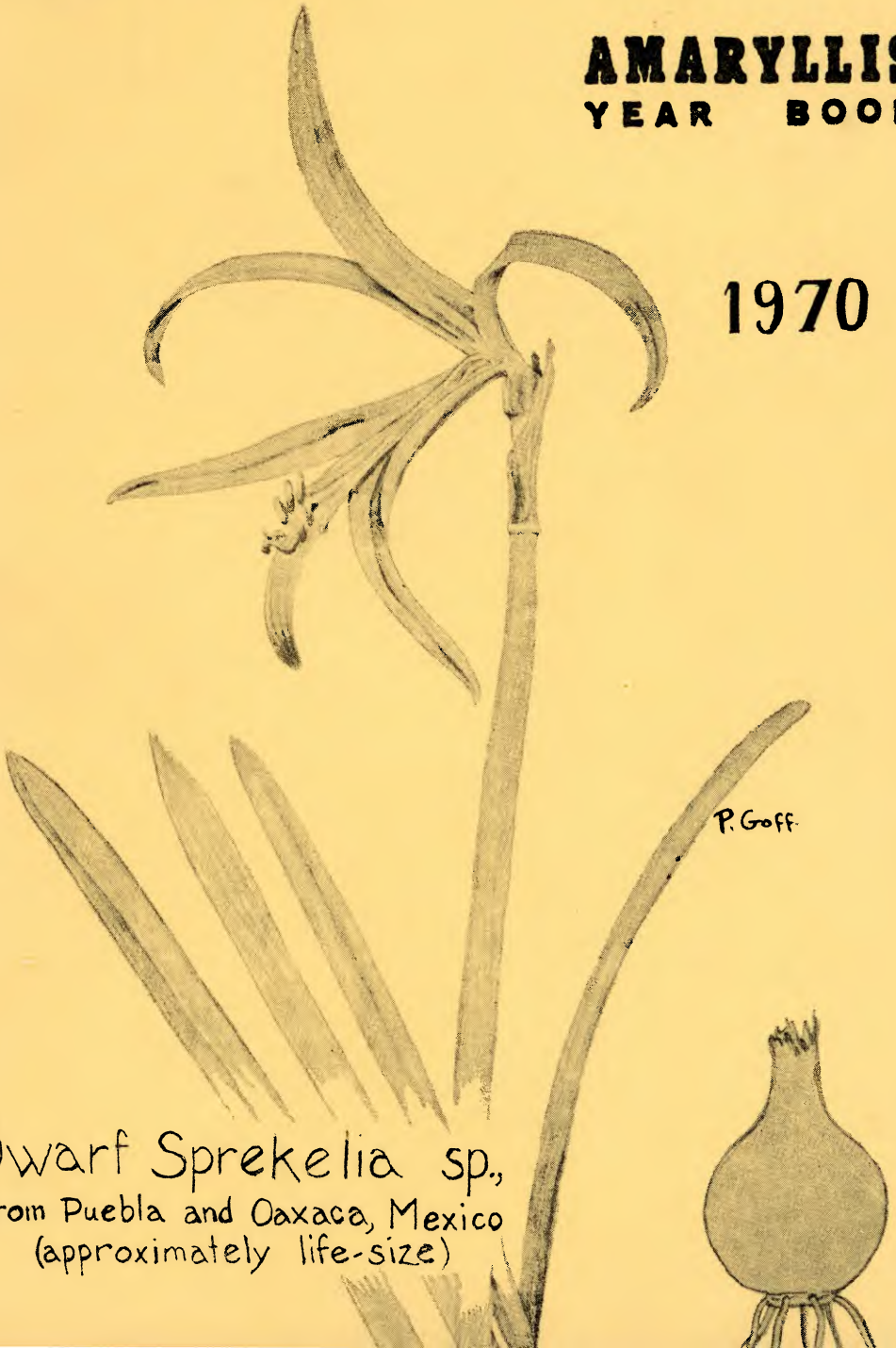
# PLANT LIFE

## AMARYLLIS YEAR BOOK

1970




Dwarf Sprekelia sp.,
from Puebla and Oaxaca, Mexico
(approximately life-size)

# 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.

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

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

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

# PLANT LIFE

## VOLUME 26

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

## 1970

EDITED BY
HAMILTON P. TRAUB
HAROLD N. MOLDENKE

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

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*Printed in the United States of America*

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# TABLE OF CONTENTS

The cover design by Prof. Penrith B. Goff is based on a drawing by Dr. Thad M. Howard of a dwarf *Sprekelia* species which he collected in Puebla and Oaxaca, Mexico.

**PLANT LIFE, VOLUME 26, NO. 1, 1970—AMARYLLIS YEAR BOOK**
**GENERAL AMARYLLID EDITION**

4. CULTURE




**PLANT LIFE, VOLUME 26, NOS. 2—4, INCL., 1970**
**GENERAL EDITION**




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## ILLUSTRATIONS




**ILLUSTRATIONS**—continued on inside back cover.

PLANT LIFE, VOL. 26, NO. 1, January, 1970

# AMARYLLIS
# YEAR BOOK
# 1970

Year Book of
The American Amaryllis Society
37th Issue

DEDICATED TO
THADDEUS MONROE HOWARD, JR.

GENERAL AMARYLLID EDITION

EDITED BY
HAMILTON P. TRAUB
HAROLD N. MOLDENKE

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

# THE AMERICAN PLANT LIFE SOCIETY

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

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[THE AMERICAN AMARYLLIS SOCIETY—continued on page 191.]

# PREFACE

We are indebted to Prof. Penrith B. Goff of Wayne State University, Detroit, Michigan, for the cover design which is based on a drawing made by Thad M. Howard of a dwarf *Sprekelia* species which he collected in the Mexican States of Puebla and Oaxaca.

This 37th issue of the AMARYLLIS YEAR BOOK is dedicated to Dr. Thaddeus Monroe Howard, Jr. (known to the members as Dr. Thad M. Howard), who received the WILLIAM HERBERT MEDAL for 1970 in recognition of his outstanding contributions to the advancement of the amaryllids. Our knowledge of the Alliums of Mexico had languished for more than a century and a half. All Alliums collected in Mexico had been thrown together under two species names—*Allium glandulosom* and *A. scaposum*. And this condition might have continued for another century and a half, or even longer, but for the determined industry of Dr. Howard in collecting all of the Mexican and Guatemalan Alliums that he encountered on his collecting trips since 1953. On the basis of the Alliums that he collected it was possible to clear up to a considerable extent the problems connected with the Alliums of Mexico and Guatemala when these living plants were placed in the hands of your editor beginning in 1967 (see Plant Life *23*: 88-95.; 110. 1967; *24*: 127-163. 1968). This points up the need for the intelligent plant collector in our day, and Dr. Howard has undoubtedly earned the recognition that goes with the 1970 Herbert Medal Award. But this is not all. He has also been active in collecting numerous species in the genera *Zephyranthes, Habranthus, Sprekelia, Hymenocallis;* and members of the genera of the tribe *Milleae*. This again represents a sufficient contribution for the Medal Award. Thus, the honor is doubly deserved.

In this issue, Dr. Howard begins in part an article on his plant collecting activities. J. L. Doran writes about his plant collecting trips to South America since 1964, and Dr. Ruppel contributes notes on his 1969 collecting journeys in Argentina.

Mr. Williams writes about the aquatic *Amaryllis* collected by Dr. Ruppel, Harry Blossfeld describes in detail two Brasilian *Amaryllis* species and Prof. Ravenna contributes a valuable article on *Amaryllis, Rhodophiala* and *Habranthus* species.

Mr. Fesmire writes on the breeding of a miniature *Amaryllis;* and Messrs. Buchmann and Mertzweiller continue their reports on *Amaryllis* breeding.

U. C. Pradhan reports on an apparent cross of *Sprekelia* and *Amaryllis,* and Henry van Woesik writes on induced mutations with reference to *Amaryllis* breeding. L. S. Hannibal discusses Crinums.

Albert P. Lorz reports on outdoor production of Amaryllis seedlings, and W. J. Perrin details the *Amaryllis* cycle. Mr. Manning writes about the induction of polyploidy in *Amaryllis*. Prof. Adee discusses *Amaryllis* culture, and the first year hobby greenhouse. Hugh L. Bush writes about his experiences with amaryllids, and Dr. Ruppel reports

on the propagation of *Hymenocallis*. Alek Korsakoff writes on *Eurycles amboinensis*, and Mr. Buck on Daylilies. Mrs. Tebben reports on the Florida Amaryllid season, and Mr. Goedert on the 1969 *Amaryllis* Season. Dr. Artjushenko contributes a monographic treatment of the genus *Ungernia*.

Mrs. Pickard writes on the guide lines for official Amaryllis shows. There are reports on the 1969 Amaryllis shows, and other contributions as shown by the table of contents.

Contributors to the 1971 issue of the AMARYLLIS YEAR BOOK are requested to send in their articles by August 1, 1970, 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, 1969*
*2678 Prestwick Court,*
*La Jolla, California 92037*

*Hamilton P. Traub*
*Harold N. Moldenke*

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**PLANT LIFE LIBRARY**—continued from page 190.

I do not mean to suggest that Dr. Gottleib's text is tailored for a spoon fed audience; quite the contrary, the motivated student has every opportunity to exert his intellectual prowess. Mastery of botanical principles is not easy to come by without serious study and "Plants" should do much to stimulate such study. At the college level this book should find favor as supplemental or assigned reading for beginning courses in plant science. It could probably be used as the main text for certain segments of beginning courses in biology.

The diagrams are good, but the photographs of plants, and plant parts are not sharply reproduced by the offset printing process. Frequently, the reproduction of the photographs is not sufficiently clear to depict the author's intentions. There is a Bibliography of 25 titles, mostly general works. A useful index of four pages terminates the book. For anyone wishing to improve his knowledge of the plant kingdom this small, compact book can be highly recommended.—**Thomas W. Whitaker**

THE EVOLUTION AND CLASSIFICATION OF FLOWERING PLANTS, by Arthur Cronquist. Houghton Mifflin Company, Boston. 1968. 396 pp. $6.95. This book is clear proof if any is needed that Dr. Arthur Cronquist, of the New York Botanical Garden, is a prodigious and prolific investigator, with a sharp and effective pen. Cronquist has a gift for the apt, pointed phrase and earthy expression. As author-scholar, he has not only mastered information from the traditional disciplines that support taxonomy such as paleobotany, morphology, histology, and anatomy, but he has screened and used significant data from genetics, cytology, biochemistry, statistics and serology. It is too early to assess the impact of this book on plant taxonomy, but this reviewer predicts it will be considerable. This does not mean that "The Evolution and Classification of Flowering Plants" is the gospel for plant classification and evolution, but surely Cronquist has provided a framework for a modern, and a much needed revision of the classification of flowering plants.

The book must be judged primarily upon the author's treatment of the first three chapters where he discusses Taxonomic Principles (Chapter 1); The Origin of the Angiosperms (Chapter 2); and The Evolution of Characters (Chapter 3). These three chapters provide Cronquist with an opportunity to present the factual and expound the philosophic basis for his classification. The remaining two chapters are essentially lists with the evidence for the arrangement of the various taxa within the system (Chapter 4, The Subclasses, Orders, and Families of Dicotyledons; and Chapter 5, The Subclasses, Orders, and Families of Monocotyledons).

Cronquist is not timid about expressing his personal opinions, and he plunges into a number of controversial thickets with abandon. In fairness, however, his position on most matters remains flexible, as he admits his judgment might be biased, or new evidence could overturn his present viewpoint.

This reviewer has neither the expertise nor the space to discuss the many features of this book, but one comment is in order. It is clear that Cronquist takes a dim view of selection as a motivating force in the evolution of the higher taxa of flowering plants. He cites many instances where it is difficult to demonstrate that one character has selective advantage over another. As Cronquist points out strict selectionists would argue that the advantage is there, but is obscured or difficult to uncover or interpret.

The book concludes with a "List of Classes, Subclasses, Orders, and Families of Magnoliophyta"; a useful Glossary of about eight pages; and an Index.—**Thomas W. Whitaker**

ANYONE CAN HAVE A GREEN THUMB, by Alice de Wolf Pardee. Hearthside Press, 381 Park Av. So., New York, N. Y. 10016. 1968. Pp. 126. Illus. $4.95. The author presents a ten-point gardening program, and proceeds to elaborate on these, including discussion of garden design; knowledge about plants; tools; maintenance; insect control; rocky, shady and seaside gardens; growing plants indoors; and favorite plants. Recommended to all beginning gardeners.

FLORAL ART FOR RELIGIOUS EVENTS, by Leon J. Tolle, Jr. Hearthside Press, 381 Park Av. So., New York, N.Y. 10016. 1969. Pp. 192. Illus. $8.95. This guide to religious floral customs is in addition a cyclopedia of the art, architecture, holy-day observances, liturgies, symbols and traditions of the major faiths practiced in America. The subject matter is grouped in two parts: (1) The religious background—setting, custom, calendar and ritual; and (2) the florist's workbook. Very highly recommended.

NEW STRUCTURES IN FLOWER ARRANGEMENT, by Frances Bode. Hearthside Press, 381 Park Av. So., New York, N. Y. 10016. 1968. Pp. 128. Illus. $5.95. This profusely illustrated up-to-date book on flower arrangement will be welcomed by the student of modern design in this field, the flower show exhibitor or judge, home decorator or hobbyist. The subject matter includes (1) assemblages, collages, constructions, combines, mobiles, stabiles, stambiles, and maxim-art, and (2) New look in plant materials; new ways with dried materials; shells, driftwood, etc.; mixing crafts; background in a new focus; and the newest developments. This book is indispensable to all interested in the newest developments in flower arranging.

DO'S AND DON'TS OF HOME LANDSCAPE DESIGN, by Robert J. Stoffel. Hearthside Press, 381 Park Av. So., New York, N. Y. 10016. 1968. Pp. 192. Illus. $6.95. This non-technical guide to landscape design for the beginner includes chapters on planning for beauty and use; the house approach; the family living area; special gardens; service and utility areas; lawns and ground covers; maintenance; garden design; lighting the landscape, and plants for the landscape. Highly recommended to all interested in landscape design.

**PLANT LIFE LIBRARY**—continued on page 35.

HERBERT MEDALIST—THADDEUS MONROE HOWARD, JR.,
JULY 1969

# THADDEUS MONROE HOWARD, JR.

## An Autobiography

A person's life is often shaped by the tiny twists and turns of fate and by the influences of those surrounding him. Certainly much of my life has been the result of such tiny unexpected twists and turns, and has indeed been influenced by other people. I have often wondered what it might have been like, under another set of circumstances, and with another set of acquaintances. To think that I can reflect on such seemingly unimportant incidents as drawing a picture of a bird in a Vacation-Bible school class, finding a *Canna* root in a vacant lot, tossed over someone's back fence, etc. as spurring my interest in zoology and botany never ceases to amaze me.

### CHILDHOOD AND YOUTH, 1929-1947

The year 1929 was the year of the Crash, and investors reacted by jumping out of windows of tall buildings. That same year I also "crashed" into the scene, but my parents, Thaddeus Monroe, Sr., and Lolita Guerrero Howard, had no tall buildings from which to jump as the result of their little "investment". I was too late for Christmas, and too early for New Year's eve, being born December 28, 1929 in San Antonio, Texas. I got to celebrate many a yuletide season in the years that followed, but birthday presents seem out of place three days after Christmas.

At the age of six, I was given the task of tracing a bird from a bird book in vacation Bible school, and thus my first real interest in ornithology was born. My interest in bird-life expanded to mammalian life as well, and as a growing child I had many wild mammal and bird pets. This was ultimately to help me choose Veterinary Medicine as a profession. My interest in plants came about quite unexpectedly, when I found some discarded *Canna* roots while playing with companions in a vacant lot. These, along with some *Iris* rhizomes were retrieved from the discards in the heap and proudly taken home to be planted as "bulbs". The Iris did not make too much of an impression, but the cannas did. This was a tall purple-bronze leafed species with small orange-red flowers and thick purplish-red rhizomes. I still have a souvenir of this original plant, now some 28 years later. Thus I began formally "collecting" my first "bulbs", even before I began gardening (by a few minutes) at the age of twelve. My interest remained linked to only those things that were lily-like and bulbous rooted. I managed to beg my parents for enough money to buy my first book on bulbous plants, "Garden Bulbs in Color", MacFarland, which became my "Bible" for awhile, until I sent off for catalogs advertised in garden magazines. My interest received its first important stimulus with the

arrival of a catalog from Oakhurst Gardens which listed "out-of-the-ordinary bulbs" uniquely described and well illustrated by its proprietor, James N. Giridlian. Another little "classic" from Cecil Houdyshel, and one from Carl Purdy, helped round out my list of informative bulb catalogs. I was deeply impressed with these three men, each of whom helped to contribute much to the bulb-gardening world. It struck me that Mr. Purdy had become famous by popularizing the native wild flowers of the Pacific coastal states, and that his name was synonymous with bulbs such as *Calochortus, Brodiaea, Fritillaria, Camassia, Erythronium,* and the like. My Texas pride was piqued. Surely we must have many species of bulbous plants within the borders of the Lone Star State that are equally worthy of gardens as those on the West Coast. I toyed with the idea of collecting and popularizing our own native Texas species, so that perhaps I might someday be a sort of poor-man's "Carl Purdy" of Texas. At age 16 this did not seem at all vainglorious, so I determined that I would do this. I had already begun collecting a few of the local natives, such as *Habranthus texanus, Nothoscordum bivalve, Allium drummondii, Cooperia drummondii,* and *C. pedunculata* and *Nemastylis geminiflora.*

In high school, I had joined the Brackenridge High Garden Club, a small and rather dreary little club, that to me had little purpose for being, and few members. I found that it was difficult to find many students who would be interested in joining any club known only as THE "Garden Club". No teen age appeal. Why not, I suggested, change its name to something that really "swings", such as "The Campus Dirt Dobbers"? The members and sponsor enthusiastically voted to change the name unanimously, and thus the C.D.D.'s were born. The transformation was amazing. We began raising money with school plant sales, and the rest of the large student body (nearly 2000) became aware of us. Our membership doubled and redoubled. No longer did we bear the stigma of being a bunch of "weirdos". And to really bridge the gap, while other social clubs were honoring our football athletes, we decided to do the same with the Basket-ball heroes, and gave a dance in their honor. That tied the "C.D.D.'s" to the athletes, and we were a social success for the first time. We made enough money from the dance and the plant sales to make a large daffodil bed on the campus, and for the planting of some trees as well.

## COLLEGE AND UNIVERSITY, 1947-1953

When I went away to college, I found that this enabled me to see more of the bulbs of Texas, and I was able to add several species new-to-me to my cultivated natives. In the Dallas-Fort Worth area I collected *Camassia scilloides, Androstephium caeruleum, Zygadenus nutallii, Allium hyacinthoides,* and *Allium acetabulum.* While at North Texas Agricultural College, I pursued my Pre-Vet curriculum, which included courses in General Botany and Plant Taxonomy. My own private interests in taxonomy made that course much easier for me than it was for the other struggling students.

After spending two years at N.T.A.C. at Arlington, Texas, I submitted my application for entrance to the School of Veterinary Medicine at Texas A. & M. College, and was accepted, entering in the autumn of 1949, at the age of nineteen. I found the area around the campus in Brazos County rich in bulb life. Here grew the most beautiful forms of *Habranthus texanus* that I had seen, and also the most colorful and robust forms of *Allium drummondii*. By this time, I had discovered the AMERICAN PLANT LIFE SOCIETY and HERBERTIA. I had also discovered Wyndham Hayward and his Lakemont Gardens at Winter Park, Florida, as an important source of *Zephyranthes,* and their kin. Mr. Hayward's list of miniature amaryllids, Crinums, and other bulbs fascinated me and I became a customer and soon a correspondent as well. I began concentrating on collecting *Zephyranthes* and Crinums, in a serious way, and began to consider breeding a few of these plants, and discussed the possibilities with Mr. Hayward in our letters. He then revealed to me the existence of the "Cooperanthes", hybrids of S. Percy-Lancaster in India, and suggested that I write Mr. Lancaster and try breeding similar hybrids. I did so, but the plants that Mr. Lancaster shipped to me never arrived—apparently lost in transit. I then decided to create my own hybrids from scratch, and the mating of *Z. citrina* with *Z. rosea* seemed to be a "natural" and I began with these two. I had hoped for an intermediate shade between these yellow and pink species, but I got only rose-pink hybrids, one of which I dubbed "Ruth Page", in honor of a teacher who had taught mathematics while I attended junior high school. In the meantime, I began corresponding with Victor L. Cory, who was then field botanist at Southern Methodist University, and Mr. Cory was very helpful in identifying my bulbous material, and in giving me whatever information that I needed. His informative letters proved to be a goldmine of information. Through Mr. Cory I was able to contact Fred B. Jones, of Corpus Christi, Texas, and find the discoverer of *Cooperia Jonesii.* At about this same time, I also received an introductory letter from Mrs. Morris Clint of Brownsville, Texas. She too was very much interested in *Zephyranthes* and their allies, and we began corresponding and exchanging bulb material. Suddenly I had hit a bonanza and was knee-high deep in the various amaryllids. Len Woelfle of Cincinnati, Ohio, wrote to me, having received my name from Mr. Hayward. Mr. Woelfle was an avid enthusiast of the *Hymenocallis* group, and he greatly helped spur my interest in them. My circle was beginning to expand, and I suddenly found myself becoming a member of the "in" group of enthusiasts, as I corresponded with all sorts of enthusiasts in the amaryllid bulb-world. It reached its peak in August of 1952, when I visited my Dad in Van Nuys, California. I then had a chance to visit Oakhurst Gardens and finally meet James Giridlian in person! It was a fateful meeting. Mr. Giridlian was an affable host, and immediately perceived that I seemed to know his plants unusually well, and he so remarked. "I OUGHT to", I said. "I've studied your cata-

logs for years and practically know them by heart''. We hit it off well, and before I left, he made me promise that I would collect native Texas bulbs for him and that he would pay me for them. Upon returning to college in the fall of 1952, I suddenly found myself in business collecting bulbs for Mr. Giridlian, and shortly thereafter for Rex Pearce, and even a few for Mr. Hayward. It was welcome income for a college student on only a limited allowance from home. I only regret that I had not started a few years earlier. Throughout the following years, Mr. Giridlian was to be my most loyal regular customer. Through him I was not only to introduce many Texas natives, but later on many of my own hybrids, and Mexican species as well. We were to be come fast friends and later travel together on a collecting expedition into Mexico and Guatemala. My friendship with Fred Jones and Mr. and Mrs. Clint was to continue growing too, along with that of Len Woelfle. During this same period, I was to correspond with Mrs. Grace Primo, of Mobile, Alabama, a charming and enthusiastic person who was known for her love of Crinums and other amaryllids, and Dr. C. W. Hall of Austin, Texas, also another *Crinum* fancier. Through Len Woelfle I was to expand the circle by contacts with Joe Werling of Los Angeles, and Les Hannibal of Fair Oaks, California. Another Californian, Dr. Leo Brewer, was to become one of my most constant correspondents, until his untimely death a few years ago. The circle grew ever larger.

## PROFESSIONAL CAREER, SINCE 1953

I graduated from College in June of 1953. The Korean war was over, but I went into the service about a month after graduation as a Lieutenant in the Veterinary Corps. My first assignment was the Meat and Dairy Hygiene School in Chicago where I was to receive training as a food inspector. During the few weeks between graduation and my commission, I managed to make a quick trip to Mexico City and back with a friend, and make a few collections of *Zephyranthes* along the way. The events of this trip were published in the 1954 edition of HERBERTIA. During this trip, I had found what turned out to be my first undescribed *Zephyranthes,* and perhaps a second undescribed species as well, along with *Z. verecunda* and *Cooperia drummondii.* Midway between Valles and Tamazunchale I spotted a large colony of light yellow *Zephyranthes* in flower, my #53-1, and this was to begin a long succession of Mexican species, new and rare, in the years to follow.

While stationed in Chicago, I visited Len Woelfle at Cincinnati, Ohio, one week-end, and we became fast friends. I also visited Raymond B. Freeman in suburban Western Springs, just outside Chicago and we talked Alliums. I was then sent to Fort Benning, Georgia, and this gave me opportunity to meet with Wyndham Hayward and Mulford B. Foster. (see Visits With Plant Enthusiasts, parts 1 and 2, HERBERTIA, 1955 and 1957) The collector instinct in my blood did not fail me during this period, and I was able to collect a late summer flowering *Allium* for James Giridlian, while at Chicago, and *Z. atamasco* from Georgia the following spring. By the summer of 1954 I was back in

Texas, at Fort Hood, and I spent a two week's vacation in Mexico that August. More plants collected . . . *Zephyranthes, Hymenocallis, Bessera, Milla, Tigridia, Nemastylis.* The following summer (1955) I found a new large yellow-flowered *Zephyranthes* at Mamulique Pass, about 40 miles north of Monterrey, Mexico. This was ultimately to bear my name as *Zephyranthes Howardii* Traub, and I was to formally receive credit as the discoverer of a newly described species at last! In 1956 I was to flower my first hybrid *Crinum* seedling, a gorgeous rose-red thing that was distinctively different from any other hybrid in this color range. By using my *Zephyranthes* hybrid 'Ruth Page' as a seed parent, I suddenly was getting a variety of unusual and beautifully colored *Zephyranthes* hybrids in a broad color range. I had finally made my break-through. I began concentrating on hybridizing more and more. Mr. and Mrs. Clint were busily collecting in Mexico. Fred Jones went with them once. They were finding new species right and left. I was starting into private practice as a small animal practitioner and had little time (or finances) for any trips into Mexico and I had to stay home and mind the store. But my hybrids kept me busy, and I found them to be profitable, as Mr. Giridlian continued introducing them, as did Robert D. Goedert. In 1962 I began once more to collect in Mexico, and suddenly I had the field to myself. The Clints had greatly curtailed their activities as Mr. Clint's health began to fail. By then Mrs. Clint and Fred Jones had both become HERBERT MEDALISTS.

My circle of bulb-enthuasists had broken. Mrs. Primo had died. Dr. Leo Brewer had died. Cecil Houdyshel had died. Wyndham Hayward had retired, and so had Rex Pearce. Then in 1964, I was to learn that my good friend, Len Woelfle had died of a heart attack. Suddenly I realized that I was alone in many ways. Len was the heart of my interest in *Hymenocallis.* His death came just as I was beginning to discover a wealth of new *Hymenocallis* species in Western Mexico. How thrilled he would have been if he could only have lived a few more years or so in order to see the new explosion of species in this genus. He loved to hybridize them and he was on the threshold of an entirely new deck of cards to play with.

Meantime my collections had turned up many new Irids within *Tigridia* and allied genera. I was to soon correspond with Elwood Molseed, a graduate student at Berkeley, intensely interested in these little known Irids. Our correspondence was to last but a few brief years, as Mr. Molseed's life was to end prematurely, a victim of cancer. His work is soon to be published.

Then in 1966 I was honored by having Jimmy Giridlian accompany me on a field trip to Mexico and Guatemala. It was an eventful trip, and we found several new species, including a new *Allium* in Guatemala. He thoroughly enjoyed himself and little did either of us know that he would never again make another such trip. He died quite suddenly and unexpectedly in the spring of 1969, and another friend of the bulb-

world has been taken from us. Claude Davis is gone now, as is Morris Clint. In 1967 Les Hannibal honored me with his company on another Mexican field trip.

I consider myself fortunate in having known and mingled amongst such an illustrious crew in this "passing parade". Each one has contributed something to me personally, and to enthusiasts of amaryllids and other bulbs as well. . . . Grace Primo, Victor L. Cory, Charlotte Hoak, Cecil Houdyshel, James Giridlian, Claude Davis, Morris Clint, Len Woelfle, Leo Brewer, Elwood Molseed. If I have overlooked any other late friends, it is unintentional. Each played an important part to a greater or lesser extent, in keeping my interest high.

I managed to do a good bit of traveling the past decade and a half, and have met with many interesting people, not the least of whom is our own editor of the APLS, Dr. Hamilton P. Traub. Dr. Traub is naturally keenly interested in all of the new amaryllid material that I bring back on my trips. The sudden unexpected windfall of Mexican and Central American *Allium* species caught him quite unawares, and resulted in his overhauling in the very short space of time since 1967 the genus as it is found in Mexico and Central America. I have taken a lot of kidding about my interest in the Onion Family from non-gardening friends over the years, but the irony of it all is that it is these same onions that led me to the place that I stand today, as the recipient of the HERBERT MEDAL! So you see, it pays to know your onions, if I may be allowed the luxury of a quip. Somehow I had always thought that if it ever really should happen, it would be because of my interest in the *Zephyranthes*, both as a hybridist and as a collector of new species. It is fitting that my love for the humble onion be my reward. Perhaps ultimately my discoveries may be equally divided among not only *Allium,* but *Milla, Hymenocallis,* and *Zephyranthes.* It will take several more years before the final score is tallied. Meanwhile it remains ironic that my very first new discovery is as yet still undescribed! It may well be one of the very last to be named, if at all.

In conclusion, I might add that I had an early start, indeed far earlier than most, and I had expert advice and help along the way. Any young aspirant can do the same, if he really wants to do so. A little tenacity helps, particularly in this field of endeavor, unless one (unlike myself) is blessed with an unusually brilliant ability.

Some readers are aware that I have been a part-time hobbyist, and part time bulb-nursery-man on the side, although as a nurseryman, I have been a poor businessman, not being able to always devote enough time to the business end of the hobby, or for that matter, the hobby itself. Unfortunately, we are running out of bulb sources. The old specialists are dying out and there are none to replace them. The bulb gardeners of the world are poorer for it.

Last but not least, I should like to thank the students who have assisted me on my trips over the years, even though I often drove them at a wicked pace up and down the mountain sides. They climbed trees

for me, scaled cliffs with me, waded streams, and into mucky swamps for plants they did not know the names of. They dug until their hands blistered, often got caught in sudden downpours, and occasionally suffered the effects of the "Revenge of Montezuma". These former students and former employees were Chris Abee, Charles Curtis, Reggie Jackson, and Dale Redding. Their reward was adventure and unforgettable memories of a Mexico that few tourists ever see. Thank you gentlemen. Thank you ALL.

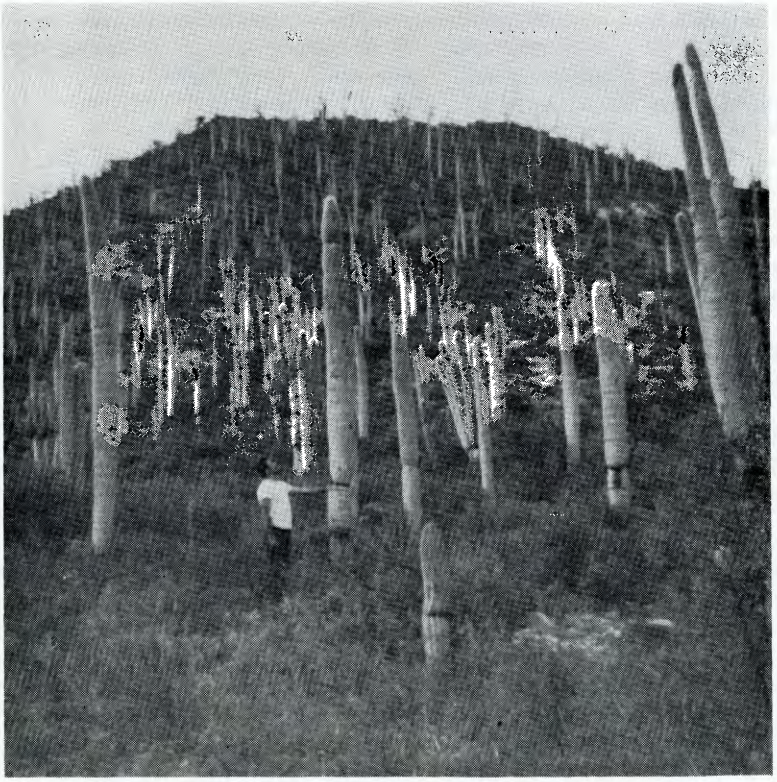

Fig. 2. Dr. Thad M. Howard among giant columnar cacti, *Cephalocereus hoppenstedtii,* south of Tehuacan, Puebla; elevation in excess of 5,000 ft. *Sprekelia formosissima* are sometimes found beneath these cacti; several new *Milla* species (62-44, and 68-252) were found in this area. Photo by Reggie Jackson, July 11, 1968.

# SOME BULBOUS AND CORMOUS PLANTS OF MEXICO AND GUATEMALA

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Many readers of the AMERICAN PLANT LIFE SOCIETY over the past seventeen years may possibly be aware of the many plant explorations made in Mexico and adjacent Guatemala by the writer, beginning in 1953, and continuing until the present time. The writer began collecting bulbs as a sideline while vacationing as a typical tourist. The first probe was in 1953, and a second trip was made a year later, during the month of August. The first trip was only to Mexico City, but the second trip also included Oaxaca, roughly 300 miles southeastward. Both trips resulted in excellent garden material and included many new species unfamiliar to me, a few of which were later to prove new to science as well. In 1955 the writer went no deeper into Mexico than Monterrey, in Nuevo Leon, but even then an important new yellow-flowering *Zephyranthes* (*Z. howardii* Traub) was accidentally discovered in flower, in what seemed to be an unlikely place. In 1957 a deeper probe into Mexico (still only as a tourist) took me into the state of Guerrero, while visiting Acapulco. This too yielded some more interesting discoveries, and helped add a bit more information for me about some of the varied bulbous and cormous plants to be found south and west of Mexico City. Then came a drought as far as my tourist vacations were concerned, and my trips were to take me no further than Monterrey for the next several years. In 1962 I began once more making annual probes deeply into Mexico, as genuine field trips, with the purpose of collecting plants as my main objective; and I became only incidentally a vacationing tourist. Thus began a new chapter in my explorations, and with it came a more serious and adventurous approach. I began keeping better records of the plants collected, and also began collecting each species in larger numbers, where once a mere handful of a dozen or less of each might have sufficed. I now always had a companion to assist me in the task of digging, counting, cleaning, labeling, and recording the bulbs collected. As my collections grew in number, my interests grew as well and I began collecting not only bulbs, but cacti and bromeliads as well. Eventually I was to add orchids, begonias, aroids, and ferns to my list . . . even carnivorous plants! In time a pattern began to formulate about the distribution of the various plants and I began to have a better intuition in "predicting" where a new species might turn up. But as always, there were the inevitable surprises, proving once again that there are exceptions to every rule. I will now attempt to summarize information that I have gained about the various genera and species that I have encountered among the Amaryllis Family as well as other bulbous plants found south of the Rio Grande River.

## I. THE GENUS SPREKELIA

Until recently *Sprekelia formosissima* was the only species of this genus known from Mexico, and was considered to be a monotypic genus having many varying forms by many authorities. I first began collecting sprekelias with the idea of adding as many variations as I could to my collection with the idea of using them for hybridizing. As my collection grew, it became apparent that not all could be considered so loosely as mere "variants". One in particular, a glaucous leaved individual, with pinkish-red flowers, seemed somehow to be a breed apart. Unfortunately, this species, which I referred to as *"S. glauca"* came from a source where it was cultivated in the city of Guanajuato, and I had no idea exactly where its native habitat might be. In 1967 we found sprekelias with similar glaucous leaves in the state of Michoacan growing at intermediate levels under fairly dry conditions (for *Sprekelia*). Incidentally, the writer has heard so many interested parties mispronounce the name "Michoacan", that I should like to take this opportunity to suggest that the proper phonetic effort should sound more like "Meech-wah-KAHN" than some of the clumsy efforts I have witnessed. Another seemingly difficult word is Oaxaca. This is really not difficult if one simply ignores the "x" and pronounces it as an "h". Then following the rule in Spanish, each and every vowel is pronounced separately (unlike English, where some letters are silent) and the "o" and "a" come out "O-ah", or more simply "wah", since "O-ah", when said rapidly is "wah", and thus we get "Wah-HOCK-a" phonetically. Simple, isn't it? But back to *sprekelias.*

The glaucous leaved *sprekelias* seem to have certain characteristics suggestive of *Habranthus.* Indeed, Dr. Traub caused a lot of raised eyebrows years ago when he had the audacity to declare that *Sprekelia* was NOT a closely related ally to the genus *Amaryllis,* but they were in fact much more closely akin to *Zephyranthes* and *Habranthus!* Later evidence supported this theory when the writer first successfully hybridized *sprekelia* with a hybrid *Zephyranthes.* The seedlings showed obvious heterosis (hybrid vigor) quite unlike typical *Zephyranthes.* Unfortunately they were lost the following winter during an unusually cold spell. In the 1969 edition of PLANT LIFE a successful hybridization between *sprekelia* and *Habranthus* is illustrated, and we now have *sprekanthus* added to our cultivated ornamentals. Indeed, the writer collected what was thought to be a small *"Habranthus"* in the southern limits of the state of Puebla, and later in the adjacent northern limits of the state of Oaxaca. Eventually my "Habranthus" flowered, and as the scape developed I was surprised to notice that the bud emerging from the spathe was deep red, and unusually long and slender. You can imagine my shock when this strange miniature "Habranthus" opened to reveal itself as a new *sprekelia* species! Unlike the common forms of *S. formosissima,* this tiny mite had bulbs no larger than a *Zephyranthes,* with relatively narrow silvery green foliage, distinctly keeled. The flower was less than 10″ tall with spidery red segments

no wider than those of a typical *Hymenocallis.* The effect was that of a slender red "spider". No question about it, this was a new and most distinctive species, and not merely another "form" of *S. formosissima.* A few years later I was to find this miniature *sprekelia* growing in a mixed colony with the larger *S. formosissima.* No evidence of intermediates through hybridization could be found, and the evidence suggests that it is not genetically likely. The miniature species is easily separated from the larger species, in both leaf and flower. Since then, I have collected additional *sprekelias* similar to this miniature species in the states of Guerrero and Colima, and they seem to be fairly well distributed along the mountain chain along the Pacific (western) side of Southern Mexico. They are found at somewhat lower elevations than the typical species, and in somewhat dryer country, on rocky hillsides, beneath giant cacti and thorny shrubbery. This *Sprekelia* was first collected by me in 1962, as a *"Zephyranthes",* not in flower, at Kilometer 341, about 5 miles north of Huajuapan de Leon, in northern Oaxaca as #62-21. The following year I collected it a bit further north near the Puebla-Oaxaca state lines in southern Puebla (Kilometer 302), just north of Petlalcingo, Puebla, and this one is catalogued #63-34. The same species was collected again at K 312, northern Oaxaca shortly afterwards. In 1964 it was recollected in this same general area, south of Acatlan, in southern Puebla, at K 304, as always along the roadsides of Mexico 190, and as always (at this time of the summer) in leaf. In 1965, I collected a similar *Sprekelia* in leaf and in fruit, in the state of Colima, and this was catalogued as #65-47. It grew in company with an unusual large-flowered yellow *Nemastylis, N. molseediana* sp. nov. (syn. *N. mcvaughii*) at K-240, on Mexico #110. As was the case with the miniatures from the Puebla-Oaxaca state lines, this *Sprekelia* was no larger than a *Zephyranthes* in leaf and fruit, though the seed capsule was a bit larger than that of most typical Mexican *Zephyranthes.*

The finding of this *Sprekelia* extended the known range of this species considerably northwestward up the coast. In the summer of 1966, this same *Sprekelia* was found again in a new locale, in the state of Guerrero, on an unpaved road below Iguala, just off Mexico 95, and catalogued as 66-64. Now its range was known to include not only the borders of Puebla and Oaxaca, but similar ecological environments in the states of Guerrero and Colima. In general, it might be said that this miniature species is found inland on the western (Pacific) chain of mountains in Southwestern Mexico at lower, intermediate altitudes, around 3000 feet, in dryer wooded areas where thorny shrubs and giant columnar cacti (such as *Neobubaumia tetetzo*) are found. Sometimes, it may be found growing alongside *S. formosissima,* but apparently they do not hybridize, and they are easily distinguished from one another in their vegetative characteristics. One might wonder how this miniature species has been so long overlooked by botanists since it is not all that uncommon within its range. The explanation is simple. The plant is so tiny that when not in flower, it might easily be mistaken for a Rain-Lily (*Zephyranthes, Cooperia,* or *Habranthus*). The flowering season is limited to the

earliest summer rains, with but a single flower being produced and the flower lasting only one or two days at most. The flower is small and spidery and is a muddy light red that might easily be overlooked. I find it chary of flowering, and likely only the largest bulbs will flower, and these are slow to reach maturity. Unlike many of the commoner garden *sprekelias,* this one does not grow vigorously. As cultivated Sprekelias go this one is relatively unexciting. But as a miniature member of the genus, it is indeed an exciting plant when grown in company with other *Amaryllid* miniatures, (such as *Zephyranthes* and *Habranthus*) with its spidery red flowers contrasting nicely and adding the variety and interest of the orchid-like form characteristic of the members of this genus. This wee *Sprekelia* was found again in the state of Colima in 1967 (#67-52) at kilometer 241 on Mexico 15, in limestone.

I do not know exactly what the northern limits of *S. formosissima* are, but it is to be found on both the western (Pacific) chain of Sierra Madre (Sierra Madre Occidental) and the eastern chain, Sierra Madre Oriental, beginning in the State of Chihuahua on the western range and the States of San Luis Potosi and Hidalgo on its eastern range. These forms are strictly alpine plants, and one does not look for them until the elevation exceeds 6000 feet, and they more normally occur on up to around 10,000 feet elevation. One does not look for "fields of *Sprekelias*". Instead, one expects to find them in small colonies in pockets of humus, wedged between crevices in rocks on hillsides and mountain sides. The large black skinned bulbs may go quite deeply. Because of their typically orchid-form, many natives consider them to be red flowered orchids. As with their rain-lily cousins, Sprekelias are triggered into bloom with the earliest summer rains, and they get the chore of flowering over quickly. Usually only the very largest bulbs will flower, and they must be extra large to produce more than a single scape. As one travels southward, eastward, and westward from Mexico City, they may be found growing also in dryer, semi-arid country beneath cacti. But even then, the elevation is typically high at 3000 feet or more. They are NOT to be found at lower, tropical elevations, nor anywhere where the ground is flat. The individuals may differ considerably, even within the same colony, in varying shades of red. In cultivation many *Sprekelia* clones are self-sterile, but produce seed heavily when pollinated with pollen of *Sprekelias* from different clones. Some of the cultivated forms are evergreen, but most Mexican *Sprekelias* are naturally deciduous in winter, and during dry periods.

In 1967 I finally found a glaucous leaved *Sprekelia* in the wild in the state of Michoacan. Some had flowered recently and were just past the fruiting stage. In cultivation these have light red flowers, smallish in size, and with narrow segments. Nothing spectacular as Sprekelias go, from an ornamental standpoint, but having the pleasing personality and form of the genus. Whether or not this is *S. clintiae, S. glauca,* or something else remains to be seen. Certainly these glaucous

natives of Michoacan are not identical to the glaucous leaved specimens that I found in cultivation in the city of Guanajuato in 1957. The Michoacan *Sprekelia* was given the collection number #67-68, and was found on a shaded hillside on then-unpaved Mexico 37, about 30 miles north of Arteaga. They grew in company with vividly scarlet forms of *Bessera elegans.*

I cannot definitely state exactly all the States in which one might expect to find *Sprekelia* in Mexico, but I have collected them in the following: San Luis Potosi, Hidalgo, Mexico, Michoacan, Jalisco, Puebla, Oaxaca, Guerrero, Colima, Nayarit, and Durango. They are know from the State of Chihuahua, and it is reasonable to assume that they are to be found in other states such as Chiapas, Veracruz, Queretaro, Zacatecas, Aguascalientes, Sinaloa, and perhaps even Sonora. Indeed, almost anywhere in higher elevations sufficiently southward where winter temperatures rarely go much below freezing for any period of time. As with most plants, one looks for them where grazing by goats has not eliminated them. Hungry livestock take a heavy toll of ornamental plantlife.

## II. THE TRIBE MILLEAE: MILLA, BESSERA, PETRONYMPHE, DIPHALANGIUM AND DANDYA

In discussing the bulbous amaryllids of Mexico, one is hard pressed to pick a favorite. There are so many species and genera from which to choose. As an amature botanist and plant collector-explorer, I might be inclined to lean toward the gaudier, more-popular genera, such as *Zephyranthes, Habranthus,* or *Sprekelia.* But sentimentally my heart likely will lean towards the lesser known beauties such as the *Millinae* . . . *Bessera, Milla, Petronymphe,* and *Dandya.* Why? Well because, aside from their recognized ornamental value, they have been very good to me. In the genus *Milla,* I found an entire galaxy of undescribed species. Those who think that they know *Milla,* will recognize it as a cormous plant, flowering in summer with loose umbels of waxy white fragrant flowers, each petal keeled with a contrasting green stripe on the backside a-la-Star-of-Bethlehem (*Ornithogalum*). But there the generalization ends. *Milla biflora* is by far the best known species, and until not too long ago was the *Only* recognized species until Dr. H. E. Moore added several new species to a genus that was thought to contain but two species (*M. biflora* and *M. bryanii*) in his monograph on *The Genus Milla and its Allies.* Since then, it has been my good fortune to add enough new species to the fold to more than double the known half-dozen recognized species. A new monograph is in the making and will shortly (we hope) be published . . . perhaps within a year or so of this writing (summer 1969). Because of the pending publication, it is impossible to give the new names-to-be of the new Milla species. But readers of PLANT LIFE will no doubt be familiar with some of them, as I have referred to them as numbers in writings of plant explorations of other years.

In general, I might state that the genus is roughly divided between those that flower only at night, opening in late afternoon and closing before sunrise, and those that remain open throughout the day. They may be further divided between those which have corms that form offsets in the ordinary manner, with basally attached cormels, and those

Fig. 3. Reggie Jackson among giant arborescent *Opuntia* species. This is the nomenifer locality of *Zephyranthes* 68-223, a tiny white-flowered species from Placeres del Oro, Guerrero, west of Coyuca de Catalan. *Dandya* No. 68-222 is also found in this area. Photo by Thad M. Howard, July 4, 1968.

which produce the cormels at the end of underground "runners" or rhizomes. Bulbs produced at the end of rhizomes are well-known in such genera as *Oxalis, Tulipa, Crinum, Hymenocallis, Allium,* etc. We see this commonly in *Tulipa clusiana,* and *Crinum americanum,* and such species are spoken of as being rhizomatous. We find this frequently among

Mexican *Allium, Oxalis,* and *Milla* species. In a nutshell, this writer was apparently the first to observe that the cormous Millas could propagate in this manner in certain species. Simultaneously the writer also observed that many *Milla* flowers opened only at night. Suddenly we had an avalanche of new species that had previously been loosely lumped as *M. "biflora"!* Later chromosome studies by Dr. Lee Lenz of Rancho Santa Ana Botanic gardens bore this out. Each and every alleged new species submitted by the writer as apparently being a "new" one was in fact *new,* not only morphologically, but cytologically as well. Unfortunately the species of the genus *Milla,* (like its distant relative within the Amaryllidaceae *Hymenocallis*), differ from one another in more subtle characters that makes the subject taxing to most botanists. As with *Hymenocallis,* nearly all *Milla* species (with but few exceptions) are white flowered. All members of the genus *Milla* have the distinctive green "keel" on the backside of each segment. All are more or less fragrant. All are cormous. The difference in foliage characters are perhaps the most obvious distinction to the novice. No one should ever confuse the giant *Milla magnifica* with #64-79 (tentatively called M. "filifolia" by this writer) as the leaves of the former may be three to five feet in length, thickly rounded and hollow like a garden onion, while the foliage of the latter are wispy, hair-like threads. Again, we find exciting contrast between the giants such as #65-77 from the north eastern borders of the state of Guerrero, which may be a yard high with up to 25 flowers in the umbel, with #68-235, from northern Oaxaca, which bears one or two large flowers on a stem only an inch tall! The latter appear like snowy summer crocus when seen at their best.

The geographical limits of the genus *Milla* is mainly within the limits of Mexico, with one species spilling over into Guatemala on the southern limits and another species or two pushing northward into the Big Bend mountains of Texas, and into southern Arizona and New Mexico. With the publication of Dr. Moore's monograph, the genus was known to include not only *M. biflora* and *M. bryanii,* but also *M. rosea, M. magnifica, M. delicata,* and *M. mortoniana.* Certainly these seemed exciting enough, since the virtues of *M. magnifica* seemed to destine this beauty to eventual horticultural immortality. Who can resist a stiff stalk two feet tall, bearing an umbel of waxy, sweetly scented white flowers on a balmy moonlit summer evening (especially when the plant is so very easy to grow under ordinary conditions). The same cannot be said of *M. rosea,* which is a stubborn, fickle, unpredictable thing. The latter may or may not even attempt to sprout that particular year, choosing instead to remain dormant, for no apparent reason. Incidentally, we find that *M. rosea* is as misnamed as its better known cousin *M. biflora.* Just as *M. biflora* is not necessarily a two flowered plant (it may have one to twelve flowers in an umbel, and normally has more than two flowers per scape), so *M. rosea is Not* a rose flowered *Milla;* The "rosiness" is really an allusion to the rose-red to brown-red

markings on the under surface of each segment bordering the green keel! And only cool temperatures will produce this pigmentation enough to warrant the name. If the weather should be very hot during the normal early autumn flowering period of *M. rosea,* the flowers may be so little pigmented as to hardly suggest any of its "rosy" reputation. Fortunately we usually find it cool enough in October to bring out this pigmentation in our climate, but the earliest ones of early September are apt to be woefully bleached. I will return to *M. rosea* later, but in all fairness, though it was misnamed, it *is* a truly lovely and unique species within the genus.

Alas, I am forced to admit that I have never seen either *M. delicata,* allegedly a small pink *Milla* species, or *M. mortoniana,* allegedly a blue flowered species. Both are from the State of Guerrero, and both are a color departure from the norm. I have spent many dollars and many days the past several years in quest of either of these two illusive species, but have yet to succeed in finding them. Indeed Dr. Moore never found them either, the species having been collected and submitted by Hinton in 1936. Mr. Hinton lived in Guerrero for a time and this botanist found things that others are still looking for. Dr. Moore's descriptions are based on Hinton's notes and the dried specimens submitted by him at the time. I have no doubt that *M. mortoniana* is indeed a quite *blue* species as far as the color spectrum is concerned, but I'm most curious as to exactly what shade (or shades) of blue it might be. At any rate it is only something to ruminate over, since we have yet to feast our eyes upon living material, in "living color". *Milla bryanii* is almost as illusive. The few corms that I have were collected for me by someone else in Coahuila. I finally flowered these and find that they are very close to *M. rosea,* although mine lacked any tinge of pink along the keel, and they bloomed about a month earlier. Flowers were a bit smaller than those of *M. rosea,* and they agree with the original description in every way. They remain open both day and night, and have distinct pedicels. The leaves are fewer in number than those of *M. rosea,* and though quite slender, they are distinctly hollow, like those of an onion. The flowers are white and are distinctly pediceled. It comes from northern Mexico, in a mountain range west of that of *M. rosea.* It has very slender leaves, and that are *hollow* (!) in cross section. It produces only basally attached cormels.

The remaining *Milla* species are all still unpublished and officially unnamed, bearing only my collection numbers. Unofficially I have given them "nick-names" which are convenient to me at the moment. These nick-names may or may not remain permanently attached to them after publication of the pending monograph by Dr. Lenz.

At the moment it is difficult to classify them only according to whether they remain open during the day-time, or whether or not they produce cormels at the end of rhizomes, since these characters are not consistent from one species to the next . . . i.e.—most often the nocturnal bloomers produce stolons, but a few do not. Likewise, at least one day-

night bloomer produces rhizomes, even though this is the exception from the rule within the day blooming species.

The genus, as stated earlier, is to be found from the northern Mexican border to the southern border. A few may spill over the Sierra Madre mountain ranges (eastern and Western) but in general they are to be found inland, cradled within the mountains and valleys after leaving the Gulf and Pacific coasts. I have collected *M. biflora* on the Pacific side, inland, in rolling country along roadsides in the state of Nayarit, south of Acaponeta in 1967. But this is an exception to the rule, as this species is normally found inland on the other side of the mountains at a much higher elevation. Likewise we find *M. rosea* north of Monterrey, in the State of Nuevo Leon at an elevation of less than 2000 feet. But this species is likewise an exception to the rule. The majority of the species are found farther inland at higher altitudes. *Milla biflora,* has the widest range, being found over much of Mexican Central Plateau, and is apt to be the *Milla* that one might encounter at higher altitudes. From an evolutionary standpoint it has been theorized that it is a *Milla* of more recent origin, since it is often found on mountains of volcanic origin. It is not alone in this respect though, as *Milla* "filifolia" (#64-79) likewise is to be found on terrain of volcanic type. Doubtless there are others.

*Milla biflora* and its allies are exceptional in that they are both day and night bloomers, with flowers opening during the day and remaining open both day and night for several days. Although they are fragrant, the fragrance is nil during the daylight hours, but becoming pronounced with the cool of the evening. Thus far only one member of this section produces offsets in the form of underground runners (#68-250, Puebla). Basally attached cormels are the rule. *Milla biflora* is noteworthy in that the individual flowers lack distinct pedicels. Indeed *M. biflora* is considered to be "sessile", but unfortunately, this is not technically a rigid rule. Quite frequently we do find poorly developed pedicels (actually pseudopedicels) of sorts that are apt to confuse not only the novice, but the "expert" as well. In general, we might safely state that the pedicels, if at all preset, are very rudimentary and poorly developed. They barely qualify as pseudo-pedicels at their best. In the case of #68-235, from northern Oaxaca, we find that these pseudo-pedicels are absent (or very nearly so) so as to make for a sessile-flowered Milla species. In this instance we find a closely related species akin to *M. biflora,* but with ultra-short scapes . . . pubescent stems but an inch tall, and floral tubes only 2 inches long. By contrast, the flowers are proportionately quite large, being almost 2 inches broad. This *Milla* is to be found in grassy pastures north of Yanhuitlan, at an elevation of around 7000 feet above sea level. For years, the writer had seen them flowering along the roadside, while enroute to the City of Oaxaca, always thinking that they were only stunted forms of *M. biflora,* no doubt the result of much overgrazing. The reader may imagine my surprise when in 1968 I stopped to verify if my assumption was correct. It was *not*! Not only did my plants

have minutely pubescent stems, but the overly large flowers had stems much too short, and tubes much too short to do justice to any forms of *M. biflora* that I had seen. When other factors (corm, leaves) were taken into consideration, it became apparent that I had been fooled much too long. This was *not M. biflora* at all, but a strange new vegetable.

I did not have quite so much trouble with *Milla* species *64-79,* although it too fooled me for a few years. This tiny mite is quite similar to *M. biflora,* and grows in the same general range in the states of Morelos and Mexico in volcanic soils. Close inspection reveals that this miniature has very tiny corms (1-1.5 cm in diameter), extremely narrow leaves only 1 mm wide, and quite thread-like. Incidentally I find that this 1 mm width is constant, regardless of corm size! The tiniest corm may produce but a single leaf 1 mm wide, while a mature corm will produce 4-6 leaves, still only 1 mm wide. These slender leaves are rounded in cross-section, with a hair-line groove going the entire length of the upper surface. The flower stem is distinctly pubescent, heavily "furred" with minute fuzz from top to bottom. This fine "fuzz" is found even on the pseudo-pedicels and/or pedicels of each flower. The flowers themselves are of typical *Milla* form, white with green stripe on the backside, but often this green stripe has a good bit of purple-blush adjacent to it. These have stamen filaments nearly twice as long as *M. biflora* (to 1 mm), and the green keels are of a softer olive-green color than one normally expects in other *Milla.* In nature this species is found growing amongst lava rocks in open grassy pastures (Morelos), or on sunny hillsides in soil of limestone character (Mexico). The type location for it is just East of Cuernavaca in the State of Morelos. This *Milla* species will shortly be described in Dr. Lenz's forthcoming monograph. The writer has no idea what the ultimate name for it will be, but *M. "filifolia"* seems as accurately descriptive a name as any at this point.

The writer must confess that filiform leaves are not unique to this *Milla* species. In my July field trip in 1968, I found two new distinct *Milla* species in southern Puebla in a single afternoon; one having thread-like leaves similar to *M.* "filifolia". This new dwarf bears the collection number 68-250. A day bloomer, this one has single-flowered umbels in every specimen seen thus far. Moreover, it produces its cormous offsets by way of underground rhizomes (!) as do some of the larger species within the genus. It is too early to state that this new species will *always* bear only single-flowered scapes, as the umbel is the rule in this family, but after examining several hundreds of these in flower, I could not find a single exception at that time. Under cultivation, it has maintained this characteristic. Certainly we would not wish to see a new error introduced as was done when *M. biflora* was named. The latter may have up to twelve flowers in the umbel, and two flowered scapes are the exception rather than the rule, with more flowers being more usual. Another unusual feature of *Milla 68-250* is the fact

that any pedicels are lacking. Pedicels or pseudopedicels are the rule in the genus, and only a few others (such as *M. biflora* are considered sessile. This new species was found flowering along the roadsides along Mexico 125, about a kilometer south of Acatepec in southern Puebla. From a distance it resembled *M. biflora,* and would ordinarily be confused as such by the untrained eye. Were it not for the rhizome information, I know I would not have been so sure about its being anything other than a very slender leaved *M. biflora.* When we consider all the important characters (rhizome formation, filiform leaves, sessile, one-flowered scapes, flowering in the daytime) it is easy to see that we have enough distinguishing features to prevent its being confused with any other species.

As though the finding of a new *Milla* species in one afternoon were not enough, I was fortunate enough to experience this same thrill again in a little over an hour! This time my discovery was a night blooming species (*Milla 68-252*) with very slender leaves and minus any signs of rhizomes. The fragrant white flowers had green keels on the underside strongly flushed wine-red. The leaves were nearly filiform, being only 1-1.5 mm wide and about 24 cm long, dark green, purplish at the base, canaliculate above, rounded below, nearly terete. There were 2-3 sweetly scented flowers to the umbel with poorly developed pseudo-pedicels, unequal in length, 1.5 to 5 cm long. I was truly astounded at finding this new *Milla,* since I was in a territory where another closely allied *Milla* species grows (*Milla 62-44*) which I first found here in 1962. The latter is a giant rhizomatous type with terete, scabrous leaves, and flowering in late summer. The new discovery had similar flowers, but there the similarity ended, since foliage and vegetative reproduction were quite different, and the flowering season was at least a month earlier than that of *62-44.* This appears to be a very localized species, since I have never run across this one before, whereas I have collected *Milla 62-44* in many different places in southern Puebla. Only time and more study will tell us if *Milla 68-252* is indeed a new species or not. In many respects it is similar to *Milla #67-84* (and 67-85), from San Luis Potosi. The latter is likewise a night bloomer with slender foliage, and without any rhizome formation. The foliage of this more northerly species is greyish green, and averages at least a half millimeter wider. The stamen filaments of the *Milla* from San Luis Potosi are much shorter (as with *M. biflora*), being 1 mm or less in length. Ultimately both *Milla 68-252* from Puebla, and *Milla 67-84* from San Luis Potosi would have to be compared with *M. bryanii* in order to see how each differs or compares. (Note: Later comparisons showed them to be distinct from one another.) Certainly each is geographically isolated from the other sufficiently enough to make one suspicious that they need not be the same species. Chromosome studies should be of much value here.

The reader might conclude that the variety of species within the genus *Milla* is far from settled, and such a conclusion would be correct.

At this point it appears that *Milla* may be as difficult as *Hymenocallis* for the taxonomist. As an example, take two related Millas from Chiapas (#64-95) and Oaxaca (66-95), with similar flowers. In Oaxaca we find them to be without rhizomes, but with slender grass-like leaves, and small corms. Upon crossing southward into Chiapas, we find that it is replaced by a similar, but more robust species freely forming rhizomes. This latter species extends as far southward as Huehuetenango in Guatemala. Each has a different chromosome number, further giving support that we do indeed have two distinct species, but the relationship is unmistakable. From the gardeners point of view it really does not matter, as we have one of the finest *Milla* species for cultivation in the rhizomatous form (64-95) from Chiapas and Guatemala. Indeed only *M. magnifica* and *M. biflora* are its match under cultivation and even then there might be reason for debate. Certainly no *Milla* is easier to grow and flower than is *#64-95*. Unlike *M. biflora,* the Guatemalan species increases rapidly by vegetative means by the freely produced rhizomes. The umbel may normally contain about a half dozen flowers, but under optimum conditions there may be a long succession of scapes over many months. The flowers are about the same size as those of *M. magnifica,* and have a very sweet fragrance. The species from Oaxaca (#66-95) as stated earlier is similar in flower, but is not as vigorous nor as easy to grow.

There is little reason to doubt that *Milla magnifica* will someday become the "standard" *Milla* species in cultivation. Why? Well, for one thing, it has unusually large flowered umbels, with a dozen or more flowers per scape (often as many as two dozen), and it is far easier to grow than *M. biflora*. Some might object to its being an evening bloomer and not ordinarily remaining open during the heat of the day, but others may find this only adds to its charm. A few might object to its unusually long onion-appearing foliage (but without any onion-"smell") which may reach three feet or more in length. These few long leaves are apt to sprawl untidily as the plant comes into flower and will require staking. But these are minor problems. It is a glorious "Milla-of-the-Night", and the perfume is equal to that of tuberoses. *Milla magnifica* is a resident of the state of Guerrero, and is to be found north of Taxco and West of Iguala in the surrounding hills and mountains.

The honor of being the largest *Milla* species does not belong to *M. magnifica,* but to a closely allied species *#65-77*. This latter species is found at the Guerrero-Morelos state lines, and is somewhat intermediate between *M. magnifica* and *M. species 62-44* from Puebla. Under cultivation, #65-77 may be fully a yard tall, and may have 25 flowers in the umbel, sometimes more. Foliage is hollow, as with *M. magnifica,* but the surface is minutely denticulate rather than smooth. In this *Milla* we find offsets may be either basally attached and/or on short rhizomes, often on the same plant. It is quite possible that it may be of hybrid origin since it is to be found midway between the range of

*M. magnifica* and *#62-44*. It flowers later than *M. magnifica,* but earlier than #62-44. In general it produces scapes fully a foot taller than either *M. magnifica* or *#62-44,* with the largest umbels. Both floral tubes and pedicels are longer than those of *M. magnifica,* both averaging 2 cm more in length. Were it as easy in cultivation as *M. magnifica* then *#65-77* would be my choice among *Milla* garden potentials. Unfortunately I find it rather difficult and erratic—a condition that is not uncommon in this genus. Still it can be quite impressive when one finds it in full flower in the evening on stems 38″ tall.

The State of Guerrero has yet another *Milla* species not yet given scientific rank as a described species. This too is another of the nocturnal bloomers, but without any rhizomes. The writer has nick-named it *Milla "scabrum"* because of its scabrous foliage, stems, and flowers. For many years its origin was unknown, having been collected many years ago in southern Mexico, presumably as a "form of *M. biflora*". In those days I was not yet aware of the many undescribed species in the genus, assuming that there were many "variations" and I was content to toss them all into a single bag simply as "*M. biflora* variations"! I can offer little excuse for my gross ignorance, except to say that other so-called "experts" before me had made the same error. At any rate, when the many "variations" bloomed, I realized that I had stumbled onto something totally unexpected. I had a passel of new species, and "scabrum" was one of these. Alas, I had no record of where I had collected it. I could not assign it a collection number that would fit into my system, so I simply gave it the number *Milla #xyz.* I reasoned that it likely was dug in southern Mexico, more likely than not in the state of Guerrero. It was a wild guess, but I was almost willing to gamble on it. As it eventually turned out, I was correct in my "guess". In July, 1968, I indeed found this species in leaf in Guerrero, a few miles north of Zumpango on the Acapulco highway. The mystery was solved . . . at least tentatively. The non-rhizome habit, and the terete, scabrous foliage certainly matched my original collection. My earlier clone had a scabrous stem, with the minute bristles extending to the pedicels and even the floral tubes. Flowers were typical of the nocturnal *Milla* types. Further study is needed before anything really definite is done about this *Milla,* but I feel that it will turn out to be another distinctive new species. To be sure, it is not unique in its rough textured leaves and stems, but it is not likely to be confused with anything else.

A *Milla* species collected in both the States of Colima (#65-50) and Michoacan (#65-71) has never flowered for me, although I am hopeful that it may do so in the summer of 1970. This is a very strange *Milla,* growing in low wet places in thick colonies in grassy pastures. The corms are tiny, and seem to increase rapidly in nature, but they quickly die off before I can get them home after digging while in leaf in Mexico. Out of a hundred or so corms I am lucky to have as many as five survive, and then it takes years to bring them back to maturity. Foliage is grassy and a bright, shiny green. I feel sure that it is a late flowering

species and likely flowers in the fall. At long last the prospects for flowering them appear to be very good (at this writing) and perhaps the riddle will be unravelled in another year.

The fall flowering *Milla* species of northern Mexico, *M. rosea* and *M. bryanii* are quite fascinating and quite frustrating. This is especially true of *M. rosea* which may remain dormant and make no effort to grow though remaining in perfectly good condition. Should it decide to grow, it will grow vigorously and quickly erupt from the ground with a rush, thrusting up its whirl of grassy leaves almost overnight. There may be as many as a dozen linear leaves per plant, in contrast to the other species which usually have less than six leaves. The waxy white flowers remain open day and night and have well articulated pedicels. Some have ruffled segments and are indeed very pretty. They need to flower before the first hard freezes as the flowers and buds will be ruined although foliage is unharmed. If *M. rosea* were reliable, it would rank with the very best in the genus, as it is very ornamental and comes at a time when flowers are getting scarce. *Milla bryanii* flowers about a month or so earlier and thus is to be considered a late summer bloomer rather than an autumn flowering species. Under cultivation, *M. bryanii* is more reliable than *M. rosea,* and can be counted on to grow annually. Like *M. rosea*, it has distinctly pediceled flowers in the usual white with green stripes beneath.

*Milla bryanii* is clearly more closely related to *M. rosea,* than to any other *Milla* species, and were it not for the fact that it flowers earlier, it would be difficult if not almost impossible to separate them. Geography separates them to a certain extent, but not as much as one might think. The state of Coahuila, which is the home of *M. bryanii,* is adjacent to Nuevo Leon, the home of *M. rosea.* As James Giridlian once remarked, "Flowers don't recognize State lines". Perhaps the most unusual feature of *M. bryanii* is the hollow leaf, which is like a depressed soda straw in cross section. Many Millas have leaves that are almost, or partially hollow for some of their length, but *M. bryanii* is the only thin leaved *Milla* to carry this to the same extent as does the giant *M. magnifica,* which has terete leaves. The flowers of *M. bryanii* are smaller than those of *M. rosea,* and less attractively marked, but this could be due to their blooming during a much hotter part of the summer. Pigmentation is intensified with cooler days and nights.

Fall blooming Millas are reported from Arizona, New Mexico, and the Texas Big Bend, and these have previously been diagnosed as *M. biflora.* The writer is of the opinion that this *Milla* (or Millas) species is perhaps something else, allied to *M. rosea* and *M. bryanii.* The prospect that we may have a new species north of the Mexican borders still waiting to be described is exciting.

*Milla* 68-235, is a species from Oaxaca, found in the vicinity of Huahuapan de Leon, and also Yanhuitlan, along the Pan American Highway in northern Oaxaca. This species is almost identical to *M. biflora,* but the entire scape . . . stems, pedicels, tube are minutely

bristled. The stamen filaments are slightly longer than those of *M. biflora,* and the scapes are at times apt to be so short as to give them the effect of flowering almost above the ground, as with *Crocus.* The writer was so struck by this odd feature that he was prompted to dub them "Crocus-Milla", a name that proved to be a misnomer. Under cultivation the following year, I was horrified to see my "crocuses" develop quite tall, normal scapes! For years I had seen these Millas in flower in Mexico in this part of Oaxaca, and for years they had fooled me as being only another version of *M. biflora.* But in 1968 those ultra short scapes completely fooled me, with those unusually large flowers. In 1969 they fooled me again in returning to a taller habit. Apparently those short scapes were due to an environmental situation and nothing more. But it now appears that we do indeed have a new species, as closer inspection has revealed the bristles of the entire scape, as well as other minor differences. There is a very good chance that we have another close ally of *M. biflora,* and that this is likely its southernmost area of penetration. As we approach the City of Oaxaca (in central Oaxaca) they are replaced by a night blooming species of another type. For the time being, it appears that we will have to forget about *Milla* with a *Crocus* habit, although the idea sounded exciting, and appealing. They will have to be tested another year to be certain, as these Millas were grown in a quite shady spot, and being normally sun lovers, the limited sunlight might have forced them to "stretch" towards the light, and thus distort their true nature. Even so, no decent *Crocus* would be caught dead doing such an exaggerated "stretch"!

In summary, we can state that there are several distinctive groups within the genus *Milla*: The nocturnal flowering types which open in the evening and close before day-break, and the day-flowering kinds that open in the warmth of the afternoon and remain open continuously both day and night. The night bloomers are evenly divided between those that form offsets basally, around the mother corm, and those which send out long rhizomes underground away from the mother corm and then form a new corm at its tip. The day blooming group are typified by basally formed offsets, but *Milla* 68-250 is the exception, as it has rhizomes.

We might note that the rhizome-forming habit does not manifest itself until we enter the south-central States of Mexico . . . Puebla, Oaxaca, Chiapas, Guerrero, and Morelos. Apparently The Central Plateau region adheres to the characteristics of *M. biflora* and its day blooming allies. Only in *M. 67-84,* from San Luis Potosi do we find a night bloomer sharing its range with *M. biflora,* but even then they are not found growing together in the same places. Where one species leaves off, it is replaced by another.

Since the vast majority of *Milla* species have white flowers with green stripes on the underside of each segment, we are forced to resort to studying the most subtle characters, such as gross measurements of anatomical parts, presence (or absence) of minute bristles, or denticulate ridges on the leaves, presence or absence of pedicels, etc. Chromo-

some studies have proved to be most valuable in helping support the gross anatomical differences. What once was a simple genus with but a few species has now become a complex genus with many species.

## THE GENERA DANDYA AND BESSERA

The writer approaches the genus *Dandya* with many reservations. What first began as a simple monotypic genus, with only *Dandya purpusii* of Coahuila as its sole representative has now taken on two additional members and has virtually exploded into our faces. At this writing, this author is quite unsure of the ultimate botanical treatment of a small group of little-known members of the *Milla* tribe. Old names, such as *Diphalangium* and *Behria* continue to rear their ugly heads to haunt and taunt. The standing of one of the two known members of the *Bessera* group is once again questioned. The dilemma is far from settled, and the loud bluster of a few well-intentioned botanists . . . is just that . . . bluster. At the risk of alienating some of the vainglorious (?) authorities, haughtily perched aloft in their secure ivory towers, the writer will present the problem, but will not attempt to finally solve it.

The genus *Bessera* is (or was) composed of two quite different plants. *B. elegans* is far and away the most familiar of the twain; the other is *B. tenuiflora.* It is unnecessary to go into the *B. elegans* morphology in detail, save to say that its most unusual character is the fact that the stamens are joined to one another into a staminal cup or "trumpet" of sorts, somewhat suggestive of *Narcissus* (save that Narcissus' cup is not formed by a fusion of stamens) but rather contains the stamens within the cup. As stated above, the staminal-cup of *Bessera elegans* is well-developed, and serves as a eye-appealing part of the architecture of the flower of this species. The little-known species from the tip of Baja California, *B. tenuiflora,* does not have this cup, but instead has a hair-line connection joining the filaments together. These connate filaments are not immediately apparent to the naked eye. Since *B. tenuiflora* has a tubular flower somewhat like *Bravoa geminiflora* (or a penstemon), one must dissect the flower lengthwise in order to expose the staminal bases. Under magnification we find that sure enough, the stamens are indeed connate. On this premise, i.e.—that the connate stamens of *B. tenuiflora* are only greatly reduced rudimentary staminal cups, this species was united with the genus *Bessera,* and the old name of *Behria* discarded as a synonym. This seemed to make sense at the time. Broadly speaking, the connate stamens *Could* conceivably be thought of as a very rudimentary cup.

Meanwhile, the genus *Dandya* was simultaneously elevated to the niche of being a monotypic genus. To be sure, it was noted that *Dandya* was likely closer to *Bessera* than to *Milla,* and it was concluded that *Dandya* must be a very primitive member of the clan, whereas *Milla* was a more modern group on the evolutionary scale. There is yet no reason to think otherwise. But the description of *Dandya* was based on dried

material collected early in this century, and while the specimens are still good and the species is a valid one, it is noteworthy to recognize that no one today has ever seen living material. The mountain range habitat of *D. purpusii* is still inaccessible, short of by way of pack animals, just as it was done by Purpus many years ago. The flowers of *D. purpusii* are said to be blue (or bluish) and are rather small. It is not clear if the stamens are connate or not, since this feature is not so easy to determine from the dried material on such smallish flowers, particularly when one must be so careful to preserve the few known existing specimens. The writer feels that there is justification enough to suspect that perhaps these stamens *are* connate. Only the finding of living material can verify if this is so, and this has not happened since October, 1910, when Dr. Purpus collected his specimens on Sierra de la Paila. Is the reader beginning to get the picture? If *Dandya purpusii* does indeed have connate stamens, then how does that affect the genus *Dandya,* with regard to the genus *Bessera?* Or how does that affect *Diphalangium* for that matter? But that is not the end of the puzzle. No, far from it! It is only the beginning.

While poking around southern Mexico, the writer has had the thrill of finding two new members of the *"Dandya-Bessera"* complex. The first one was discovered in Guerrero in 1964, and was given the number *64-74.* At the time, the writer was perplexed. What *was* this strange cormous plant with the strange *shooting-star-like* flowers so much resembling *Dodecatheon* in appearance? Was it an *Allium?* No, it had a corm. Was it *Muilla?* Perhaps, but investigation showed that *Muilla* has reticulated corm-coats, whereas our new plant had fibrous coats, just like *Milla.* Checking a bit further, I decided that perhaps this was the long-lost *Diphalangium graminifolium,* the original herbarium specimen having been destroyed by bombs in its European herbarium in the 2nd World War. It is virtually impossible to retrace *Diphalangium* in any way today, since the description of it was never too clear, and since there is no specimen to refer to. The mystery remained unsolved until 1967, when the writer stumbled across another similar species in southern Michoacan. This one had lavender flowers that were upfacing, rather than pendulous, but otherwise similar to family characteristics of #64-67. It was instantly apparent that this new mauve-colored species was too much like the line drawing of *D. purpusii* made from dried material for the monograph of THE GENUS MILLA AND ITS ALLIES, by H. E. Moore, in *Gentes Herbarium,* Vol. VIII, Fasc. IV, 1953, and illustrated on page 262. Suddenly it all fits together! I had found two new *Dandyas.* But *were* they Dandyas? Or were they Besseras? Dr. Lee Lenz brought this to my attention, pointing out that our new "Dandyas" had connate stamens. And if this be so, how could we justify separating them from the genus *Bessera?* I was stunned! That was a good question . . . how *could* we? And to really confirm the dilemma, I finally flowered *Bessera tenuiflora* (at long last) and had a chance to compare its connate structures with those of the two *"Dandyas."* I was stunned again. The bases of the stamen filaments of *B. tenuiflora* and

the two new *"Dandyas"* are much the same! We are thus posed with a set of problems: Should *Bessera elegans* be joined with *Dandya,* thereby making an enlarged, but loosely connected genus *Bessera?* Should *B. tenuiflora* be separated from *Bessera* and placed in the genus *Dandya* . . . or better yet, in the genus *Behria?* Should *Dandya* remain a separate genus, or should it too be re-located in the genus *Behria?*

It is unscientific to day-dream about the many possibilities, tantalizing though they might be. The writer can only give his own humble opinion (and that is all it is . . . an opinion) about the most likely prospects. These are: (1) The genus *Diphalangium,* though officially and perhaps permanently *dead* would likely have contained the plants which we now know as *Dandya.* But having been wiped out by a bomb, this name will forever remain questionable. There is nothing we can do about it, and we will have to accept it. (2) The genus *Bessera,* as we are familiar with it, is a very distinctive plant if confined to *B. elegans.* Its gross morphology is such that it is not apt to be confused with anything else, including the species from Baja California, formerly known as *Behria tenuiflora* Greene, having tubular flowers and connate stamens, but *no cup*! Thus confined, *Bessera* remains a most distinctive genus. (3) The genus *Behria* remains as a monotype, with only *B. tenuiflora* known, and is typified by having tubular flowers and connate stamens. (4) The genus *Dandya,* with three known species, remains, and is typified by flowers that open widely ("starry") and having connate stamens, but having neither tubular form, or a distinct staminal cup. The writer must admit to not having seen the original dried specimens of *Dandya purpusii* (Brandegee) Moore, Gentes Herbarium 1953, but Dr. Lee Lenz has discussed it with me and has compared it with my own lavender flowered *Dandya 67-64,* and has assured me that they are quite different from one another, although he did not elaborate. At any rate, it is a good species for cultivation, and in the 2nd year of culture, the umbels have doubled in number of flowers, so that 20-25 flowers is not uncommon. The flowers open 1-4 at a time over a long period, and a large corm may produce a second scape. The flowers open around mid-day or perhaps before, when the sun hits them, and they expand into lavender stars, with spreading but sometimes reflexed, upfacing blooms. Foliage is very similar to *Bessera,* being narrowly terete, and dark green. This *Dandya* is unusual in having the minute denticulations or "bristles" on the stems and pedicels, that are found in some *Milla* species. The flowers close at night, but may (or may not) reopen the following day. Tentatively this *Dandya* is being called *D. Hannibalii,* in honor of Les Hannibal who was with me when I found it, although all such tentative names are only that, as of this writing—tentative in the most literal sense. The final name-choice will rest with Dr. Lenz.

The other *Dandya,* with the "shooting star" flowers has tentatively been labeled *D. thadhowardii* by Dr. Lenz, but this name will not be final until published. This white flowered *Dandya* is one of the oddest

flowered species to be found within the entire family of *Milla* and its allies. The stamens curve to form a "bird cage" around the pistil. There is a faint fragrance present, but this is illusive. Under cultivation, this little *Dandya* has proved to be a good bloomer, with largest corms easily producing 20 or more flowers over a period of weeks, from the umbel.

To the amaryllid buff, it really won't matter what the final disposition of *Dandya* will be. They are well worth having, but the existing supplies are so small as to make them almost unobtainable, and then in no significant quantities for garden use. They form offsets slowly and propagation might be more rapid if grown from seed, which they do produce in small amounts.

## THE GENUS PETRONYMPHE

*Petronymphe* is another one of those weird oddities that seems to fit nowhere, although it seems closest to its *Milla* cousins. There is a bit of *Bessera* in it too, as the flowers in the umbels are pendant or nearly so. The color of the flowers is sort of pale yellowish green, and though very lovely and graceful, are inconspicuous. Leaves are nearly triangular in cross section, and remind us somewhat of *Allium triquetrum* in this characteristic. *Petronymphe decora* is the only member of this small genus at present, and Dr. Moore calls them "Rock-nymphes", because of their cliff-hanging environment. The writer has spent much time in trying to find them in nature, but has always failed, even though I managed to find the general area (Acahuitzotla, Guerrero) where they hail from.

There you have it. The large cormous family of Mexican amaryllids comprising the genera *Milla, Bessera, Dandya, Petronymphe,* and *Behria.* A complex lot they are, but tantalizing as well. There is still much to be learned about them, although we now know more than ever before. The largest number of species are to be found in the state of Guerrero, and adjacent States of Oaxaca, Michoacan, Morelos, and Mexico. To be sure, other states are represented by either a *Milla,* a *Bessera,* or both. In the northeast, it is *M. rosea* and *M. bryanii.* In the central plateau it is *M. biflora,* with a few *Bessera elegans* in Jalisco and vicinity. In San Luis Potosi City and vicinity we may also find the night blooming 67-84. In Colima and Michoacan we may find the little-understood 65-50 in bloom late in the year. In Puebla we may find at least four species, including *M. biflora.* No doubt many new species are awaiting discovery.

TO BE CONTINUED WITH **ZEPHYRANTHES**, ETC.

## IN MEMORIAM—CLAUDE WORTHAM DAVIS, 1894-1969

Teacher, researcher, soldier, scholar and, above, all, a kind, Christian gentleman and an unselfish friend who was more interested in giving than in getting, Claude W. Davis died March 23, 1969 in Baton Rouge, Louisiana, at the age of 74. Born November 23, 1894 in Delhi, La., he grew up there and attended schools in Louisiana including Louisiana Tech., and Louisiana State University where he received both the B.S. and M.S. degrees. Although soldiery appeared completely out of character for him, he served his country in World War I as a lieutenant; and in World War II as a major, and a specialist in agriculture in England, North Africa, Italy, France and Germany. He retired from Louisiana State University in 1955 as Professor emeritus of agricultural extension education after spending 35 years in service to Louisiana agriculture.

This was his profession but his avocation, which he pursued intensely, was the growing and hybridizing of daylilies, *Amaryllis* (see Fig. 26, page 98, PLANT LIFE, 1960) and *Iris*, both Louisiana and bearded. Many of his daylilies and Louisiana iris were registered and eagerly sought by enthusiasts in these fields. Also, he grew roses to a perfection that was envied by all who saw them. Many visits with Prof. Davis to buy a few amaryllis resulted in a return home with an armful of "free goodies" in addition. Not only did he share his creations with others, but his enthusiasm encouraged others to participate in these creative endeavors. Prof. Davis will be sorely missed by the many friends who knew and loved him and by a world left richer because he had been here.—*Fred Buchmann*

## 1969 HERBERT MEDAL PRESENTATION TO W. QUINN BUCK

ED PENCALL, *Vice President, Southern California Hemerocallis and Amaryllis Society*

The regular meeting of the Southern California Hemerocallis and Amaryllis Society on June 21, 1969, was made the occasion for the presentation of the 1969 HERBERT MEDAL to W. Quinn Buck. Mrs. George Marshall, member of the board of trustees of the California Arboretum Foundation, Sponsors of the Los Angeles State and County Arboretum, and an active leader in the Southern California Horticultural Institute, made the presentation.

After reading the official citation from Dr. Hamilton P. Traub acting for the American Plant Life Society, Mrs. Marshall outlined the horticultural accomplishments of the year's HERBERT MEDALIST. She then briefly sketched the contributions of previous HERBERT MEDAL recipients. All present felt Mr. Buck a worthy addition to their ranks.

Members of the Southern California Hemerocallis and Amaryllis Society presented Mr. Buck with a fine Bulova watch for his constant contributions to the Society as general factotum and adviser. He in turn presented each guest and member a ramet of his *Hemerocallis* clone 'Gold Antique'.

Mr. Buck also was speaker for the meeting, and he outlined his first interest in plants, his introduction to colchicine, and his work in

Fig. 4. Mrs. George Marshall is shown presenting the 1969 HERBERT MEDAL to W. Quinn Buck in award ceremonies held in the Seminar Room at the Los Angeles State and County Arboretum, Arcadia, Calif., on June 21, 1969. Photo by Lance Reuther.

hybridizing and polyploidizing plants. His long discussion of the use of colchicine, particularly with the *Hemerocallis,* was clear and understandable as he showed how to use the mutagen, what results could be hoped for, and what accomplishments had been made.

This gala meeting lingers in the memories of those who were present, and we look forward hopefully to other such occasions for our group.

## EDITOR'S MAIL BAG

Your editor has moved into his new home nearer to the University of California campus in the Toorey Pines region in order to take advantage of the new research Library. He still has the task of moving

the thousands of bulbs. The new address is 2678 Prestwick Court, La Jolla, Calif. 92037.

We regret to announce that Mrs. W. E. McArthur, of Jacksonville, Florida, one of the pioneers in the popularization of the amaryllids, died suddenly, June 2, 1969 at the age of 90 years. An In Memoriam note will appear in the 1971 PLANT LIFE. Under date of March 29, 1969, Mrs. Arthur had written with reference to PLANT LIFE and the AMARYLLIS YEAR BOOK, "I have always enjoyed and profited by the wonderful articles written for this unique magazine and noted the growing knowledge and improvement of *Hemerocallis* and other amaryllids. I miss the bulb articles written by Mr. Hayward; have not seen or heard from him lately; for reason the penalties of age have curtailed my activities."

Under date of October 29, 1969, Wyndham Hayward writes,—"I have finally moved out of my house at 915 South Lakemont Avenue, Winter Park, Florida into my trailer home 1 mile south of Goldenrod. My address will be *7459 Restful Street, Orlando, Florida 32807.*"

In 1969, Mr. James E. Mahan, your Secretary of the National Amaryllis Judges Council, and your Registrar of Amaryllid Names, has been welcomed into the ranks of *Patron Life Members* by contributing $500 or more to the Society for the advancement of the amaryllids.

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**PLANT LIFE LIBRARY**—continued from page 5.

FLORA EUROPAEA. VOLUME 2. ROSACEAE TO UMBELLIFERAE. Edited by T. G. Tutin, V. H. Heywood, N. A. Burges, D. M. Moore, D. H. Valentine, S. M. Walters and D. A. Webb. Cambridge University Press, 32 E. 57th St., New York, N. Y. 10022. 1969. Pp. xxvii + 455; 5 maps. $23.50. **Flora Europaea** is sponsored by the Linnean Society of London. The Editorial Committee is based in the British Isles and is supported by Advisory Editors and Regional Advisors from all over Europe. It is a projected four volume work in which the national and regional floras of Europe are to be synthesized for the first time. Volume **one** was published in 1964, and now volume **two** has appeared in 1969, and it measures up to the high standard set in the initial volume. The work is arranged according to the Engler system except that the Monocotyledons have been placed at the end.

After the **Preface** and the informative **Introduction,** there follow lists of basic and standard floras; synopsis of families **Roseceae** through **Umbelliferae** included in Volume 2; key to the families of Angispermae; explanatory notes on the text; detailed descriptions of families, subfamilies, genera and species. Available evidence from morphology, geography, ecology and cyto-genetics has been taken into consideration in delimiting the species and subspecies. The volume is completed with the four appendices; key to the abbreviations of authors names, titles of books, periodicals, and anonymous works, cited in the text; glossary of technical terms; an index; and five maps.

The editors and collaborators are to be congratulated on producing such an outstanding example of effective international cooperation in giving to the world this reliable and exceedingly useful work. It is very highly recommended to all interested in the most recent information about European vascular plants, including the professional plant scientist, the student of botany, and the amateur plantsman.

THE RIBOSOME, by A. S. Spirin and L. P. Gavrilova. Molecular Biology, Biochemistry & Biophysics Volume 4. Springer-Verlag, 175 5th Av., New York, N. Y. 10010. 1969. Pp. 161. Illus. $14.90. We are indebted to the Russian authors for this concise monograph which has its purpose "to formulate more or less generalized representations of the structure and function of the ribosome as we envision it at the present day. After an informative introduction dealing with the general scheme of protein synthesis, coding of information (the genetic code), storage and replication of the coded information, transfer of information, involvement of amino-acids in protein synthesis and synthesis of protein on the ribosome, the detailed discussion of the subject matter is grouped under two headings. Part 1 is concerned with the structure of the ribosome, and Part 2, with the functioning of the ribosome. The volume is completed with an ample bibliography and a subject index. This stimulating book is indispensable to all biologists, and is very highly recommended.

HORTUS CLIFFORTIANUS, by Carl Linnaeus. Folio. Amsterdam 1737 [1738]. Pp. [xxiv], x, iv, + 502 [16] + 36 plates. Facsimile Reprint, Verlag von J. Cramer, Postfach 48, Lehre, Germany. The reprinting of this early work is an important event. The main part of the book (pages 1 through 502) is devoted to a catalog of the plants in the Cliffort garden, arranged according to Linnaeus' **Genera Plantarum.** European as well as non-European plants are enumerated. Since this work pre-dates Linnaeus' **Species Plantarum** (1753), and the entries are cited in the later work, it is obvious that **Hortus Cliffortianus** is required in the interpretation of the species concerned.

The original folio volume is the most impressive of Linnaeus' works both in typography and the fine copper plate engravings. In addition to the baroque frontispiece by Wandelaar, there are 35 plates by Ehret and/or Wandelaar. The first two illustrate leaf forms, the rest portray plant species. These drawings are notable for the floral details, and they foreshadow the later period of botanical illustration that lasted to the middle of the 19th century. Verlag Cramer is to be complimented on reproducing the original work faithfully on high quality paper and in an excellent, durable cloth binding. It is a volume both for the collector of fine books and the active worker in plant science. All taxonomists should avail themselves of this opportunity to acquire this necessary work for ready reference. Very highly recommended.

RELIQUIAE BALDWINIANAE, compiled by William Darlington. Facsimile of the 1843 Edition. Introduction by Joseph Ewan. Four indices—of persons, plant names, etc. appended. Hafner Publ. Co., 31 E. 10th St., New York, N. Y. 10003. 1968. Pp. 347. Illus. $12.50. Subtitled, "Selections from the correspondence of the Late William Baldwin, M. D., Surgeon in the U. S. Navy", this is the biography of the short-lived Dr. Baldwin, who was endowed with a keen analytical mind and thorough painstaking habits. He traveled widely in the Carolinas, Georgia and Florida, and his letters, expertly edited by Darlington, furnish an interesting commentary on the botanical events, discoveries, personalities, places and frustrations of an era long past. We are indebted to the publishers for making available to us this valuable reconstruction of the past since only a limited number of copies were originally distributed. Very highly recommended.

**PLANT LIFE LIBRARY**—continued on page 48.

# 1. REGIONAL ACTIVITY AND EXHIBITIONS

## THE 1969 AMARYLLIS SHOWS

The Amaryllis Shows began in the latter part of March with the Corpus Christi Official Amaryllis Show, March 21, 22 and 23. Then followed the Official Amaryllis Show of the Greater New Orleans Area, April 12 and 13; the 1969 Houston Amaryllis Society Official Amaryllis Show, April 13; the Greater Houston Official Amaryllis Show on April 20; and the Southern California Official Amaryllis Show at Arcadia, California, on April 26 and 27. The Baton Rouge Amaryllis Garden Tour was held on April 27 in place of the regular show. No reports were received from Hattiesburg and Mobile.

## CORPUS CHRISTI OFFICIAL AMARYLLIS SHOW, 1969

Mrs. Carl C. Henny, *Schedule Chairman,*
*Corpus Christi, Texas 78404*

The Coastal Bend Amaryllis Society held its tenth annual Exhibit in conjunction with the Lola Forrester Flower Show in our Coliseum, on March 21st, 22nd and 23rd of this year. Weather conditions and an early date for our show prevented us from having a large number of amaryllis in bloom for our display.

Our "Pot Grown" section was very small, due to the Longshoreman's Strike, which prevented our members from receiving the amaryllis bulbs they had ordered from Ludwig and Co., Holland. Mrs. Carl Henny was fortunate in having 'Daintiness' (pot grown) in bloom, which scored 97 points, for which she received the Ludwig Challenge Trophy and an Award of Merit. Mrs. R. A. Hornberger received a "Special Achievement Award" for her 'Apple Blossom' cut scape, which scored 95 points. Mr. R. L. Retallack and Mr. W. M. Neyland received blue ribbons for their entries.

Mrs. Carl Henny also received a "Special Trophy" for receiving the greatest number of blue ribbons for her entries in the "Breeder's Class". The American Plant Life Society Award of Merit was given to Mrs. Henny and Mrs. Hornberger for their entries of 'Daintiness' and 'Apple Blossom'.

Non-Members receiving blue ribbons were Mrs. Guy Coffee, Mrs. Earl Jones, and Mrs. C. H. Van Scoy. A total of 12 blue ribbons, 5 red ribbons, and 2 gold ribbons were awarded for specimens displayed within our exhibit.

Mrs. Edward T. Story, Mrs. Larry Miller, and Mrs. R. H. Parkinson, National Accredited Amaryllis Judges from San Antonio, Texas, served as judges for our Exhibit.

# 1969 GREATER NEW ORLEANS OFFICIAL AMARYLLIS SHOW

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

Over eight hundred people viewed the 1969 Official Amaryllis Show held over the week-end of April 12th and 13th at the Lakeside Shopping Center Mall. Everyone was well pleased with the show location and the amaryllis display. This was the second year that the Garden Circle Amaryllis Club and the Men's Amaryllis Club of New Orleans joined together to sponsor a combined show. Mrs. W. J. Perrin was chairman of the Artistic Design section and Dr. Tim Calamari, Jr. chairman of Horticulture.

The Garden Circle handled the Artistic Design Section of the show which consisted of thirty-two invitational entries featuring amaryllis. Tri-color winner in the Artistic Design Division was Mrs. Gordon Morris. Winner in the Creativity Division was Mrs. William D. Grace. Silver trays were presented to both winners.


Figure 5. 1969 Greater New Orleans Amaryllis Show. Part of Exhibits.

The Men's Amaryllis Club sponsored the Horticulture Section in which over two hundred and sixty entries were made, with almost one hundred and sixty being pot plants. Milo Virgin and Albert Diermayer won top honors in the Horticulture Section. Mr. Virgin won the sweep-


Fig. 6. 1969 Greater New Orleans Amaryllis Show. Upper, Dr. Tim Calamari, Jr., Chairman, Horticulture Section; and Mrs. W. J. Perrin, Chairman, Artistic Design Section. *Lower,* part of exhibits, Artistic Design Section.

stakes ribbon for the most blue ribbons in the registered hybrid section, Ludwig Cup for the best Ludwig specimen (a Picotee Red Lining), the Swetman Trophy for the most blue ribbons overall, and the President's Trophy for the most blue ribbons won by a member of the Men's Amaryllis Club of New Orleans. Al Diermayer won the sweepstakes ribbon in the non-registered hybrid section, the Latapie Trophy for the best registered specimen (a 'Maria Callas'), the Mahan Award for the second best registered specimen ('Flamboyant'), and the Clements Trophy for the best non-registered specimen. Miss Ann Weed was winner of the Southern Seed and Popcorn Company Trophy for the best specimen in the breeder's class. Vincent Peuler won the Edward F. Authement Memorial Trophy for the second best non-registered specimen. Florence Autry received the Reuter Seed Company Award for the best cut specimen (an outstanding *A. johnsonii*). Dr. Tim Calamari, Jr. won a special trophy for the best single floret ('Margaret Rose'). Amaryllis Society Awards went to Al Diermayer, Milo Virgin, Ann Weed and W. J. Perrin.

Perhaps the most impressive and memorable aspect of the show was the enthusiastic and genuine cooperation between the members of both clubs in the planning, staging and dismantling. Most everyone who viewed the show agreed that this cooperation resulted in an amaryllis show which was in every respect a real success.

## 1969 HOUSTON AMARYLLIS SOCIETY OFFICIAL SHOW

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

The Houston Amaryllis Society Show on April 13, 1969 has passed into history. The 1969 season was one well worth noting. Old man weather paid us a visit in February with warm spring sunshine. But, through March the season was marred by cold, wet weather which resulted in short scapes and injured blooms. However, we discovered that this same phenomenon existed over the entire area.

The "poor Amaryllis season" everyone talked about still produced myriads of flowers and many beautiful show specimens. A section presenting the professional arrangements as a distinctive entry (not in competition with the horticulture division) and special educational exhibits have developed a growing interest in the dazzling beauty of today's modern arrangements.

In competitive horticulture, the Amaryllis Judges awarded the American Plant Life Society awards of Merit to Mrs. Tracy Word, Mrs. Ward Blair, and Mrs. A. F. Lagatski. Dr. E. M. Yeats received preliminary commendations for seedlings.

# GREATER HOUSTON OFFICIAL AMARYLLIS SHOW, 1969

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

Colorama—Could there be a better way to describe the brightness of the amaryllis? Color was splashed throughout the Houston Garden Center where hundreds of visitors viewed the Greater Houston Amaryllis Club's Sixth show on Sunday, April 20, 1969.

The "Color Splash" was immediately brought to the attention of the visitors by three huge six foot artist's palettes on the main stage and entrance of the Center. The Staging Committee headed by Mrs. C. R. Mercer with Mrs. Chas. H. Pease and Mrs. Glen Melton, cleverly substituted mammoth colorful amaryllis for the paint pots, making a very effective display.

Mrs. W. S. Wheeler, Entries Chairman said she was very pleased that the members brought in such a nice assortment of specimens, with so many different amaryllid family specimens to show, such as clivias, various doubles and species.

Again this year there were many seedlings entered and competition was keen for A Preliminary Commendation given by the American Amaryllis Society, affiliated with the American Plant Life Society. The novice hybridizers are not only developing beautiful blossoms, but a hardier stock by crossing the Dutch and amaryllis from other countries with some of our better American strains. These crosses are better conditioned to combat the problems that some of us have with the Dutch bulbs that are overly forced and produce well only the first year.

Also, the Invitational Section had outstanding entries. Mr. Randolph Lorio won the silver trophy with an almost faultless four blossom specimen and was delighted to learn the silver dish was a permanent possession.

Despite the color on the display tables, visitors were drawn to the trophy table to view the top winners, as follows:

Mrs. Sally Fox won the Greater Houston Amaryllis Club silver tray for an outstanding specimen 'Beacon' which had five open florets. Mrs. Anna Heesche's 'Trixie' won the Ludwig Challenge Cup. Mrs. Clint R. Black was presented a silver covered dish for 'Sparkling Gem', a miniature. All of the above were presented with Award of Merit from the American Amaryllis Society. Mrs. John Ellett had the best American specimen in the show and won a silver dish.

Mrs. R. A. Fawcett's large rose shaded seedling of Dutch parentage won a silver shell. She was presented a Preliminary Commendation Award from the American Amaryllis Society. Mr. Kermit L. Warnasch won a silver tray for Sweepstakes with ten blue ribbons. All classes were judged by official amaryllis judges selected by Chairman, Mrs. Clint R. Black.

The Educational Exhibit consisted of methods of propagation from

seed to clone; and vegetative reproduction. This section was capably handled by Mr. Kermit L. Warnasch who answered many questions to interested visitors.

Mrs. W. J. Snow acted as Arrangements Chairman and commented on how many ways the members used amaryllis to make outstanding arrangements. These were not judged and merely added beauty and color to the show. Mrs. John Ellett is President of the Greater Houston Amaryllis Club. She assisted the Show Chairman, Mrs. Sally Fox, and both felt this was an outstanding show with goal fulfilled—"promoting interest in growing amaryllis". Color lovers—Amaryllis lovers—A great Synonym!

## SOUTHERN CALIFORNIA OFFICIAL AMARYLLIS SHOW, 1969

JOE WERLING, *Show Chairman,*
*5139 Hermosa Av., Los Angeles, California 90041*

Our show was held at the Los Angeles County and State Arboretum on April 26 and 27, located at 301 N. Baldwin Ave., Arcadia, California. The theme this year was "Fantasy in Flowers."

The great majority of exhibitors grow amaryllis in the open ground. So many of us spent many spare hours "coaxing" our bulbs to send up their flower scapes in proper time to make the show dates. With our combined efforts we searched all over Southern California to have enough flowers to make a good showing. We certainly did not have an abundance of flowers, but as the "show must go on" we hope that in our own small way we may have provided encouragement for others to participate in our next year's show. Considering weather and availability of flowers our show was a very presentable display.

Now to the awards: Sweepstakes—S. S. Harsbarger; Runner-up—V. R. Fesmire; Best Gracilis—S. S. Harbarger; Best Seedling (hybridizer's class)—Quinn Buck; Runner-up—Mrs. Scott; Popularity Poll Winner—Dr. Martha Kohl; Special Award for species—L. Doran; Special Award for vase of cut flowers—Dr. Martha Kohl—probably a Richard Diener hybrid; Special Award for cut flowers—E. A. Angell.

The jewels of our exhibition were a collection several species from South America by J. Leonard Doran, 1117 N. Beachwood Dr., Burbank, California. Following is a brief description: First, a No. 52—*A. belladonna* collected in Pucayaca, Peru. It was a rose tone which is unique for *A. belladonna;* Secondly, *A. pardina,* spotted, collected in Bolivia; Third, unidentified species (?) collected at Caragutatuba, Brazil—a flaming orange; Fourth, *A. flammigera* collected in Argentina; Fifth, *A. reginae,* a bright red flower, unknown, was collected in the mountains in the western part of Espirito, Santos, Brazil.

Ed Pencall's seedlings in the large containers made a spectacular display.

The certified judges that served for this show were Polly Anderson, Roger Fesmire, Quinn Buck, Eva Turnquist, Gladys Williams and Jack McCaskill.

We are indebted to the following members who so graciously worked long hours making our show a success: Mr. & Mrs. Harshbarger, Eva Turnquist, Mr. & Mrs. Roger Fesmire, I. K. Rosoff, August Phillips, Ed Pencall, John Vosburg, Irma & Joe Werling, Dr. Spearman, the Cochrans, the Dorans and Mrs. Welbourne. Also, we want to congratulate

Fig. 7. 1969 Southern California Amaryllis Show. Upper, part of exhibits; and *Lower,* trophies awarded at the show. Photo by Jack McCaskill.

Quinn Buck for receiving the William Herbert Medal for 1969. This award was given for his outstanding contributions in amaryllis and tetraploid daylilies hybridizing.

## 1969 BATON ROUGE AMARYLLIS GARDEN TOUR

FRED BUCHMANN, *1766 Avondale Drive, Baton Rouge, Louisiana 70808*

For 1969 the Baton Rouge Amaryllis Society decided not to have an official show but to have a garden tour instead. On Sunday afternoon, April 27, the gardens on tour were at the homes of Mrs. T. K. McKnight who has many thousands of large-flowered hybrid *Amaryllis* seedlings growing outdoors; Mr. and Mrs. Ed Beckham who have many seedlings and also most of the recent Dutch introductions growing both outdoors and in a greenhouse; and Mr. and Mrs. Fred Buchmann where species hybridizing has been emphasized. While considerable informal

visiting takes place among several members of the group, this was an occasion when all members could visit and discuss conditions of culture, methods of propagation, hybridizing theories and objectives in hybridizing. The tour was leisurely, informal and enjoyed by all. A great many more interesting flowers were viewed than at a show where only those specimens in near perfect condition are on display.

## GUIDELINES FOR OFFICIAL AMARYLLIS SHOWS

Mrs. A. C. Pickard, *Houston, Texas*
*Amaryllis Instructor for Judging Schools*

By growing, knowing, showing and sharing through flower shows, we add to the beautification and human relationships in the dynamic growth of our communities and its therapeutic value. These shows are attended by an enthusiastic public to obtain education in horticulture.

In order to insure the further growth of this movement, much time and thought will have to be devoted to the organization and improvement of many of the individual shows. The fundamental purpose of an exhibit is to acquaint Mr. Stranger with the plant family and to intrigue him into growing plants himself. We often fail to get the fullest joys from our plants simply because we do not know how to truly share our interests and enthusiasm with others. But, you cannot do the job properly without intelligent preparation.

What makes a good Society? Maybe it is a real good President. Maybe it is a good board of Officers. Maybe it is the fact that we sponsor the prettiest flower show in the widest range of color you have ever seen. You may have all of these things, but if you do not have enthusiastic members, you do not progress.

Appointment of Committees: The first step in flower show preparation is the appointment of the general committee by the President of the organization sponsoring the show. This General Committee serves as the nucleus that directs the multiple activities of planning and staging a show. The individual selected as Chairman should be energetic, diplomatic, dependable, and have executive ability and general knowledge of the organization.

The Schedule: Within the limits prescribed by the A.A.S. Show rules, the schedule is the law of the show. Yet, so many schedules are silent on so many important points that bitter arguments and misunderstandings frequently arise. Unfortunately, many committees write their current schedule simply by copying the one used last year, which in turn was a duplicate of the one used the year before. Or copy from some sister organization that created potential problems obviously problems for one show will not necessarily be the same for all others.

The filing of the schedule with the chairman is a necessary first step for approval. Each show schedule must provide for horticultural sections of all 9 divisions of registered Amaryllis cultivars. Cut specimens and pot plants set up in their respective classes. Sections and

classes for non registered plants. The show schedule should provide for the following divisions: seedlings, educational, artistic, junior, corsage classes. Collection classes are encouraged. Commercial exhibits or displays may be entered in the Commercial Division. The local show committee is the final judge as to the commercial status of a grower. Most commercial growers prefer not to compete because of the ethics of the Society. Shows which limit competition in the horticultural division to amateurs should provide the opportunity for the commercial grower to be awarded special awards.

Because of the added attraction and artistic value, plant society shows welcome entries by arrangers. An Amaryllis must be used in all arrangements for competition. Some shows get along very well without limiting competition regardless of whether they are professional or trained amateurs. But, often it is desirable in the schedule to provide special classes for advanced or members of expert groups with appropriate definitions as to the status of *Novice, Amateur* or *Advanced Amateur.*

Art and Craft Exhibit is a fairly new feature designed to stimulate more interest in the use of Amaryllis. Some suggestions to work with in this category are oils, water colors, dry brush, etc. These can be done in any form or design in which the Amaryllis flower is recognizable. Space allotted to each group will depend on the type and interest expressed. Participation in this exhibit open to A.A.S. members and separate class for non-members. So, don't withhold your talents.

Corsage Class: Because of needed flexibility to meet the demands of progress in shows, appropriate corsages can be made from almost any Amaryllis flower. Miniature Amaryllis flowers predominating gain distinction and individuality through skillful handling of material selected. The following suggested classes are adaptable for Amaryllis shows: (1) Corsage, open class, no specified occasion or costume. Fresh Amaryllis flower predominating; (2) Corsage: A. Tailored B. Informal C. Formal.

A corsage is judged according to the same elements and principles of design as are applied to all other arts. Such a class may be provided "For Exhibit Only" by members of the society to add beauty and prestige to the show.

Some societies support a Junior division, others do not. Its use is approved only by using the same rules as those approved by the sponsoring society. The division may be sub-divided into age groups and all exhibits in the horticultural division must have been grown by the exhibitor whose name appears on the entry card.

Educational Exhibit: The educational committee should be prepared to undertake this task. The separate displays need only specific differences involved in hybridizing Amaryllis.

(1) Insect or self pollination and plants resulting from hand pollinated seed. The display should be labeled H.P. and if pollen from the same plant (self), if from a sister seedling, (sib).

(2) Display methods of propagation showing life cycle of Amaryllis from seed to clone with parent and offspring.

(3) Vegetative or Asexual propagation. This term applied to the propagation of the plant from parts other than seeds and the plants reproduced possesses exactly the same characteristics as the parent plant. Methods of display and demonstration are: A. Cuttage of bulb into many sections; B. Scoring the basal plate; C. Scooping the center.

Educational exhibits should be in an area where people may mingle, discuss and study them.

The most successful show depends a great deal on the personal touch of the members. Extend the welcome hand to a prospective member by including in the schedule the Invitational Classes. Shows are the best method of interesting newcomers and present the fascinating activities of growing beautiful Amaryllis.

We have found Amaryllis lovers drive great distances every year from the far corners of our State and adjacent states. They come with note books and jot down varieties they like. Many who visit shows are aged or are apartment dwellers, having no need to grow the plant but come merely to visually enjoy the beautiful flowers since their circumstances restrict their growing. To inspire and educate such ambitious spectators is bound to have a long range effect upon the beauty of your community.

Distribute copies of the schedule as far ahead of the growing season as possible. Explanation of some of the terms used in the schedule are necessary for proper interpretation. By providing programs in cultural practices far in advance, members will be encouraged and better prepared to stage a first class show.

Show time: It's show time and entry day is near. Many people will have the fun of winning the Award of Merit including blue ribbons. This pleasure will be fourfold. Not for the prizes won, but for the joy of growing, knowing, showing and sharing.

Lucky is the gardener whose garden peaks at show time. Timing that one prize bloom for the show is a gamble. All of us have seen great beauties come on too early or bloom too late for the show. Nothing can be done about Old Man Weather but some caution can be taken by planting bulbs at different dates or if garden grown bulbs are planted in different locations. Refrigeration can be used to great advantage to hold back buds for a week or more. They should be cut just before the floret opens, wrapped gently and placed carefully in the refrigerator with temperature not to exceed 50 degrees. Remove about three days prior to the show, wrap the end of the scape with a rubber band in order to hold the length of scape and place in 2 to 3 inches of water in a container sufficient in height to hold the scape erect. Bring the specimen gradually to light in a warm room to expand the florets.

Warm temperature hastens blooms and cool temperature will retard. If you decide to enter the specimen just the day before, cut your specimens early in the morning. Select specimens in prime stage of development. It is worthwhile one week before show time to spot potential entries. If the bottom of scapes are cut straight across, it

will help keep the scape upright. If wide mouth bottles are used, a wad of florist clay may be used to hold the scape in an upright position.

Exhibit the potted specimen in a clean unadorned pot—clay pot preferred. Do not wrap with foil as the brightness detracts from the flower color. Stakes are permissible if necessary to hold the scape. No deduction if not discernible. The removal of anthers is allowable and no deduction made for doing so if so stated in the schedule.

It is better to remove all spent florets and scape from the plant as they detract from the open florets. Remove any residue from the foliage. Grooming of the specimen is entirely up to the exhibitor. Amaryllis flowers must stretch for a few hours after opening to attain full size. If this much time has not elapsed the flower will look stiff and not fully matured.

Labeling Entries: Encourage exhibitors to label adequately using Registration number, name and division if possible. Labeling should be done well in advance of the show date and should be large enough to insure visibility. This will remain until the specimen is entered in the show and transferred to entry card placed with specimen. Advise beginners how to transport entries by giving suggestions. Carry specimens in tip proof containers. A small amount of water will keep specimens fresh. Leave plenty of room between exhibits to prevent damage. Protect florets from wind and weather. Label all specimens with your name. Write legibly in case someone is helping you get your entries in place. It is a time saver. The person exhibiting should arrive at the show place in ample time to get his entries through classification and entry channels before the last minute deadline.

How about Trophies? We know that exhibitors make the show and to encourage them the necessary bait—Trophies. They are donated by membership and friends. One of a plant lovers most heart warming experiences is to find the judges have included his plant among the awards.

Classification and Placement: With the schedule, classification and placement go hand in hand. Rapid and efficient placement can be the most important part in getting the show on the road for judging. There will always be problems in classifying and placing and a tremendous amount of information must be completed before the show is opened to the public.

Complete final duties as part of the horticulture committee by eliminating classes in which no entries were received and rearrange the tables in order to use the voids to create a more pleasing over all look. There is no way of knowing in advance how much table space to allocate for each class. Classes may be combined or further divided in the interest of adequate or better judging. Now the entries are accurately classified and ready for the Amaryllis official judges.

After the awards are made, the clerks can attach the ribbons to the entry cards. Hostesses should serve in shifts in each section of the show. They give information, answer questions and lead conversations

to educate people about Amaryllis. The Hostesses police the show and guard the property of the exhibitors.

The Publicity Committee: The Publicity Committee's work should begin long before the opening of the show by submitting publications to the newspapers. Immediately following the show, obtain the results and give a brief story including outstanding exhibits. Award winners should be mentioned, giving names. Announce names of the Judges after the show, never before.

Grow as many Amaryllis as you can, learn as much about their culture as possible, join the Plant Society where more information is available, and above all have fun growing and showing Amaryllis.

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**PLANT LIFE LIBRARY**—continued from page 36.

RHODODENDRONS AND AZALEAS, by the Sunset Editors. Lane Books, Menlo Park, Calif. 94025. 1969. Pp. 80. Illus. $1.95. This profusely illustrated, easy to read complete guide to the selection and growing of Rhododendrons and Azaleas will be welcomed. The topics discussed include "Meet the Rhododendron clan"; how Rhododendrons and Azaleas grow; requirements for success; trouble shooting your plants' problems; their use in the landscape; container plants; guiding your plants' development; propagation; shopping for the plants, and Index. Highly recommended to all gardeners.

BRITISH MOSSES AND LIVERWORTS. 2nd ed., by E. Vernon Watson. Cambridge University Press, 32 E. 57th St., New York, N. Y. 10022. 1968. Pp. 495. Illus. $13.00. This second edition of a standard reference work will be welcomed. Full descriptions and ecological details of over 200 of the common or more notable species are illustrated to show the diagnostic microscopic and macroscopic features, and also brief notes on many other species are given. An introduction to the general characteristics of the bryophytes, and the simple terminology, make it possible for the beginner to use the book. The keys and habitat lists will be invaluable to the beginner and the specialist. Very highly recommended to all interested in the mosses and liverworts.

THE PHYSIOLOGICAL ASPECTS OF PHOTOSYNTHESIS, by O. V. S. Heath. Stanford University Press, Stanford, Calif. 1969. Pp. 310. Illus. $8.50. The recent outstanding advances made in the chemical aspects of photosynthesis based mainly on experiments with unicellular organisms has led to a relative neglect of its physiology. To repair this imbalance, the author has drawn on experiments dealing with photosynthesis by leaves of higher plants whenever possible. Part 1, the photosynthetic system deals with chloroplasts and their pigments, and the diffusion paths. Part 2, with the physiology of photosynthesis. These summaries of recent and current research findings constitute a much needed work of reference. Very highly recommended.

THEORIES ON THE NATURE OF LIFE, by Giovanni Blandino. Philosophical Library, 15 E. 40th St., New York, N. Y. 10016. 1969. Pp. 374. Illus. $6.00. In the first part, the author attempts to present objectively the formal thought and investigation into the nature of life. In the second part, he advances his own opinion on the nature of life. In the third part, he presents appendices on problems about chance hypotheses and evolution, and the problem of cybernetics. Highly recommended.

**PLANT LIFE LIBRARY**—continued on page 69.

# 2. LINEAGICS

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

## COLLECTING SOUTH AMERICAN AMARYLLIDS, 1964—1968

J. L. DORAN, *1117 N. Beachwood Dr., Burbank, California 91502*

Having been interested in amaryllis for many years I finally became aware of the species, the acquisition of which has become an obsession. I have acquired them in any possible way. The object is to develop a pool of germ plasm to enable the hybridizers to further produce new and more novel colors, patterns, and conformation, inasmuch as the Dutch have probably reached the limit with the few species involved in the Dutch hybrids.

The first trip was to central Peru in 1964. Next across the Caribbean and into Brasil in 1965. In 1966, we went thru a corner of Brasil and into northern Argentina. In 1967, we visited Central Bolivia and another area of Peru. In 1968 Central Brasil, across Paraguay and into northwest Argentina. These trips involved 100,000 miles of air travel and many miles by bus, truck, canoe, boat, and afoot. Generally, amaryllis only grow in inaccessible places. I found a very beautiful form of *A. psittacina* in an island-like shelf in the middle of a waterfall.

The most interesting acquisitions are:

| Col. No. | Date | Habitat, Etc. |
|---|---|---|
| | 1964 | |
| D-5 | Aug. | *Cr. erubescens* 2½ miles east of the Tinga María bridge in swampy muck soil, el. 2000 ft. |
| D-7 | Aug. | Miniature *A. belladonna* west slope of the Cordillera Central, near the road between Tinga María and Pucalpa, about 10 miles west of El Boacrón de Padre Abat in sticky red clay soil, el. 7000 ft. |
| D-9 | Aug. | Miniature *Eucharis* near El Bocaron de Padre Abat. |
| D-10 | Sept. | *A. reginae* near Huinco, el. 1200 ft. |
| D-11 | Sept. | *A. vittata* (Traub 1084 a-b) near Huicongo. Has very ruffled petal edges. |
| D-14 | Sept. | *A. belladonna* salmon pink, small near Huayabamba river. |
| D-17 | Sept. | *Hymenocallis* with yellow flower near Huallaga river. |
| | 1965 | |
| D-22 | Sept. | Rose trumpet amaryllis on island in estuary of Rio Oronoco, el. 100 ft. approx. |
| D-25 | Oct. | *Amaryllis* sp. with small flowers and narrow petal, Fa- |

zenta São Sabasteão, el. 2900 ft., dry forest, deep residual soil.

D-27 Nov. *Hymenocallis amancaes* near Akebono, Peru in dry sandy loam, el. 100 ft.

1966

D-32 Oct. Amaryllid, a very bright orange flower in sand in swamps near Coraguatatuba, Brasil, el. 100 ft.

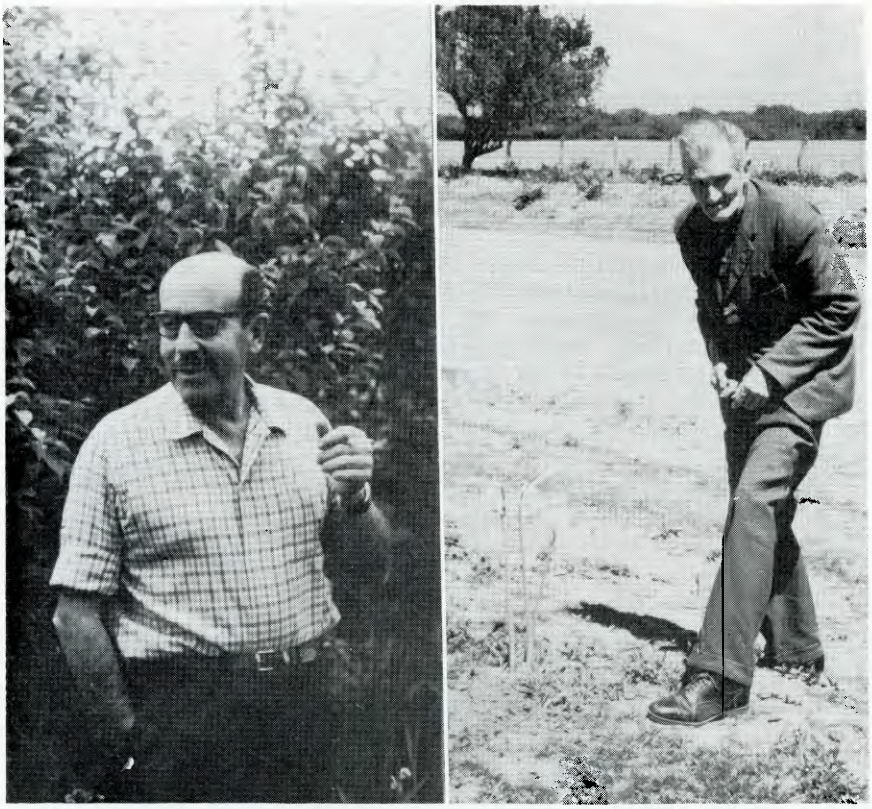

Fig. 8. Left, Dr. Carlos Gomez Ruppel in his garden, Mendoza, Argentina. Right, Sr. Alejo Moris at the site, in front of him, where the plant, *Amaryllis tucumana* or *A. immaculata* was found, a few miles north of El Galpón, Argentina, near the 25 S. latitude on the map (see Fig. 11). Photos by J. L. Doran.

D-34 Oct. Possibly *A. flammigera* 50 Km. north of Foz de Iguasu in heavy red soil in shade.

D-36 Oct. *A. aglaiae* on road to Tafi del Valle, el. 1050 meters open shade, moist loam.

Fig. 9. *Amaryllis aglaiae* Castellanos, growing near Meseta de Acucena on the road between Acheral and Tafi del Valle. Upper left, light yellow form; upper right, red form; Lower, group of the yellow and red forms. Photos by J. L. Doran.

D-40 Oct. 1967 *A. ambigua* in full sun, flat valley, north of Córdoba.

D-44 Oct. *Chlidanthus boliviensis* north of Cochabamba, el. 11,000 ft. in gray clay soil on steep slopes.

D-46 Oct. *A. pardina* (?) or hybrid south of Santa Cruz, Bol., in newly cleared forest land, el. 1500 ft.

Fig. 10. Wall of canyon, habitat of *Amaryllis aglaiae*. Same location as indicated in Fig. 9. Photo by J. L. Doran.

D-49 Oct. *A. vittata* (?) or natural hybrid, tyrian purple color across petals 35 miles west of Santa Cruz in sandy, dry, barren hills, el. 2600 ft.

D-52 Oct. 1968 *A. belladonna,* roseine purple in shade 6 km. south of Tarapota, Peru and 1 km. east of road of Juan Guerrera.

D-59 Oct. *A. fosteri* 8 km. north of Amargosa, Brasil in sun in edge of heavy brush thickets in dry loam.

D-61 Oct. *A. reginae* between Arcacé and Piedra Azul Espirito Santos, Brasil.

D-64 Nov. *A. tucumana* (?) 11 km. north of El Galpón, Argentina in heavy, moist clay soil.

D-66 Nov. *A. aglaiae* (?) red form 36 km. from Acheral on road to Tafi del Valle at Meseta de acucena at 1200 meters in meadows in heavy shade in grey, loam soil.


Fig. 11. Map of Northwestern Argentina, the area is rich in *Amaryllis* species—*A. parodii* at Villa de Maria, Rosario de la Frontera, Salta; *A. belladonna* L. at Oran; *A. immaculata* at Tumbaya; *A. tucumana* (?) near El Galpón; *A. aglaiae* near Tafi del Valle, etc.

Fortunately No. 61 bloomed this spring and it was an *A. reginae* exactly like the one (#10) found earlier in Peru. Nearly 2,000 miles apart! No. 22 is an outstanding flower, large blossoms from very small bulbs, if this should be a new species and can be crossed with the trum-

pets from Argentina and Bolivia it should produce some interesting seedlings. No. 25, *A. santacatarina, A. flammigera* and *A. argilagae* are very similar. No. 27, *H. amancaes* grows along the coast of Peru, which is a desolate desert with no rainfall, but in a few tiny spots of a few acres, they get up to 5 inches of rain a year. Here the bulbs are found 6 inches deep with the roots growing up through the tunics to near the surface where the soil is moist. No. 32 may be a contribution to brighter orange flowers. No. 49 is an outstanding flower very similar to *A. vittata* var. *vittata* but does not have a white keel and the coloration is a tyrian purple. No. 52 could add a new color tone to hybrids—as a species it is outstandingly beautiful. When we inquired about *A. aglaiae* we were told that someone had pastured hogs in the area where we had collected them before, the hogs had destroyed them all. (Fig. 9) We went farther into the mountains and found an area covered with them. This area was forested with large spreading trees containing many bromeliads and orchids which were in bloom. The ground was shaded but was covered with fuschias and ferns. The area was typical of a cold rain forest, very damp and cool. The red and cream colored forms grew together (see Fig. 12).

#64, *A. tucumana* (?) the large bulbs of this were 7½ inches in diameter. We had to send for a shovel to dig them.

When we decided to try to collect *A. fosteri* for re-introduction, we wrote Mulford Foster for more information. Although his instructions proved adequate, it seemed impossible to obtain much information. Friends in Brasil did forward a map and some information but it seemed like a "wild goose chase." Going inland from Salvador by bus, we left the tropical rainy area and entered a dry desert country, covered with thorn bush, cactus, harsh bromeliads, and thorny palms. This thorn covered "horror" was so dense in places that it could not be penetrated. We were told that the rains would come in 5 to 6 weeks, for this reason I did not expect to find *A. fosteri,* believing that it would bloom and grow after the rains. My guides did not understand what I was looking for and were of no help. I found no sign of *Amaryllis.* After several hours of criss-crossing the area west of Amargosa looking for dry leaves, I came upon it in full bloom. Once Antonio knew what we were looking for he knew where to find more. Seventeen scapes were collected with 93 flowers, average of 5½ with 4 the least and 8 the most per scape. The diameter of the largest bulb was 8 cm. The smallest blooming bulb was 3.2 cm. diameter. Bulbs as small as 2 cm. diameter were found with well developed rhizomes. Rhizomes were produced as in other species *but in another manner,* the rhizome grew off the root plate and came out of the side of the bulb by penetrating the scales (see Fig. 13). All bulbs had a well developed root system although the soil was very dry. There was no hint of new leaves. Seed pods were 3½ cm. diameter by 2½ long. Pods were observed that were nearly ripe and bulbs were found with a scape just starting, but

Fig. 12. Upper, *Amaryllis tucumana,* found a few miles north of El Galpón, Argentina, growing at the edge of a pasture. Lower right, *Amaryllis fosteri,* area near Paraizu, Brasil (see Fig. 11). Lower left, helpers standing back of a plant of *A.* fosteri, same general location. Photos by J. L. Doran.

the seed should have been ripe before or shortly after the rains start. The color of flowers found growing in the sun was closer to China Rose HCC 024/2 than a salmon pink.

Referring to the map (Fig. 11) of northwest Argentina: The holotype of *A. parodii* was found between Villa de Maria and Ojo de Agua. *A. ambigua* is found between Cordoba and Jesus Maria. *A. belladonna* is found near Oran. A different form of *A. parodii* or a new species is found near Salta and another type east of Rosario de la Frontera.

We plan to make another trip in November and December 1969.

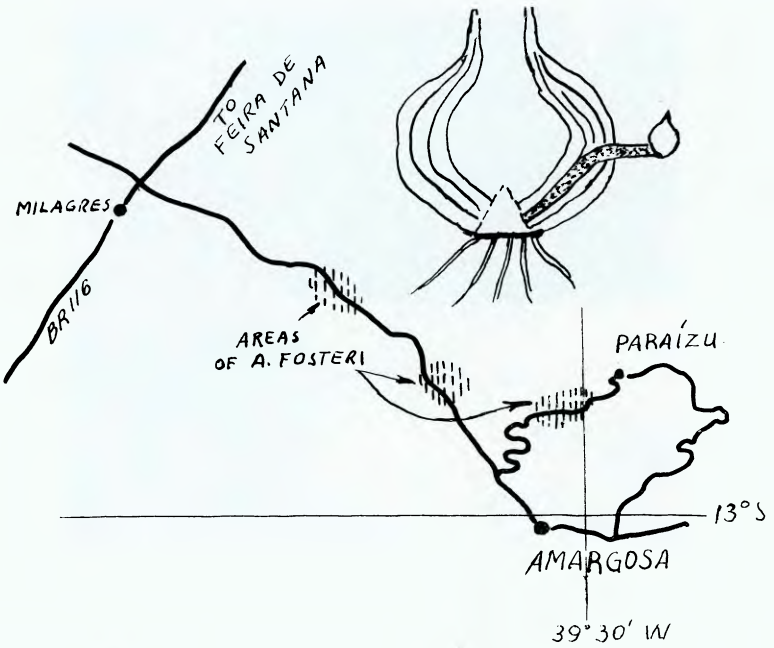


Fig. 13. Map showing the areas where, *Amaryllis fosteri* grows, about 110 Km. (by road about 280 Km.) west of Salvador, State of Bahia, Brasil. Upper right, sketch showing how *A. fosteri* produces rhizomes.

## MAY-JUNE 1969 COLLECTION TRIPS

C. G. Ruppel, *Mendoza, Argentina*

After several days on the go, I arrived on the 26 May in Salta which is in Northern Argentina. Already I had gotten two big *A. belladonna* "*minor*" bulbs which is a valuable miniature. But as it lacks hardiness in the heavier frosty zones, it must be constantly renewed at Mendoza in order that one can see it bloom. Amongst its strong points are: (1) In itself, it is a desirable miniature, (2) It sets seeds freely and (3) It

crosses and since it does, and as the following are all frost resistant in my area, the following could give some of that desired hardiness as in the *A. belladonna "minor"* x *A. aglaiae, A. b. "minor"* x *A.* species *"Red Cochuna"* and also in *A. b. "minor"* x *A.* sp. *"Yanellosianum"*. Further work would be necessary to select out that which retain the desirable characteristics of the *Amaryllis belladonna "minor"* type.

After leaving here, I intend to go to Posadas, Misiones to plant some *Heliconia* spp. rhizomes (Musaceae) as the climate back-home in Mendoza is too cool for their rapid growth altho they are hardy there. Here with its tropically warm, humid climate and the right soil, the *Heliconia* spp. rhizomes will multiply much more rapidly for me. Also, I've set my mind to go to Santo Tomé, Corrientes to seek for more bulbs of *Amaryllis* sp. *"Mrs. Sosa"* and of *Amaryllis angustifolia.*

On the way from Salto to Posadas, I received some most intriguing information. For I was told that near Rosaria de la Frontera, there grows an *Amaryllis* species with a long trumpet, white and red stripe in color, the flowers are many and fragrant too. Could this be the home-grounds of the species, *Amaryllis ambiguum?*

On arriving on June 1st at Posadas, Misiones, the persistent rainfall hindered any but the shortest of trips. Luck was with me though. For on one of these short jaunts, a cherished lost plant was found again. Now, *Aloysia virgara* (syn. *Lippia* in the *Verbenaceae*) is a showy low bush with local name of "Niño Urupá". It has dense dark green foliage, bears myriads of long white single racemes of flowers which are sweetly vanilla-scented and bears them from late spring to frost! Here, getting it from the wilds, I could study its habitat and its needs so that I could give it the right care this time at home and not lose it thru ignorance.

Before one can leave for Santo Tomé, near Posadas, the weather must clear first as the heavy rain makes the roads impassable and I'm left helpless to get to the place to obtaining more bulbs of *Amaryllis angustifolia.* But finally, good weather came and I arrived on the 3rd of June in Santo Tomé. So I was able to reach the swamps where *Amaryllis angustifolia* grows deeply imbedded in the muck with water on top. After hard work, a half-dozen mature bulbs were gotten out. A hundred bulbs would have been fine but they are rather scarce and they are difficult to dig. For the bulbs have very long necks—25 to 30 cms—(10″ to 12″) which are covered to the base of the leaves by water and the stirring up of the sticky mud further makes the task troublesome to do.

Fortunately, this species bloomed for Mr. Paul H. Williams, Jr. of Fort Worth, Texas this year. It had an amazing scape which bore 9 red flowers. To say more, I would rob Mr. Williams' article which he plans to write for publication in PLANT LIFE. This I'm sure the *Amaryllis* fans will appreciate.

Unluckily, there were no bulbs to be had at this time of the *Amaryllis* sp. *"Mrs. Sosa"* which has a long green chartreuse trumpet and is evergreen.

Also while I was in Santo Tomé, there occurred the unhappy event of losing Mr. Pablo Argilaga (see the 1967 PLANT LIFE) from a heart attack. I'll miss him very much for he was not only a fine gentleman and a fine friend but also one who helped me a great deal in searching out for amaryllids and the like.

## TWO BRASILIAN **AMARYLLIS** SPECIES

HARRY BLOSSFELD, *Rua Pedro 336, Tremembe da Cantareira, São Paulo, Brasil*

### **AMARYLLIS AULICA** KER-GAWLER

*Habitat and behavior*: Collected in forest of Cantareira Mountains, north of São Paulo City, in Brazil, at 3000 feet altitude, epiphytic. A large clump of bulbs grew attached to a bow of a woody bignoniaceous liana stretched between two huge trees standing on a steep slope. The clump had about ten peduncles, each bearing two or four open flowers, the whole looked from a distance like a scarlet umbrella swinging in the air. It was an unforgettable sight.

The species flowers in late fall to mid-winter, a good bulb generally producing two peduncles, with two or four flowers each. The plants lose their leaves here in Brazil in March, and quite reluctantly, and already in April appear the tips of flower sheaths on the bare bulb. While these are growing slowly, the new leaves come out vigorously and when the buds break through the sheath, the plant has already all its leaves completely developed to final size.

Due to the blooming period being in the cool winter season, the flowers last a long time and may remain in perfect condition during 20 days; this species has the best lasting qualities of all species and hybrids in the author's collection and being out-of-the-season, it always attracts much attention in our lath house.

It is of easiest possible cultivation and will stand almost any type of neglect, but it is sensitive to excessive watering in fall, while the leaves drop or while it is bare. It will, however, endure drought and poor soil and may be kept two or three years in the same pot without fertilizer and still will bloom. It enjoys a light, porous soil, with some orchid fibre mixed in and when the growth starts, an occasional application of a weak solution of chicken manure will produce a decided increase of vigor and blooming.

*Description: Bulb* 7.5 to 10 cm in diameter, pear shaped, producing a sucker every other year. Covered by brown tunics and in natural conditions, mostly above the soil or moss, not buried. *Leaves* on strong bulbs from 6 to 10, about 50 cm long and 5 cm broad, tapering to both ends, with a blunt tip; at base very slightly flushed with purple and decidedly keeled. Apical half almost flat above, but with a prominent rounded keel below. The surface appears opaque by about 40 minute longitudinal fluted veins. The foliage remains about 11 months on the bulb.

*Peduncle* one to four per bulb, in late fall, starting simultaneously

with leaf growth; stem hollow, sub-cylindric, up to 50 cm long, at base 2 cm diameter, tapering to 1.3 cm at tip, where it becomes oval, flattening into a two-valved sheath, 7.5 to 10 cm long. *Spathe valves* wilting while buds open, about 7.5 cm long and 1.8 to 2.1 cm broad at base, becoming straw coloured and finally clear brown. *Bracteoles* two to four, 4.3 cm long and at base, 6 mm broad, triangular in shape. *Pedicel* cylindric, plain green, 3.7 cm long when flowers open, but stretching to over 8 cm length when the pods approach ripeness. Diameter 0.9 cm. *Ovary* with a darker green colour, 1.5 cm long, somewhat trigonous and set at a 45° angle to pedicel, so that the flowers open in a horizontal position. After fertilization, the ovary joint straightens, so that the pods bear the wilted remains of the flower atop.

*Flowers* on good sized bulbs, four to an umbel, each measuring 15 cm in diameter, all segments being bright crimson, with purple reticulations; perigone about 12.5 cm long. Segments quite different in shape, giving the flower a very peculiar form, that remembers of an orchid blossom. *Outer segments* 12.5 cm long and 1.8 to 2.5 cm broad, the uppermost broadest and straight, the others narrower and slightly falcate. On their back is a prominent greenish keel ending into a greenish appendageous tip. *Inner segments* slightly shorter, but much broader, up to 5 cm wide and flat, except the lowermost, which has a typical notch near the base, where it folds up, tightly wrapping the bundle of filaments. *Paraperigone* characteristic, in shape of a green, globular bladder at the bottom of the flower, leaving open but a small slit atop, where insects may plunge their tongue to get at the nectar. *Perigone* as a whole, of vivid crimson colour on the inside; but as reticulation becomes denser and its veins almost confluent near the base of all segments, the general colour in the center of the flower deepens to a velvety purple of extraordinary beauty. Only the innermost 1.2 cm area around the paraperigone is green, each segment having a crimson center stripe, across the green area. *Filaments* crimson, except at the base, where they emerge greenish from the paraperigone. With their basal half they lie flat on the lowermost segment, then curve upwards. *Anthers* pale violet, 1.3 cm long and four-angled when closed. They have a vertical position and after splitting, shrivel considerably. *Style* crimson, a little longer than filaments, ending into a trifid stigma, each division 0.6 cm long. *Pod* green, 5 cm in diameter, inflated trigonous, containing 100 to 150 seeds. Gestation period 70 days. *Pods* split wide open when ripe and release seeds to the wind. *Seed* papery, dark brown, glistening and hyaline, triangular or half circular in shape, 2.2 cm by 1.3 cm. Weight 4000 seeds to one ounce.

*General comment: Amaryllis aulica* is, for the amateur collector, one of the most desirable species, because it is so easy to grow, showy even when not in flower and really beautiful when in bloom. Its blooming period in winter gives it a special merit and it is strange and regrettable, that hybridizers did not insist upon selecting winter flowering strains from its hybrids. The floral characters and the very bright colours recommend it for breeding

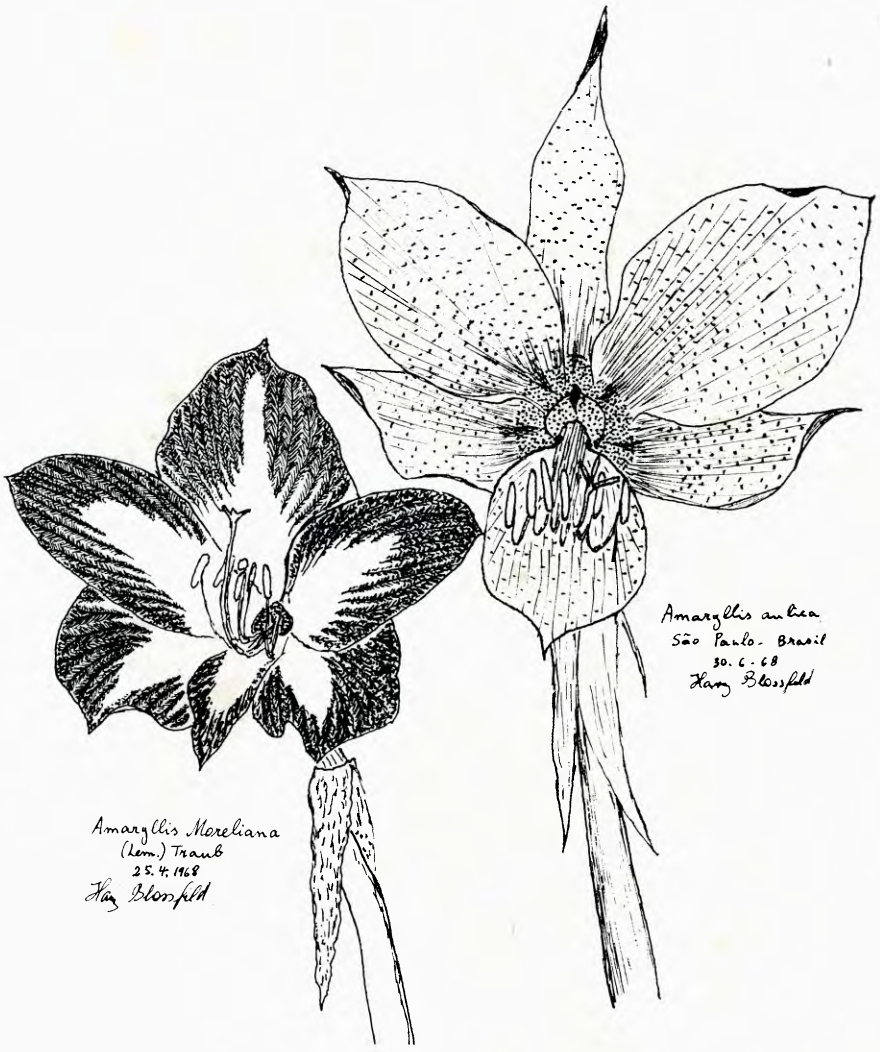


Fig. 14. *Amaryllis moreliana* (Lem.) Traub and a rare form of *Amaryllis aulica,* as grown by Harry Blossfeld, in Brasil. From drawings by Harry Blossfeld.

### AMARYLLIS MORELIANA (LEM.) TRAUB

*Habitat and Behavior:* Collected in the Organ Mountains, near Novo Friburgo, in the Rio de Janiero State, Brazil. The species grows generally on rocks, in humus deposits that accumulate in fissures of

granite stones, preferably under the light shade of small-leafed shrubs. Flowering season in Brazil is quite variable, from fall through winter and rarely in spring. This irregular blooming habit is quite singular and has been confirmed for more than ten years, since the author grows this species. During all that time it occurred only twice, that from the eight original bulbs, two were blooming simultaneously. The fact should be considered by hybridists.

The species is easy to grow, but the bulbs are slow to increase in size and reluctant in producing stolons or offsets. Its flowers are quite similar to those of *A. psittacina,* which however has a more solid paraperigone; it is related to *A. correiensis* and to *A. aulica.* A remarkable fact is, that when it flowers in fall or winter, it does so on the bare bulbs but if it blooms in spring, the scape will grow simultaneously with the new leaves. The plant generally produces but one peduncle on each bulb and in some years, it fails to bloom at all.

*Description: Bulb* rather big, 7.5 to 12.5 cm in diameter, globular, covered by dark brown tunics. Neck of bulb quite prominent, 10 cm high, 3 cm diameter, sub-cylindric and slightly tapering to tip. *Leaves* 5 to 6 per bulb, 60 cm long by 4 cm broad, lorate, dark green, opaque above and glaucous below, having a strongly canaliculated midrib. *Peduncle* growing from the bare bulb in fall or winter, or together with new leaves in spring; 35 to 50 cm long, sub-cylindric, 1.5 cm in diameter, hollow, glaucous green and sometimes flushed with purple in lower third. *Spathe* two-valved, green while flower buds open, but wilting while in bloom, 8 cm long at base, 1.8 cm broad. *Bractioles* two, 5 cm long and at base, 0.3 cm broad. *Pedicel* clear green, slightly tapering and trigonous, 6 cm long, that is, much shorter than spathe valves; pedicels stretch to 8 cm length, while the pods ripen. *Ovary* 1.5 cm long, dark green, trigonous.

*Flowers* usually two on a scape; fall, winter or rarely spring. *Perigone* funnel-shaped, with a curiously oval shape of the rim, which measures 12 cm in horizontal diameter and 10 cm vertical diameter. This peculiar feature is caused by the very stiff and broad upper segment, that resists to the vertical expansion of the perigone. *Paraperigone* reduced to a triangular ring of whitish scales, edged with red. *Outer segments* almost equal, 5 cm broad (!) by 12.5 cm long, having along the center of outside face, a strong green keel with darker green reticulations, alongside of which is an area suffused with red dots along these reticulations and near the rim, the red colour becomes confluent. On the inside face, the reticulation is not apparent and replaced by green divergent veinings irradiating from a broad green central stripe, which is quite conspicuous in this flower. Towards the border, these veinings turn red in a feather pattern, forming 9 to 11 divergent curved lines, that become confluent near the sepal borders and are an almost solid red near the segments tip. *Inner segments* much narrower, 3.5 cm by 11 cm, the lowermost being only 2 cm broad at widest place. Outside face plain green, only obscurely reticulated, having divergent green veinings which turn red only quite near the margins and be-

come confluent in an area of about 2 cm from the segments tip. The inside face shows a broad, dark green central stripe, which has six parallel fluted veins. This is enframed by a number of feathery streaks, that radiate from deep inside the perigone in way of partly interrupted veins towards the tips. There they become broader and finally are confluent at the edge of the segments. *Filaments* whitish, shorter than segments, the apical half curved upwards and faintly suffused violet. *Anthers* while closed, pale lilac and remarkably big: 0.7 cm long, but on second or third day shrivelling to almost half that size. *Style* longer than filaments and of identical colour, resting flat on the lowermost segment while the flower is opening, but later curving upwards. *Stigma* irregularly trifid, whitish, spreading only partially and reluctantly.

*Pod* 3.7 cm diameter, inflatedly trigonous, containing an average of 100 seeds each. The dry remains of perigone remain on pod until it splits. The pod then becomes yellow and opens to 45°, releasing the interleaved seeds to the wind. Seeds dark brown to almost black, papery, somewhat hyaline on margins, glistening, in shape of an equilateral triangle to almost semicircular. Weight 13 grams per thousand, but almost twice as much, when gathered from a freshly split pod.

*General remarks.*—The above description was made from a rather small number of plants grown by the author, representing field collected stock. These plants were remarkably uniform, but originated from one locality; there appear to be some rather confusing coincidences of this plant with the descriptions of *A. correiensis* and *A. psittacina,* which should be investigated by a comparing study of live authentical material with the original diagnosis. The old descriptions mostly lack information of very important distinctive characters now recognized as such, and should be amended.

## ZEPHYRANTHES (SUBG. COOPERIA) MORRISCLINTII

Hamilton P. Traub and Thad M. Howard

Up to the present time only white- and yellow-flowering species in the subgenus *Cooperia,* genus *Zephyranthes,* have been reported. Several years ago, the Morris Clints and Thad M. Howard collected in Mexico a pink-flowering species in this group. This species is here appropriately named *Zephyranthes morrisclintii,* to commemorate the memory of the late Morris Clint (see 1968 PLANT LIFE page 16).

This new species represents a valuable color addition to the dependable Cooperia group of *Zephyranthes* which is now widely cultivated and/or naturalized.

**Zephyranthes** (subg. **Cooperia**) **morrisclintii**
Traub & Howard, **sp. nov.**

Holotype: Traub No. 1000 (TRA), cult. La Jolla, Calif., grown from bulbs, collected by Dr. Thad M. Howard near Iturbide, Nuevo Leon, Mexico.

Bulbus 4-4.5 cm. longus 4.7-5.5 cm. diametro, collo 4.5-5 cm. longo; foliis 3 vel 4 viridibus usque ad 36 cm. longis 7 mm. latis; scapo usque ad 10.5 cm. longo; spatha 5-5.4 cm. longa; umbella uniflora; floribus laete roseo-rubellis; pedicello 3-3.5 cm. longo; tubo tepalorum 3.5 cm. longo; segmentis tepalorum 4.1 cm. longis 2.2-2.4 cm. latis; staminibus biseriatis 1.1 et 1.7 cm. longis.

*Bulb* globose, 4-4.5 cm. long, 4.7-5.5 cm. in diam., neck 4.5-5 cm. long, 7-10 mm. in diam.; tunics dark brown. *Leaves* 3-4, linear, green, up to 36 cm. long, 7 mm. wide, bluntly acute. *Scape* compressed with rounded edges, lighter green, slightly reddish near the base, up to 19.5 cm. long, 4x6 mm. in diam. at the base, narrowing to the apex. *Spathe* reddish, 5-5.4 cm. long, united for 3-3.5 cm. below, apex single, fenstrate in specimens examined. *Umbel* 1-flowered; flowers light rose pink (HCC 427/2 to 427), lighter on the inside. Scent similar to that of other species in subg. *Cooperia* but not as strong. *Pedicel* 3-3.5 cm. long, 2x3 mm. in diam., slightly compressed, with rounded edges. *Ovary* oblong, 1 cm. long, 4x4.5 mm. in diam. *Tepaltube* 3.5 cm. long, enlarging upwards, 3 mm. in diam. (base), 7 mm. in diam. (apex). *Tepalsegs* oval, subequal, 4.1 cm. long; setsegs 2.4 cm. wide, apex rounded, apiculate, petsegs 2.2 cm. wide, apex rounded. *Stamens* upright, in 2 series, 1.1 and 1.7 cm. long; filaments white, anthers affixed 2 mm. from lower end; pollen yellow. *Seeds* D-shaped, flat, dark brown to black.

Range.—Collected by Dr. Howard (#64-A), State of Nuevo Leon, Mexico, Highway 60, near Iturbide. The species was also collected by Mr. & Mrs. Morris Clint.

## CHLIDANTHUS CARDENASII SP. NOV.

Hamilton P. Traub

For a long time the genus *Chlidanthus* appeared to be monotypic with only *C. frangans* Herb., but in 1957, a second species, *C. boliviensis* Traub & Nelson was added. Later (1967) the hybrid between the two, *C.* x *traubii* Moldk. was added. In 1968 Dr. Martin Cardenas sent a specimen with description of still another species (Fig. 15), which is here appropriately named in his honor.

**Chlidanthus cardenasii** Traub, **sp. nov.** (Fig. 15)

Holotype: Cardenas specimen (TRA no. 1001), collected by Dr. Martin Cardenas at Mollevillque, Prov. Bilbao, Dept. Potosi, Bolivia, alt. 2,2000 m.

Bulbus globosus 8 cm. longus 8-10 cm. diametro; foliis hysteranthis angustis viridibus; scapo 20 cm. longo solido compresso unimarginato; spatha lanceolata; umbella octoflora; pedicellis 2-3 cm. longis; ovario obscure trigono; tubo tepalorum 2.5 cm. longo; segmentis tepalorum lanceolatis 1.6-1.7 cm. longis 5 mm. latis smaragdinis; staminibus 1-1.2 cm. longis; stylo 5 cm. longo; stigmate trifido; capsula doliiformi.

Bulb globose, 8 cm. long, 8-10 cm. in diam., tunics dark brown; leaves appearing after the flowers, narrow, green, not fleshy; scape 20 cm. long, 1.2 cm. in diam., solid, flattened, pink with one conspicuous 1-1.5 mm. edge; spathe lanceolate, 6-9 cm. long, acute; umbel 8-flowered; pedicels 2-3 cm. long at anthesis, elongating to 6 cm. in fruit, slender pink; ovary obscurely trigonous, 10-15 mm. long, 3-4 mm. in diam., purple-brownish; tepaltube 2.5 cm. long, slightly widening above, pink

Fig. 15. *Chlidanthus cardenasii* Traub, *sp. nov.* Native to Bolivia. Photo by Dr. Martin Cardenas.

below, green-streaked above; tepalsegs lanceolate, 1.6-1.7 cm. long, 5 mm. wide, emerald green keeled purple-lilac on under side; stamens 1-1.2 cm. long; filaments light green, thin, expanded below and inserted at the base of the tepals; anthers light yellow, versatile; style 5 cm. long, light green, thin; stigma trifid with thickened tip, pruniose; fruit a 3-celled capsule, barrel-shaped, 3x1.5 cm.

Range.—Known only from the holotype locality, Mollevillque, Prov.

Bilbao, Dept. Potosi, Bolivia, alt. 2,2000 m. plants are deeply situated in the dry mountain crevices.

## AN AQUATIC **AMARYLLIS** SPECIES FROM ARGENTINA

PAUL H. WILLIAMS, JR., *6128 Sundown Drive*
*Fort Worth, Texas 76114*

In July 1967 a letter was received telling of a dried specimen of an *Amaryllis* species collected in a swamp in Misiones, Argentina, near the Corrientes border. Dr. Ruppel had seen the specimen in the Lillo Institute in Tucuman and was determined to collect this species with enormous deep-red flowers. As the road was under water and it was winter, he contracted with a young man to collect mature bulbs for him.

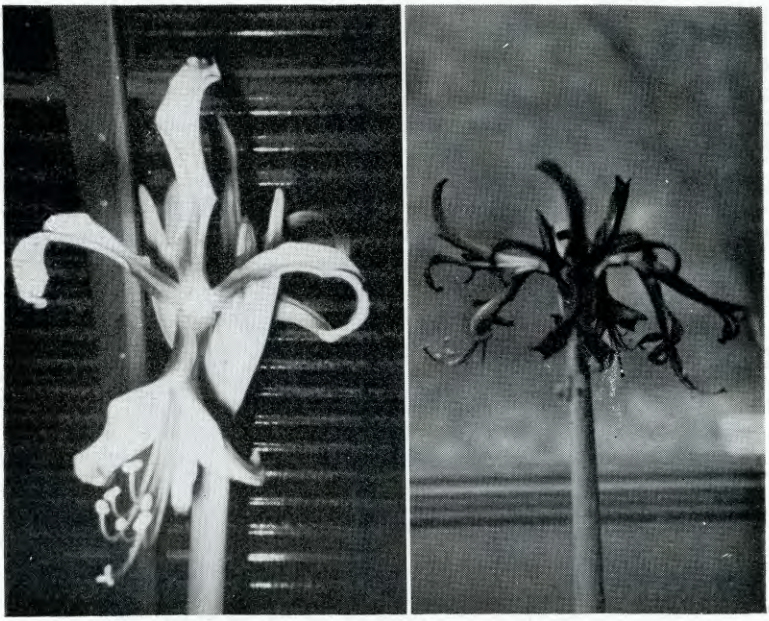

Fig. 16. The aquatic *Amaryllis angustifolia* (Pax) Traub & Uphof, native to the region near Santo Tome, Corrientes, Argentina. Photos by Paul H. Williams, 1967.

In October 1967, Dr. Ruppel received twenty bulbs, each showing the remains of a scape; however, two of the bulbs were three times larger than the rest. In March 1968 most of these bulbs were sent to the United States for distribution, with the intention of naturalizing them in various parts of our country. As the bulbs had been retained

in dormancy since collection, they were to be immediately planted in part shade in rich organic soil and allowed to shift for themselves. They were believed to be capable of being under water for extended periods and also to go for long periods without water as they were located 20 to 25 cm. underground.

In August 1968 I received, by way of Florida, one of the two larger bulbs of this species showing the tip of a bud. New information had been obtained about its cultural needs. At the collection site, near Santo Tome, Corrientes, Argentina, "it is evergreen and grows in water up to its long neck, or higher, like cress among weeds". This bulb was potted but the scape aborted as did one over a month later. The pot was placed in the greenhouse for the winter and given routine *Amaryllis* treatment. In February 1969 a scape appeared which did not abort, and during March I was treated to the sight of nine "sprekelias" in one umbel!

The nine flowers were red or deepest rose. Segments, filaments, and style were all red and the pollen was yellow. One flower opened, then its opposite, then the one to the right and its opposite. Next the second set of four in the same order—the ninth opened last in the middle. This allowed bloom for a long time, with seed pods forming from early blooms as the last were opening. The spathe valves were large and held stiffly erect and green until half the flowers had bloomed. The blooms were about the size of *Sprekelia formosissima* but not quite as full in appearance. There were six leaves, the longest being 56 cm. long, and the widths varied from 3 to 4 cm. They are glaucous, linear, and margined, and are held stiffly erect—not keeled, but u-shaped in cross section for half their length.

All bulbs of the original lot arrived with long necks and not much bulb. Those that were potted have since lost the neck and gained in bulb size. The neck length of the collected bulbs was due to being under water. The necks allowed the leaves to grow above the water and is not a permanent identification feature under culture.

Bulbs planted in the yard did not show foliage this year (1969) until July. One bulb of the original lot was potted and is surviving under ordinary pot culture. Two offsets have formed. The pot containing the large bulb was placed in a large glazed pot without drainage which contains *Hymenocallis liriosme*. The water level in the glazed pot is maintained above the base of the *Amaryllis* pot. Under these conditions the *Amaryllis* is thriving in morning shade with full afternoon sun in our above 100 degree July heat. The plant in this pot has one offset. All three offsets are at the very edge of the pots, which leads me to believe this species may be rhizomatous. I have made no visual check as yet.

Now, as to identification, your guess is as good as mine. At the bottom of Page 153, 1969 PLANT LIFE, Prof. Ravenna refers this species to *A. angustifolia*. His description must be different from that of Page 127, 1938 HERBERTIA. At no time have any of the leaves been

nearly as narrow as *A. angustifolia.* The flowers were never "quite declinate". Quoting from Dr. Ruppel—"the leaves were 120 cm. long x 5 cm. lat." "I have only seen the habitat, bulb, and leaf. The latter does not fit (*A. angustifolia*). I measured many of them; all were 100-120 cm. long x 4-4 cm. lat." The bloom and cultural conditions would indicate *A. cybister* var. "spectabilis" as described on Page 295 of Dr. Traub's THE AMARYLLIS MANUAL.

Reciprocal cross attempts with *A. striata* forma *fulgida* were unsuccessful, as were attempts using stored pollen of *A. evansiae* and *A. moreliana.* Stored pollen of *A. yungacensis* was successful and seedlings are growing. Attempts at selfing also met with failure; however, seed of this species has been collected at the site in Argentina but would not germinate in Fort Worth. Stored pollen of this species and that of *A. moreliana, A. reginae,* and *A. pardina* was used on *A. ambigua.* The results were negative except for this species and one third pod from *A. pardina.*

The aquatic nature of this species opens exciting possibilities for hybrids more suited to the wetter regions of the southeast United States

## ALLIUM MICHOACANUM SP. NOV.

HAMILTON P. TRAUB

*Allium michoacanum* ranks among the smallest of the Mexican Alliums collected by Dr. T. M. Howard. Bulbs were received from him in August when the plants were past the flowering stage. Fortunately, it flowered in my garden as a potted plant on September 10, 1969.

**Allium michoacanum** Traub, sp. nov. Plant Life 24: 139. 1968, **anglise.**

Holonomenifer: Traub No. 1099 TRA, Sept. 4, 1969, grown from bulbs collected by Dr. T. M. Howard, Aug. 4, 1967, past flowering stage (Howard No. 67-74A) on Mexican Highway 15, k 233, east of Morelia, Michoacan, in the mountains.

Bulbus parvissimus 6 mm. longus 4 mm. diametro a bulbulis in rhizomatibus gracilibus amplificatus; foliis 2 vel 3 (-4) 12-18 cm. longis 1-1.5 mm. latis; scapo 18 cm. longo; umbella 4-7-flora floribus parvissimis albis non late aperientibus; pedicellis ca. 9 mm. longis; tepalis 6 mm. longis 2-2.25 mm. latis; filamentis quam tepalis brevioribus; stylo quam staminibus parum longiore.

*Bulb* very small, 6 mm. long, 4 mm. in diam.; coats membranous; increasing by bulblets produced terminally on slender rhizomes; roots very thin, less than 0.5 mm. thick. *Leaves* 2-3, (-3-4 under cultivation), very narrow, 12-17-18 cm. long, 1-1.5 mm. wide, slightly canaliculate on upper side, under side striated; sheathing below to form a narrow deciduous neck, to 4 cm. long, 2 mm. in diam. *Scape* to 18 cm. long, very slender, 1-1.5 mm. in diam., green. *Spathe* monophyllous, lanceo-

late, inclosing the flower buds, later splitting at one side by pressure of expanding buds, 6 mm. long. *Umbel* 4-7-flowered; flowers very small, not opening widely, white, setepals keeled green to brownish. *Pedicels* about 9 mm. long at anthesis, elongating to about 11 mm. thereafter. *Perigone:* tepals lanceolate; setepals 6 mm. long, 2.25 mm. wide, acute; petepals 6 mm. long, 2 mm. wide, acute. *Stamens:* filaments shorter than the tepals, 3 mm. long, anthers 1 mm. long. *Ovary* 1.25 mm. long, 1.5 mm. in diam.; style very slender, slightly over-topping the stamens.

Range.—Known only from the nomenifer location on Mexican Highway 15, K 23, east of Morelia, Michoacan, in the mountains.

Notes.—This most interesting little species ranks among the smallest Mexican Alliums. It is difficult to maintain under cultivation, unless the cultural requirements are known. All, except three of the bulbs collected by Dr. Howard were lost due to growing them in a sandy soil which was humus-poor. Three were saved by transferring them to a humus-rich soil, after it was noted that the bulbs were gradually disappearing without a trace in the sandy soil. The bulbs flowered later (September 5—October 15) under cultivation at La Jolla, Calif. than in the natural habitat where they were past flowering in early September.

## CHROMOSOMES OF **ALLIUM EUROTOPHILUM** WIGGINS

Lee W. Lenz
*Rancho Santa Ana Botanic Garden*

During the summer of 1969 Dr. Hamilton P. Traub sent the author seeds of two forms of *Allium eurotophilum* and requested that chromosome counts be made. Seeds placed on moist filter paper in petri dishes germinated readily. Root tips were pretreated for three hours at 12° C in a .004 M solution of 8-Quinolinol (Eastman Organic Chemicals) to which was added one drop of naphthalene monobromide per vial. They were fixed in 3:1 absolute alcohol and acetic acid and stained with aceto-orcein. Both forms of the species submitted showed 14 somatic chromosomes (see Fig. 17) and in this respect they are consistent with other New World alliums of the subgenus *Amerallium,* all of which possess a base number of n=7. Base numbers of the Old World species, and one North American species, *A. tricoccum* Ait. (2n=32), of the subgenus *Allium,* are n=8, 9, and 10. The chromosomes of *A. eurotophilum* are all long metacentric, or near metacentric, and there are two pairs with satellites, one of them regularly showing a tandem arrangement.

According to Traub, (pers. com.) the seed came from bulbs collected by Dr. Reid Moran (Moran, 15330) July 21, 1968, where they were growing in shade on the steep east slope of Cerro "2828", an east run, Sierra San Pedro Mártir, State of Baja California. The altitude given was 2800 m. The species was first described by Ira Wiggins from material collected in the Sierra San Pedro Mártir at 2800 m. where it was growing in deep mucky leafmold in a shaded canyon. According to

Wiggins its affinity is with the widely distributed *A. validum* S. Wats. and it favors the habitat of that species. Chromosome numbers reported for *A. validum* are 2n=28 & 56.

According to Traub, *eurotophilum* is remarkable among alliums in being the only one known to him showing recurrent blooming.

NOTE.—The photo-print for Fig. 17 was lost in transit to the engraver; it will be reproduced in the *1971 PLANT LIFE*.

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**PLANT LIFE LIBRARY**—continued from page 48.

BERNHARD EDWARD FERNOW, A STORY OF NORTH AMERICAN FORESTRY, by Andrew Denny Rogers III. Facsimile of the 1951 Edition. Hafner Publishing Co., 31 E. 10th St., New York, N. Y. 10003. 1968. Pp. 623. Illus. $11.00. This book details a most interesting biography of Fernow, who was the first professional forester in North America. When he arrived from Germany, a forester was classed as a sort of Robin Hood. Today forestry is a recognized branch of biology, and there are 18,000,000 acres of forest reservations in the United States and Canada. All of these advances cannot be credited to Fernow, but he was the leading American forester from 1876 to his death in 1923. This fascinating story of his life is told in detail in this book. Highly recommended to all interested in plant science and conservation.

"NOBLE FELLOW", WILLIAM STARLING SULLIVANT, by Andrew Denny Rogers III. Facsimile of the 1940 Edition. Hafner Publishing Co., 31 E. 10th St., New York, N. Y. 10003. 1968. Pp. 361. Illus. $9.50. This book details the fascinating biography of William Starling Sullivant (1803—1873), one of the early and most distinguished characters of early North American science. He became the "father" and foremost authority on the study of Bryology, the science of mosses, without a superior anywhere in the world during the period of his life. Details of his contributions to the scientific world and a complete list of the mosses he named and described are included. Very highly recommended to all interested in plant science.

A SHORT HISTORY OF BOTANY IN THE UNITED STATES, edited by Joseph Ewan. Hafner Publishing Co., 31 E. 10th St., New York, N. Y. 10003. 1969. Pp. 174. $7.50. Starting with a calendar of events (chronology) beginning c. 300 B. C. and ending with 1968, and the early history of botany in the United States, by the editor, this interesting book contains brief articles by twelve authorities on the various phases of plant science in the United States, morphology and anatomy, genetics and cytology, plant physiology, etc. Highly recommended to all interested in plant science.

THE ALGAE AND THEIR LIFE RELATIONS, by Josephine E. Tilden. Facsimile of the 1937 Edition. Hafner Publishing Co., 31 E. 10th St., New York, N. Y. 10003. 1968. Pp. 550. Illus. $13.50. This facsimile reprint of Prof. Tilden's outstanding synthesis of knowledge about the algae will be welcomed. The arrangement of all of the material in an orderly fashion is a real achievement. Terms have been simplified and reduced in number, and a series of life cycle diagrams have been included with the objective of clarifying many obscurities. The topics discussed include hypotheses concerning the phylogeny of the algae; distribution of the algae; classification of the kinds of algae; the problem of algal control; algal foods for animals and man. Very highly recommended to all interested in the algae.

**PLANT LIFE LIBRARY**—continued on page 104.

# REGISTRATION OF NEW AMARYLLID CLONES

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

Mr. James E. Mahan, *Registrar*

Mrs. Emma D. Menninger, *Associate Registrar*

This department has been included since 1934 to provide a place for the registration of names of cultivated **Amaryllis** and other amaryllids on an International basis. The procedure is in harmony with the International Code of Botanical 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. This may be obtained at $5.00 prepaid from: Dr. Thomas W. Whitaker, Executive Secy., The American Plant Life Society, Box 150, La Jolla, Calif. Catalog of Hybrid Nerine Clones, 1882-1958, by Emma D. Menninger; and Catalog of Brunsvigia Cultivars, 1837-1959, by Hamilton P. Traub and L. S. Hannibal, were published in 1960 Plant Life, with additions to both in Plant Life 1961. In Plant Life 1961, the first edition of The Genus X Crinodonna was published which serves also as a catalog of cultivars. In Plant Life 1964, the first edition of "Catalog of Hybrid Amaryllis Cultivars, 1799 to Dec. 31, 1963" was published. Other catalogs of cultivated amaryllids are scheduled for publication in future issues.

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

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

Correspondence regarding registration of all amaryllids such as **Amaryllis, Lycoris, Brunsvigia, Clivia, Crinum, Hymenocallis,** and so on should be addressed to Mr. James E. Mahan, Registrar, 3028 Palmyra St., New Orleans, Louisiana 70119. 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, 1969

**Registered by Ludwig & Co., Hillegom, Holland.**

**'Bianca'** (Lud. 1969) R; A-878; D-8; U-4 fld.; 16″-18″ h.; 4″-5″ diam.; pure white with greenish yellow throat; spr. and winter.

**'Nostalgia'** (Lud. 1969) R; A-879; D-5 B; U-4 fld.; 26″-28″ h.; 9″-10″ diam.; darkest oxen-blood red with darker cherry red glossy throat; spr. and win.

**'Orange Majesty'** (Lud. 1969) R; A-880; D-5 A; U-4 fld.; 26″-28″ h.; 8″-10″ diam.; solid orange (nasturtium red) with only slightly darker throat; spr. and win.

**'Takarasuka'** (Lud. 1969) R; A-881; D-5 A; U-4 fld.; 26″-28″ h.; 8″-9″ diam.; bright brick red with a suggestion of salmon orange; spr. and win.

**'Wedding Bells'** (Lud. 1969) R; A-882; D-5 A; U-4 fld.; 28″-30″ h.;

9″-11″ diam.; pure white with yellowish throat; spr. and win.

**Registered by Walter R. Latapie, New Orleans, La.**

**'Hilda Latapie'** (Lat. 1969) R; A-876; D-7; U-3 fld.; 14″ h.; 6″ diam.; white with faint cherry red streak each side of mid-rib, inner throat green; spr.

**'Walter Latapie'** (Lat. 1969) R; A-877; D-7; U-4 fld.; 17″ h.; 6″ diam.; blood red (820) with faint white rib running from midway down center of petal into throat; spr.

**Registered by Milo C. Virgin, Covington, La.**

**'Belle Bianca'** (Vir. 1969) R; A-883; D-8; U-4 fld.; 16½″ h.; 4″ diam.; pure white with apple green throat; spr.

**Registered by G. C. van Meeuwen & Sons N. V., Heemstede, Holland.**

**'Athos'** (VM 1969) R; A-884; D-5 A; U-4 fld.; 20″-24″ h.; 6″ diam.; blood red solid color; spr.

**'Balthasar'** (VM 1969) R; A-885; D-5 A; U-4 fld.; 20″-24″ h.; 7″ diam.; solid blood red with petals ribbed; spr.

**'Baruta'** (VM 1969) R; A-886; D-5 A; U-4 fld.; 24″-28″ h.; 6″ diam.; solid dark red; spr.

**'Cicero'** (VM 1969) R; A-887; D-5 A; U-4 fld.; 24″-28″ h.; 6″ diam.; solid orange red; spr.

**'Cupido'** (VM 1969) R; A-888; D-5 A; U-4 fld.; 24″-28″ h.; 5″ diam.; salmon pink with white stripe, white center into throat, upper petals reddish to the center; spr.

**'Glorious Victory'** (VM 1969) R; A-889; D-5 A; U-4 fld.; 20″-24″ h.; 7″ diam.; salmon orange, petals light at edges and darker at center; spr.

**'Gondibar'** (VM 1969) R; A-890; D-5 A; U-4 fld.; 24″-28″ h.; 5″ diam.; blood red with darker center into throat; spr.

**'La Paloma'** (VM 1969) R; A-891; D-5 A; U-4 fld.; 20″-24″ h.; 7″ diam.; light salmon-pink with light red veining on petals coming from center; spr.

**'Leticio'** (VM 1969) R; A-892; D-5 A; U-4 fld.; 24″-28″ h.; 7″ diam.; solid orange red; spr.

**'Loveliness'** (VM 1969) R; A-893; D-5 A; U-4 fld.; 20″-24″ h.; 7″ diam.; light salmon-pink with red on the upper petals; spr.

**'Parsifal'** (VM 1969) R; A-894; D-5 A; U-4 fld.; 20″-24″ h.; 6″ diam.; bright red with orange glow; spr.

**'Superba'** (VM 1969) R; A-895; D-5 A; U-4 fld.; 20″-24″ h.; 7″ diam.; dark blood red; spr.

**'Van Meeuwen's Mont Blanc'** (VM 1969) R; A-896; D-5 A; U-4 fld.; 24″-28″ h.; 6″ diam.; pure white with light green in center toward throat; spr.

**'Vulcanus'** (VM 1969) R; A-897; D-5 A; U-4 fld.; 20″-24″ h.; 7″ diam.; light bright red with orange center toward throat; spr.

**Registered by Harry DeLeeuw Co., Ltd., South Africa.**

**'Majuba'** (HDL 1969) R; A-898; D-5 B; U-4 to 5 fld.; 15″ h.; 6½″ diam.; scarlet (HCC 19), foliage coming together with stems.

**'Kalahari'** (HDL 1969) R; A-899; D-5 A; U-3 to 4 fld.; 15″ h.; 7½″ diam.; Rose opal (HCC 022).

**'Coral Seas'** (HDL 1969) R; A-900; D-5 A; U-3 to 4 fld.; 16″-17″ h.; 7″ diam.; Turkey red (HCC 721).

**'African Sunset'** (HDL 1969) R; A-901; D-5 A; U-4 to 5 fld.; 16″-17″ h.; 7½″ diam.; Capsicum red (HCC 715) foliage coming together with stems.

**'Rio Grande'** (HDL 1969) R; A-902; D-5 A; U-4 to 6 fld.; 11″-12″ h.; 6″ diam.; Signal red (HCC 719).

**'Camp Fire'** (HDL 1969) R; A-903; D-5 A; U-4 fld.; 16″ h.; 6″ diam.; scarlet (HCC 19).

**'Calabash'** (HDL 1969) R; A-904; D-5 A; U-3 fld.; 17″ h.; 6½″ diam.; crimson (HCC 22) veined with white.

**'Assegai'** (HDL 1969) R; A-905; D-5 A; U-3 to 4 fld.; 20″ h.; 7½″ diam.; scarlet (HCC 19).

**'Watusi'** (HDL 1969) R; A-906; D-5 A; U-3 to 4 fld.; 13″ h.; 6″ diam.; carmine (HCC 21).

**'Masai'** (HDL 1969) R; A-907; D-5 A; U-4 fld.; 18″ h.; 7″ diam.; white with small scarlet veins near throat of three top tepalsegs.

**'Bambara'** (HDL 1969) R; A-908; D-5 A; U-3 to 4 fld.; 13″ h.; 7″ diam.; signal red (HCC 719).

**'Barotse'** (HDL 1969) R; A-909; D-5 A; U-4 to 5 fld.; 21″ h.; 7″ diam.; light cardinal red (HCC 822/3).

**'Ashanti'** (HDL 1969) R; A-910; D-5 B; U-4 fld.; 14″ h.; 7″ diam.; orient red (HCC 819).

**'Bush Fire'** (HDL 1969) R; A-911; D-5 A; U-4 to 6 fld.; 14″ h.; 7″ diam.; light Indian orange (HCC 713).

**'Festival'** (HDL 1969) R; A-912; D-5 A; U-3 to 5 fld.; 14″ h.; 6½″ diam.; scarlet (HCC 19).

**'Simba'** (HDL 1969) R; A-913; D-5 A; U-3 to 4 fld.; 18″ h.; 8″ diam.; Dutch vermilion (HCC 717).

**'El Toro'** (HDL 1969) R; A-914; D-5 B; U-3 to 4 fld.; 17″ h.; 7″ diam.; poppy red (HCC 16).

## HYBRID BRUNSVIGIA CLONE

*Registered by Hamilton P. Traub, 2678 Prestwick Court, La Jolla, Calif.*

*'Early Hathor'*. Similar to the later-flowering white 'Hathor' and its seedlings. Flowers in late July in southern California. Originated as a rare solitary recombination among many seedlings obtained by crossing other hybrid *Brunsvigia* clones with the clone 'Hathor'. The genes for early-flowering were derived originally from the early-flowering *Brunsvigia major* Traub which begins to flower in late July in southern California.

## CYRTANTHUS CLONE

**Registered by Alek Korsakoff, Jacksonville, Florida.**

**'Meta's Pride'** (Korsakoff, 1969). Plants up to 47 cm. high. Very vigorous, better in habit of growth than either parent; intermediate but closer to seed parent in the floral characters. Flowers 3 cm. across; tepaltube and back of tepalsegs carrot red (HCC 612/1); tepalsegs saturn red (HCC 13/1) inside. This is a cross between **C. mackenii** (sulfur yellow, HCC 1) ♀ x **C. sanguineus** ♂.

**'Janis Korsakoff'** (Kor. 1969) R; CY-4; U-7 fld.; 45 cm. h.; 22mm. diam.; marigold orange (11/3) in front and on back edges of petals, with nasturtium red (14/2) on keels. This is a clone of the hybrid **Cyrtanthus** x **henryae.**

**REGISTRATION OF CLONES**—continued on inside back cover.

# CONTRIBUTIONS TO SOUTH AMERICAN AMARYLLIDACEAE III *

PEDRO FELIX RAVENNA

The present series includes new species, new combinations and miscellaneous notes in the genera *Amaryllis, Rhodophiala, Habranthus, Zephyranthes, Stenomesson, Griffinia* and others. Most of the plants were gathered and studied by me, during collecting trips through Latin America. A few species were described on the basis of dry specimens. All the bulbs collected were introduced in my collection of living plants for subsequent study.

In addition to my private herbarium, I have examined specimens of the following Institutions: B, BA, BAA, BAB, BHMG, DPN, HBR, HH, LIL, M, NY, PACA, RB, SP, TRUX, UB.

## I. STUDIES IN THE GENUS AMARYLLIS

### *Amaryllis petiolata*

Correct name of a misidentified species mainly from Argentina.

In 1956, during a student's excursion to Punta Lara (near the city of La Plata), I saw for the first time an isolated clump of a delightful "miniature" *Amaryllis* which I provisionally determined as *Hippeastrum flammigerum* Holmb. At that time we were supervised by the memorable Prof. L. R. Parodi. Punta Lara, in the province of Buenos Aires, is the southernmost area of gallery forest, at present in accelerated process of destruction because of tourism.

After that occasion, I was surprised in seeing the plant cultivated in several gardens of the city of Buenos Aires. Moreover, I knew that the same plant was collected alive in the Delta of the Paraná River (Entre Ríos part) by Prof. A. Burkart. In the Darwinian Institute I also found dry specimens from the latter area, and also others collected by Hauman in the Martín García Island and by Hicken from Holmberg's collection of living plants.

Searching in the literature, I realized that the species was cited for the first time in Argentina by Holmberg (1903, p. 157-158), as *Hippeastrum rutilum* Herb., and afterwards, under the same specific name, by Hauman & Vanderveken (1917, p. 282) and Cabrera (1953, p. 148). Following this concept, I began to determine herbarium specimens, with some reluctance, as *Amaryllis striata* Lam. (syn.: *Hippeastrum rutilum* Herb.). At that time I had not had the opportunity of studying the latter species at Río de Janiero, where it was originally collected.

In September 1965 I saw the true *Amaryllis striata* Lam., for the first time, growing gaily on the rocky cliffs near Leblon (a Río de

* The second series of this work (see Plant Life vol. 25, 1969), was wrongly numbered as the third.

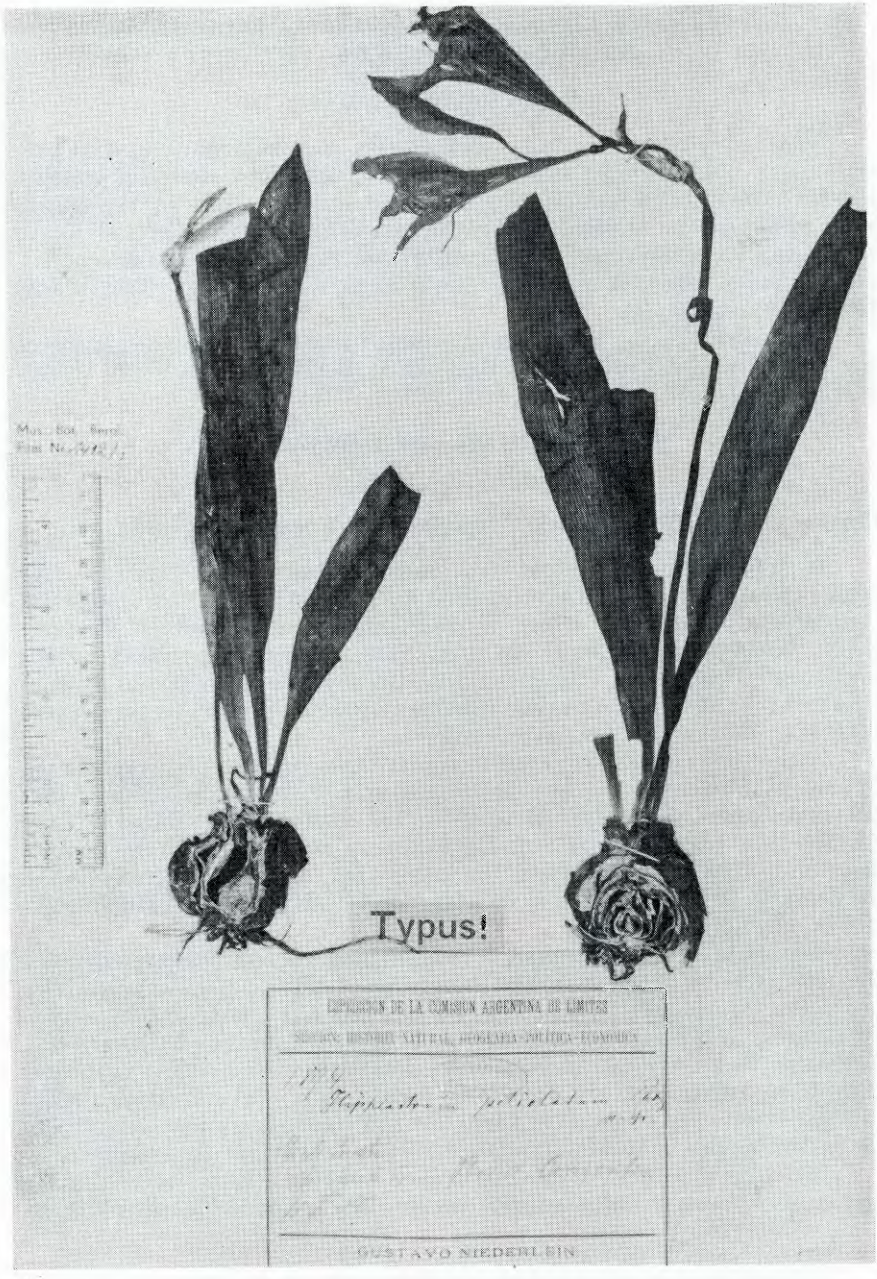


Fig. 18. The type-sheet of *Amaryllis petiolata* (Pax) Traub et Uphof.

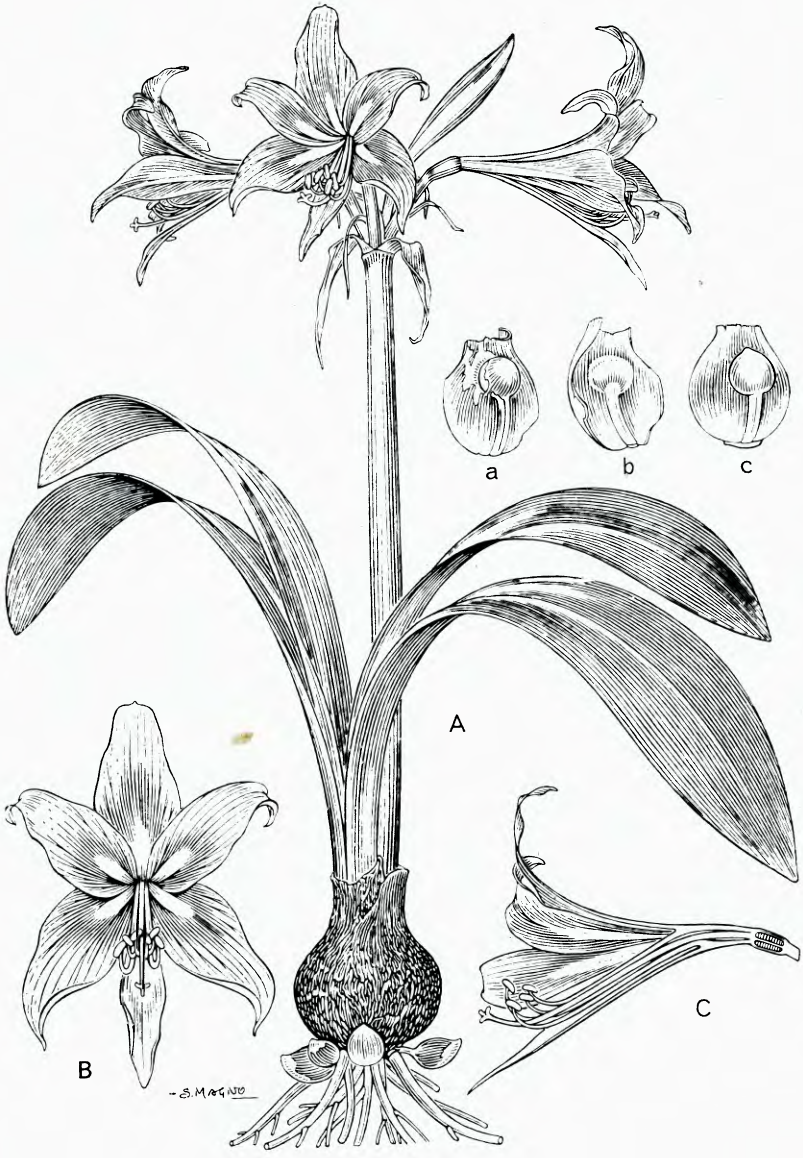


Fig. 19. *Amaryllis petiolata* (Pax) Traub et Uphof. *A*, plant in flower (X ⅓); *B*, flower, front view (X 0.5); *C*, longitudinal cut of flower, showing insertion of stamens and style; *a*, *b* and *c*, three aspects of generation of a bulblet (*b*, view from the adaxial face of the tunic). Drawn by S. Magno.

Janiero quartier) and also at the Rasa Island. The latter is a place which was explored in early times by botanists like Banks, Commerson and Martius. It is quite possible that Commerson was the collector who brought the plant to Lamarck for classification. As a result of my trip, it became clear that Lamarck's species was different from the Argentinian one. Thus I turned back to my previous concept in considering the latter as *Amaryllis flammigera* (Holmb.) T. & U. This fact was communicated to people who were working on this plant.

On the other hand, the problem concerning the identity of *Amaryllis petiolata* (Pax) T. & U. was still unsolved. In 1965, Dr. Gómez Rüppel, from Mendoza, went to the original location (in the province of Corrientes) in order to try to find this plant and introduce it into cultivation. He was unable to find the type-location of "Monte Justo", near Santo Tomé, but he did find a place called "Capón Susto" [From Dr. Gomez Rüppel correspondence]. "Monte" and "Capón" [Native term of Guaraní origin, composed from "caá", plant or tree and "paú", place: place with trees or wood], are both native terms for wood. In the neighborhood of Santo Tomé, Dr. Gomez Rüppel found an *Amaryllis* which Dr. Traub named *A. argilagae.* This proved to be identical with *A. flammigera* (Holmb.) T. & U.

In 1967 I decided to request on loan from the Botanical Museum of Berlin-Dahlem, the type-specimen of *Amaryllis petiolata* (Pax) T. & U. (Arg., Corrientes, Santo Tomé, Monte Justo, leg. Niederlein). There were strong possibilities that it could have been burned during the last war. Fortunately, it had been saved, along with many other types of Monocotyledones. When it reached my hands, a previous supposition became true: the specimen agreed in every respect with the plant collected in the province of Misiones by Holmberg, and named by him *Hippeastrum flammigerum.* Another point of interest was noted: on the sheet label was written *Monte Susto,* which means something like "frighting wood", and not "Monte Justo". Thus, the plant was originally collected in the same place detected by Dr. Gómez Rüppel as "Capón Susto". In this manner a long time misidentified species of *Amaryllis* has been properly named.

The same plant was collected alive on the way to Puerto Stroessner, in Paraguay, during the excursions organized to that country in 1967, by the Sociedad Argentina de Botánica. Some time later it flowered in Buenos Aires. According to Spegazzini (1917, p. 42) it was also found in the Isla Hornos (Republic of Uruguay). In 1967 I found a few plants in the wood relics of Isla Martín García.

It is necessary to call attention to the reader, that the incorrect name "Hippeastrum rutilum" has been used very recently for this species by Naranjo in his excellent work on the caryology of some *Amaryllidaceae,* and by Fabris (1969) in the Flora de la Provincia de Buenos Aires.

**Amaryllis petiolata** (Pax) T. & U. (Figs. 18 and 19)

Traub et Uphof, Herbertia 5: 126-127. 1938; *Hippeastrum petiolatum* Pax, Engler Bot. Jahrb. 11: 330. 1890; *Hippeastrum flammigerum* Holmberg, An. Mus. Nac. Buenos Aires, Ser. III. 5: 158. 1903; *Amaryllis flammigera* (Holmb.) Traub et Uphof, Herbertia 5: 127. 1938; *Amaryllis argilagae* Traub, Pl. Life 23: 57. 1967.

Plant about 30-45 cm. high. Bulb almost globose, about 45-60 mm. in diam., covered with dark brown coats, with a very short or obsolete pseudo-neck, very prolific, bulblets almost round, often compressed, about 10-20 mm. wide, originated on the bulb tunics. Leaves 2-3 at flowering time, loriform to oblanceolate-petiolate, often somewhat falcate, laxly spreading, striated, a dark green, almost flat toward the apex, about 17-40 cm. long, to 48 mm. wide. Scape cylindrical or sometimes compressed, a pale green, somewhat pruinose. Spathe 2-4-flowered; valves lanceolate, almost equal, marcescent, about 20-42 mm. long; inner bracts few, linear. Pedicels about 24-54 mm. long. Flowers horizontal or sometimes declined, scarlet passing to coral-red with age, with a yellowish star at the throat, about 67 mm. long and 62 mm. in diameter. Ovary narrowly obovoid, obtusely triangular, a brownish green, to 6 mm. long, 4.8 mm. in width. Tepals oblanceolate, connated for 10 mm., recurved, somewhat undulated, the outer ones about 62 mm. long, 19 mm. wide, apiculate-velutinous, inner lateral to 61 mm. long, 15.5 mm. wide, the lower inner horizontal, narrower, about 59 mm. long, 11 mm. wide. Filaments declined, slightly incurved at their apex, lateral episepal ones to 32 mm. long, upper episepal about 34-35 mm. long, lower epipetal to 39 mm. long, the lateral epipetal ones about 42 mm. long. Style declined, to 60 mm. long; stigma trifid, its lobes about 2.5-3 mm. long.

Hab.—Gallery forests of the Río de la Plata (including the islands), and both the rivers Uruguay and Paraná in the Argentinian Mesopotamia; also in the Republics of Paraguay and Uruguay. Apparently it does not grow in the Brazilian territory. In Argentina it has been found, except for more or less extended gaps, from Punta Lara (prov. of Buenos Aires) to Iguazú (prov. of Misiones).

Specimens: Argentina: Ex hort. Holmberg; leg. Hicken (SI). Ex prov. Misiones, Culta in Hort. Bot. Bonariae, I-1902; leg. C. Spegazzini? (LPS 19464). Prov. of Entre Ríos, Delta inferior, Arroyo Martinez; leg. Burkart 27586, 6-XI-1959. (SI) Cult. in SI; leg. ipse 15063, 13-X-1944 (SI). Idem; leg. ipse 27586, 14-XI-1956. Uruguay Republic, dept. of Colonia, Riachuelo; leg. Cabrera 13633, 1-X-1960 (LP). Montevideo; leg. Felippone 3373 (SI).

*Amaryllis petiolata* was misplaced by Pax in subgenus *Habranthus* (= genus *Habranthus*).

The species never produces fruits under cultivation and apparently not even in the wild state. According to Naranjo (1969), the plant has a chromosome complement of 2n=55, and the pollen is 95 per cent self-sterile.

The bulb produces a great number of bulblets. These are nearly round, somewhat compressed, not more than 20 mm. in width. How are they generated? We may immediately understand that it is an unusual process. In fact, they are originated *on* the bulb tunics, apparently just beneath the epidermis. At the time when they are produced (Summer-Autumn), it is possible to see that the bulb is somewhat irregular in shape. Removing the outer tunics, it can be seen that the inner ones bear in almost all cases, one bulblet. This is attached almost always at the middle of the tunic. Below it there is an enlarged vascular strand system which connects the base of the bulblet to the corm of the bulb. This kind of a cord persist a time after the tunic has already dried

Bulblets have a dormant period from the time when they are generated to the next Spring (sometimes almost a year). Moreover, their outer coat is often hard and completely closed around. In this way the bulblets can resist immersion for long time during floods, which are not unfrequent in the Argentinian Mesopotamia. Rivers may carry them for long distances until they take root in some other place.

*Amaryllis striata* has the same type of vegetative proliferation, even if not so profuse. In this species the bulblets probably fall over the cliffs or maybe they are carried off by torrential rains. Similar cases are found in some *Liliaceae* as *Ornithogalum caudatum* Jacq. and *Scilla argentinensis* Haum. I prefer to use this name in place of *Camassia biflora* (Ruiz & Pav.) Cocucci (1969).

Obviously, this kind of proliferation saved *A. petiolata* from extinction. But, how did the species originate? Naranjo (1969, p. 78) says that it possibly is a hybrid between a hexaploid (2n=66) and a tetraploid (2n=44). In this case, which could be its parents? The closest species are: *Amaryllis striata* Lam. (2n=44), from Río de Janeiro, and *A. aglaiae* Cast. (2n=22), from the mountains of Tucumán. Both plants are separated from ours by efficient barriers: the southern plateau of Brazil (Serra Geral) and the Chaco Region in Argentina. It is possible that an answer of this problem could be found in the study of the following subspecies.

**Amaryllis petiolata** (Pax) T. et U.
ssp. **cochunensis** Rav. **ssp. nov.**

A subspecies petiolata bulbi cataphyllis haud bulbilligenis, tubo perigonii leviter breviori, differt.

Differs from subspecies petiolata on account of the tunics, which does not produce bulblets, and the perigone tube somewhat shorter.

Hab.—In woods of the southern part of the Aconquija mountains, mainly in the Río Cochuna region, prov. of Tucumán, Argentina.

Specimens: Culta in Bonaria ex bulbis collectis in sylvis regionis flumini Cochuna, dep. Chicligasta Tucuman Argentinae; leg. Ravenna 1002, prim. 1961 (typus in Herbario Ravenna).—Tucumán, dept. Chicligasta, Las Pavas, 2000 m.; leg. P. Joergensen II-1911 (BAB 35053).—

Idem ibid; leg. ipse 109, X-1912 (BAB).—Idem ibid, 1200 m. leg. S. Venturi 4556, 22-IX-1926 (LP, LIL). Idem, El Clavillo, al pié de la cuesta; leg. Fabris 6605, X-1966 (LP).

The attention of genetists is drawn to the necessity of studying the chromosomes of this subspecies. The plant is cultivated in the United States (see Pl. Life 1965:) from bulbs sent by Dr. Gómez Rüppel.

Except by the fact that the bulb tunics do not bear bulblets and that the perigonium tube is somewhat shorter, it is similar in every respect to the type.

## Type Species of Subgenus **Macropodastrum**

The application of the name *Amaryllis elegans* Spreng. (1815). to the type-species of the subgenus *Macropodastrum* is relatively recent. In fact, the first reference in connection with it, is found in the Index Kewensis. The name there is treated as a synonym of "*Hippeastrum solandriflorum* Herb.; Traub and Uphof (1938) accepted this statement, but due to priority they standardized *Amaryllis elegans,* a name which until then had never come into use.

It must be noted that Herbert's *Hippeastrum solandriflorum* (1821), is a variant of the name *Amaryllis solandraeflora* Lindl. (1821), but they both should probably be regarded as different. Nevertheless, as they appeared in the same year and, being Lindley's name in the proper genus, the latter must be selected. Moreover, *solandraeflora* is a correct epithet under Latin grammar.

The original diagnosis of *A. elegans* states as follows: "A. spatha multiflora corollis cernuis subpedicellatis intus glabris, laciniis alternis uncinatis, scapo tereti, foliis lineari-lanceolatis". This descriptive phrase does not show any special discrepancy, excepting perhaps the character "spatha multiflora". In fact, our plant is almost always two-flowered or rarely 4-flowered. Notwithstanding, in the discussion Sprengel says: "Proxima *A. vittata,* sed hujus pedicelli longiores, corolla intus scabrido-punctata, radices laciniarum exteriorum interiorum margini adnatee, quod secus in nostra. Corolla alba striis roseis elegantissime picta. *A. belladonna* pro cujus varietate habetur, differt petalis interioribus basi ciliatis, scapo compresso, corollis erectis". The translation follows: "Allied to *A. vittata,* but this has longer pedicels, the corolla with scales within, the lower part of the outer tepals adnate by its margins to the inner ones, which is quite at variance from our plant. Corolla [perigone] white very elegantly pink-striped. We received it as a variety of *A. belladonna;* this one differs by its scaled inner segments, its compressed scape, and the erect corolla[?]."

We can see above two points worthy of consideration: a) Sprengel says that the segments of *A. elegans* are not connate by its margins as in *A. vittata.* If this is true, *A. elegans* cannot be identified as our plant, because concrescent tepals continued by a distinct, often very long, perigone—tube, is the principal feature in the subgenus *Macropodastrum.*

(b) "Corolla [perigone] white very elegantly pink-striped". This is, in my opinion, the definitive evidence that Sprengel's name was applied to a different species, which could even pertain to another genus. The name "elegans" was obviously chosen because of the "white very elegantly pink-striped flowers". The type-species of *Macropodastrum* has greenish-white, not at all striped, flowers; it is quite a distinctive species.

In order to avoid any possibility of mistake, the type-specimen of *Amaryllis elegans* Spreng. was requested from several European Institutions, including Kew Gardens and the Botanical Museum of Berlin-Dahlem. I was informed that there is no specimen of that species in their herbaria. Possibly it never existed or maybe it was burned in the Berlin Museum during the war.

Due to the facts above mentioned, the name *Amaryllis solandraeflora* Lindl. must be restored. On the other hand *Amaryllis elegans* Spreng. is proposed here as "nomen dubium".

**Amaryllis solandraeflora** Lindl. (Fig. 20)

Lindley, Coll. Bot.: tab. 11. 1821; *Hippeastrum solandriflorum* Herbert, Appendix Bot. Reg.: 31. 1821; *Crinum stapfianum* Kraenzlin, Kew Bull. 1913: 191, Excl. syn. *Amaryllis elegans* Spreng.

Hab.—Central, Western and Northeastern Brazil, apparently also in Venezuela and the Guyanas. I have collected bulbs in Brazil in the following places: Goiás, Serra Dourada, near the town of Goiás (rare); Mato Grosso, Chapada do Amolar, in grassy fields; same State, Xavantina, abundant in sandy places; Piauí, between Oeiras and Floriano, in the caatinga (rare); Maranhão, mun. Pastos Bons, Serra do Caatingerio, in dry slopes (scarce).

Specimens: Brazil, chiefly Province of Goiás, comm. A. Glaziou 22204, 1806 (photo-type of *Crinum stapfianum* Kraenz. from K). Pernambuco, Petrolina, viajem ao "sertão"; leg. A. Lima 2/9-I-1961 (RB 11357). Goiás, Campos Belos; leg. A. P. Duarte 9488, 24-X-1965 (RB 130246).

A photograph of the type of *Crinum stapfianum* Kraenzl., received from Kew Gardens, revealed that this is a further synonym of *Amaryllis solandraeflora* Lindl.

A new species in subgenus **Omphalissa**

The present beautiful species I discovered in a Garden at Santa Ana do Livramento, Río Grande do Sul. The owner of the house said that it was gathered in wild state, in the south of the State of Santa Catarina. Talking with Dr. P. R. Reitz [Director, Herbario "Barbosa Rodrígues", Itajaí, Santa Catarina], he said that apparently the same species was collected by him in the same region. The latter material has not reached my hands yet.

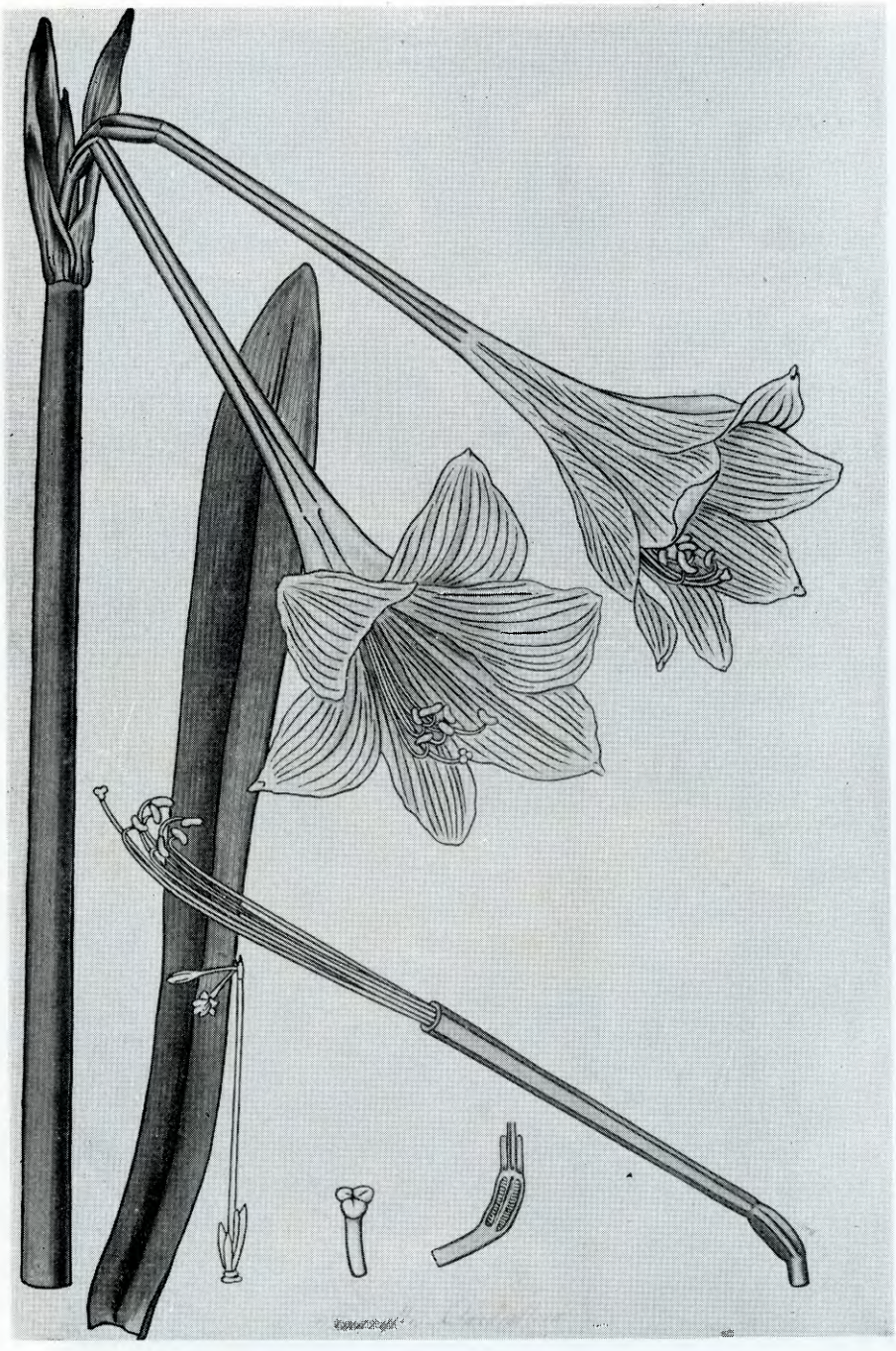

Fig. 20. *Amaryllis solandraeflora* Lindl., photograph from the original illustration (Coll. Bot.: tab. 11, 1821), by courtesy of Kew Gardens.

Fig. 21. *Amaryllis papilio* Rav., raised in Buenos Aires from bulbs gathered at Santa Ana do Livramento R. G. do Sul, Brazil; a native of Santa Catarina. *Left,* front view. *Right,* side view.

**Amaryllis papilio** sp. nov. (Fig. 21)

Planta usque 52 cm. alta. Bulbus ovatus ad 9 cm. longus circ. 55 mm. latis in collo brevi circ. 4-5 cm. longis productus, tunicis cartaceis fusco-ochraceis vestitus. Folia synanthia lorata canaliculata viridia usque quinque ad 30-50 cm. longa circ. 33-37 mm. lata striata recurve patentia. Scapus leviter compressus ad 33 cm. longus leviter pruinosus basin versus purpurescens usque 15-16 mm. latus. Spatha biflora; valvae marcescentes subaequales ad 10-10.5 cm. longae; bractea interior unica linearia ad 7.5 cm. longa. Pedicelli subaequales teretes ad 5.5 cm. longi circ. 6.5 mm. lati. Flores leviter declinati ad lateras valde compressi pallide viridi fusco-rubro-tincti usque 9 cm. longi ad 13.4 in diametro verticale et 12 cm. in diametro horizontale. Ovarium oblongum nitide viride ad 16-18 mm. longum circ. 9-10 mm. latum. Tepala oblanceolata usque 10-11 mm. concrescentia, exteriori-superius ad 10.5 cm. longum circ. 35 mm. latum sordide albo-viridescente insigniter fusco-rubro venatum et tinctum apiculo circ. 5 mm. longo instructum, exteriora lateralia angustiora saepe minus rubro-striata ad 14 cm. longa circ. 27 mm. lata apiculis circ. 6.5 mm. longis instructa, interiora lateralia late oblanceolata ad 9.5 cm. longa circ. 44 m. lata ad margines leviter undulata prope basin viridia dense fusco rubro-tincta et venata, interiori-inferius peracutum ad 10.5 cm. longum circ. 25-28 mm. latum basin versus fusco-rubro-suffusum fasciculum staminorum amplectente ad margines ejusdem colore tinctum. Filamenta declinata stricte fasciculata alba, sepalinum superius ad 8 cm. longum, sepalina lateralia ad 8.2 cm. longa, petalina lateralia ad 9 cm. longa, petalinum inferius ad 9.2 cm. longum. Coronula viridis clausa crenulata. Stylus declinatus superne leviter ascendens albo-viridescens usque 11 cm. longus; stigma trifidus lobis patentes usque 4 mm. longis.

Plant to 52 cm. high. Bulb ovate, about 9 cm. long, 55 mm. in width, produced into a pseudoneck for 4-5 cm.; the outer tunics papery, a dark brown. Leaves synanthious, lorate, canaliculate, green, about five, to 30-50 cm. long, 33-37 mm. broad, striated, recurvely spreading. Scape somewhat compressed, to 33 cm. long, somewhat pruinose, purplish and 15-16 mm. wide toward the base. Spathe two-flowered; the valves marcescent, subequal, to 10-10.5 cm. long; inner bract single, linear, about 7.5 cm. long. Pedicels almost equal, cylindrical to 5.5 cm. long, 6.5 mm. in width. Flowers somewhat declined, laterally rather compressed, a pale green tinged with a dark red, to 9 cm. long, 13.4 cm. in its vertical diameter and 12 cm. in its horizontal diameter. Ovary oblong, a bright green, about 16-18 mm. long, 9-10 mm. in width. Tepals oblanceolate, connated for 10-11 mm., the upper outer to 10.5 cm. long, 35 mm. broad, a greenish white markedly striated and stained with a dark red, its apiculum to 5 mm. long; lateral outer ones narrower, often less red-striated, about 14 cm. long, 27 mm. broad, its apicula about 6.5 mm. long; lateral inner ones broadly oblanceolate to 9.5 cm. long, 44 mm. broad, with somewhat undulate margins, green toward the base and markedly striated or stained with dark red; lower inner very acute

to 10.5 cm. long, 25-28 mm. broad, stained with a dark red toward the base, here sheathing the stamens fascicle, its margins of the same red color. Filaments declined, closely fasciculated, white, the upper episepal to 8 cm. long, lateral episepal about 8.2 cm. long, lateral epipetal to 9 cm. long, lower epipetal about 9.2 cm. long. Basal scales closed around the stamen fascicle, crenulate. Style declined, slightly curved toward the apex, a greenish white, to 11 cm. long; stigma trifid, its lobes spreading to 4 mm. long.

Hab.—South of the State of Santa Catarina, Brazil. Cultivated in Río Grande do Sul (Brazil) and in my collection in Buenos Aires.

Specimens: Cultivated in Buenos Aires from a bulb gathered in the south of the State of Santa Catarina, Brazil (exact locality not known); leg. Ravenna 1000, Nov. 1967 (typus Herb. Ravenna).

This plant is related to *Amaryllis aulica* Ker.; it is easily distinguishable from it because of the laterally compressed flowers of a different color. The name due to the shape of the lower pair of inner tepals which resemble the wing tails of some butterflies of the genus *Papilio;* the brown-red blotches and the general aspect of the flower also reminds a butterfly.

Apparently the same species was found by Dr. Gómez Rüppel near Porto Alegre.

### **Amaryllis araripina,** new species from Pernambuco, Brazil

During explorations in the State of Pernambuco, I discovered a new species in the subgenus *Macropodastrum.* This was found in low elevations, about 5 km SE from the small town of Araripina.

### **Amaryllis araripina** Rav. sp. nov.

Planta usque 90 cm. alta. Bulbus globosus vel subovatus usque 65 mm. latus in collo circ. 5-9 cm. longo productus, tunicis exterioribus fusco-ochraceis obtectus. Folia lorata canaliculata recurve patentia ad 30-40 cm. longa vel interdum ultra circ. 45-55 mm. lata ad apicem obtusa, ad anthesin usque tres. Scapus teres robustus ad 80-82 cm. longus circ. 20 mm. latus. Spatha biflora bivalvata; valvae ad anthesin siccae membranaceo-cartaceae subaequales ad 46 mm. longae; bracteae interiores usque quinque lineari-lanceolatae. Pedicelli ad 42-60 mm. longi. Flores pulchre albi tubum versus leviter ochracei ad 16.5-17.5 cm. longi circ. 74-84 mm. lati. Ovarium obtuso-triquetrum ad 7-8 mm. longum circ. 3.5-4.5 mm. latum. Perigonii tubus ad 90-95 cm. longus. Tepala oblanceolata recurve patentia haud crispato-undulata, exteriora usque 80-84 mm. longa circ. 21 mm. lata apiculata; apiculus circ. 1 mm. longus; interiora subaequilonga usque 22.5 mm. lata acuta. Filamenta fasciculato-declinata ad apicem incurva alba, sepalina lateralia ad 50 mm. longa, sepalinum superius ad 55 mm. longa. Petalium inferius circ. 60 mm. longum, petalina lateralia ad 65 mm. longa. Antherae subreniformes vel sublunulatae ad 5-5.9 mm. longae; pollen luteus. Stylus ex ovario circ. 17-17.5 cm. longus; stigma breviter trifidus, lobis crassiuscaulis paullo

recurvatis ad 1.2-1.8 mm. longis.

Plant to 90 cm. high. Bulb almost globose or ovoid about 65 mm. in width, produced into a pseudo-neck for 5-9 cm., the outer coats of a dark brown. Leaves lorate canaliculate, recurvely spreading, about 30-40 cm. long or sometimes longer, 45-55 mm. broad, obtuse, about three at anthesis. Scape cylindrical, robust to 80-82 cm. long, 20 mm. in width. Spathe two-flowered, bivalved; valves dry at anthesis, papery-membranous, almost equal, to 46 mm. long; inner bracts five, linear-lanceolate. Pedicels about 42-60 mm. long. Flowers white, the tube slightly ocraceous, to 16.5-17.5 cm. long, 74-84 mm. in diameter. Ovary obtusely trigonous to 7-8 mm. long and 3.5-4.5 mm. in width. Perigone-tube to 90-95 mm. long. Tepals oblanceolate recurvely spreading, not crisped or undulated, the outer to 80-84 mm. long, 21 mm. broad, apiculate; the apiculum to 1 mm. long; inner subequal to 22.5 mm. broad, acute. Filaments fascicled, declined, incurved at the apex, white, lateral episepal to 50 mm. long, upper episepal about 55 mm. long, lower epipetal to 60 mm. long, lateral epipetal to 65 mm. long. Anthers almost reniform or sumilunate about 5-5.9 mm. long; pollen yellow. Style to 17-17.5 cm. long; stigma shortly trifid, its lobes thickened, somewhat recurved, to 1.2-1.8 mm. long.

Hab.—In shady sandy places, on hills, near the town of Araripina, in the State of Pernambuco, Brazil. It grows near *Cassia* sp. and thorny Leguminosae.

Specimens: In collis 5 km a urbe Araripina civit Pernambuco Brasiliae; leg. Ravenna 165, XII-1962 (typus Herbarium Ravenna).

With pure white flowers and a shortly trifid stigma, this plant comes close to *A. argentina* (Pax) Rav.; the leave are similar to this species. On the other hand the flower shape is quite similar to that of *A. solandraeflora* Lindl.; however, it differs from it on account of the broad recurved leaves, the flower color, and the faintly trifid stigma.

The name commemorates the Araripe Indians, who were the original inhabitants of the region where the plant grows.

The varieties *conspicuum, rubritubum,* and *striatum,* Herbert's names attached to *Hippeastrum solandriflorum* Herb. are transferred to this species. This is done tentatively, because they both cannot be maintained with that species; their morphology agrees reasonably with *A. araripina* Rav.:

**Amaryllis araripina** Rav. ssp. **conspiqua** (Herb.) Rav. comb. nov.

*Hippeastrum solandriflorum* Herb. var. *conspiquum* Herbert, Amaryll.: 136. 1837.—*Amaryllis solandraeflora* Lindl. var. *vittata* Lindley, Edwards' Bot. Reg. 11: tab. 876. 1825.—*Amaryllis elegans* Spreng. var. *conspiqua* Traub Amaryllis Manual: 266. 1958.

**Amaryllis araripina** Rav. ssp. **rubrituba** (Herb.) Rav. comb. nov.

*Hippeastrum solandriflorum* Herb. var. *rubritubum* Herbert, Amaryll.: 136. 1837.—*Amaryllis elegans* Spreng. var. *rubrituba* Traub, Amaryllis Man.: 266. 1958.

**Amaryllis araripina** Rav. ssp. **striata** (Herb.) Rav. comb. nov.

*Hippeastrum solandriflorum* Herb. var. *striatum* Herbert, Amaryll.: 136. 1837.—*Amaryllis elegans* Spreng. var. *striata* (Herb.) Traub, Amar. Man.: 266. 1958.

## II. **RHODOPHIALA** NOTES

A new *Rhodophiala* from Brazil is described here. The species was found in Minas Gerais and represents the northernmost record of the genus. Additionally a number of new combinations and new taxa are proposed.

**Rhodophiala cipoana** Rav. sp. nov.

Planta usque 20-25 cm. alta. Bulbus ovatus ad 35 mm. longus circ. 19-21 mm. latus in collo brevi productus, tunicis exterioribus fusco-ochraceis. Folia ad anthesin incipientia unica vel dua lineari-canaliculata circ. 3-6 mm. lata. Scapus circ. 19-27 cm. longus. Spatha biflora; valvae ad basin liberae marcescentes ad 15-25 mm. longae, bracteis interioris duis setaceis includentes. Flores pedicellati purpurei ad 45-55 mm. longi circ. 38-45 mm. lati. Ovarium obovato-clavatum obtuso-triquetrum ad 4 mm. longum circ. 2.5 mm. latum. Tepala oblanceolata ad 1.4-1.6 mm. connata, exteriora ad 40-56 mm. longa circ. 9 mm. lata apiculata, interiora ad 40-52 mm. longa circ. 9 mm. lata acuta. Filamenta declinata, sepalina lateralia ad 17 mm. longa, sepalinum superius circ. 18-19.5 mm. longum, petalina lateralia circ. 22-26 mm. longa, petalium inferius ad 26-27.5 mm. longum. Antherae versatiles oblongo-reniformes circ. 4.5 mm. longae; pollen loculique lutei. Stylus declinato-ascendens circ. 50 mm. longus. Stigma trifidus lobis recurvatis usque 2.5-3 mm. longis instructus.

Plant to 20-25 cm. high. Bulb ovate about 35 mm. long, 19-21 mm. in width, produced into a pseudo-neck; the outer coats of a dark brown. Leaves incipient at anthesis, single or two, linear-canaliculate, to 3-6 mm. broad. Scape about 19-27 cm. long. Spathe two-flowered; valves free down to the base, marcescent, about 15-25 mm. long; inner bracts two, filiform. Flowers pedicellated, purple, to 45-55 mm. long, 38-45 mm. in diameter. Ovary obovate-clavate, obtusely trigonous, about 4 mm. long, 2.5 mm. wide. Tepals oblanceolate, connated for 1.4-1.6 mm. the outer to 40-56 mm. long, 9 mm. broad, apiculate; the inner about 40-52 mm. long, 9 mm. broad, acute. Filaments declined, lateral episepal to 17 mm. long, upper episepal to 18-19.5 mm. long, lateral epipetal about 22-26 mm. long, lower epipetal to 26-27.5 mm. long. Anthers versatile, oblong-reniform to 4.5 mm. long; pollen yellow. Style declined-ascending about 50 mm. long. Stigma trifid, its lobes recurved, to 2.5-3 mm. long.

Hab.—In sandy quartzitic soil at the top of the Serra do Cipó, State of Minas Gerais, Brazil; I have collected it near the house called "Palacio", at km 122 and 123 of the MG-2 route. It grows near *Trimezia fistulosa* Fost. (*Iridaceae*), *Trimezia* sp., *Trimezia truncata* Rav. ssp.

*Pseudotrimezia cipoana* Rav. (*Irid.*), *Lychnophora* sp. (*Compositae*), *Poligala* sp., *Barbacenia coccinea* (*Velloziaceae*), *Barbacenia* sp. (Shruby), and others.

Specimens: Brazil, Minas Gerais, mun. Santa Luzia, Serra do Cipó, cerrado; leg. E. P. Heringer 7342, 12-XI-1959 (typus UB).

*Rhodophiala cipoana* has its closest affinities in the *Rh. bifida* complex. The latter species has, however, larger globose bulbs deeply immersed in the ground. It resembles somewhat *Rh. araucana* (Phil.) Traub, mainly because of the plant size, but this has smaller erect flowers of a different color.

I found it at km 122 and 123 of the road which passes by the Serra do Cipó. Bulbs were gathered in two different occasions in their vegetative state but did not survive cultivation in Buenos Aires.

In its native habitat plants are submitted to intentional periodical fires, especially during the end of the dry season. Thus it is very difficult to find them in flower. For the same reason they cannot produce seeds freely. Moreover, if we consider the weak bulb which has a short pseudo-neck, and the very restricted area, we realize that the species is in a serious risk of extinction.

**Rhodophiala mendocina** (Phil.) Rav. comb. nov.

*Habranthus mendocinus* Philippi, An. Un. Chile 2: 406. 1862.—Excl. syn. *Habranthus mendocensis* (Bak.) Sealy.

Plant about 22-30 cm. high. Bulb subglobose or sometimes ovoid, often very large, about 5-7 cm. in width, produced into a pseudo-neck; outer coats membranous, a dark brown. Leaves few, sometimes serotine, linear, canaliculate, often prostrate, a pale green, pruinose, obtuse, about 20-30 cm. long, 6-10 mm. broad. Scape cylindrical, pruinose, about 16-28 mm. long, 6-10 mm. wide near the base. Spathe bivalved, often 3-5-flowered; valves membranous, free to the base, lanceolate, subequal, about 45-55 mm. long; inner bracts few, almost filiform. Pedicels about 12-20 mm. long. Flowers erect, infundibulate, yellow, about 36-40 mm. long, 30-40 mm. in diameter. Tepals oblanceolate connated for 2.5-3 mm., the outer sometimes tinged with a brownish-red in the outside, apiculate, about 35-40 mm. long, 11-13 mm. broad, the inner about 34-38 mm. long, 10-12 mm. broad. Filaments yellow, ascending, lateral episepal to 9.5-10 mm. long, upper episepal to 10.5-12 mm. long, lower epipetal about 17-18 mm. long, lateral epipetal to 18-18.5 mm. long. Anthers semilunate, yellow, about 3.8-4.5 mm. long. Style arquate, ascending, about 29 mm. long. Stigma trifid, its lobes recurved to 2-2.5 mm. long.

Hab.—In sandy places of the province of Mendoza, Argentina, to the south of the province of La Pampa and Patagonia.

Specimens: Argentina, prov. of Mendoza, Ramblones; leg. Carette 121, I-1921 (SI). Idem, Piedra de Afilar; leg. ipse 160, I-1921 (SI). Idem, dept. of San Carlos; leg. L. M. Torres 8 (SI). Idem, parte austral; leg. R. Guevara, 27-XI-1902 (BAB). Idem dept. of Las Heras, Quebrada

Fig. 22. *Rhodophiala mendocina* (Phil.) Rav., as it grows in northern Neuquen, Argentina. Photo from the archives of the Servicio Nac. de Parques Nacionales.

del Toro; leg. J. Hunziker 6344, 28-III-1954 (BAB), in fruit. Mendoza and Neuquen; leg. Gerling 149, 1907-08 (SI). Idem ibid.; leg. ipse 244 (SI). Prov. of La Pampa, dept. Utracán, Ruta 21; leg. E. Cano 3271, 21-XI-1965 (BAB). Idem, entre Chacharramendi y La Reforma; leg. Ragonese & Piccinini 8139, 17-XII-1951 (BAB). Idem, La Reforma, sobre el rio Salado; leg. O. Solbrig 190, 17-XII-1951 (SI). Prov. of Neuquen, Dept. Chos Malal, Riscos Bayos; leg. Boelcke et al. 11180, 25-I-1964 (BAA, BAB, SI). Dept. of Zapala, 7 km al sud de Zapala, Ruta 40; leg. R. L. Pérez Moreau 3236, 12-XII-1961 (BAB). Prov. of Río Negro, dept. of Adolfo Alsina, camina entre Viedma y S. Antonio Oeste; lèg. Correa et al. 2455, XI-1963 (BAB).

Philippi's name *Habranthus mendocinus* was wrongly included as a synonym of *Hippeastrum advenum* in Index Kewensis. This statement was accepted by Traub & Uphof (1938), Traub & Moldenke (1949), and Traub (1953).

*Rhodophiala advena* (syn. *Hippeastrum advenum* Herb.) is native in the hills and coastal plains of Central Chile. It does not occur in the Argentine province of Mendoza, separated from Chile by the high mountains of the Andes. Our plant was cited in the past by Holmberg (1903, p. 143) under *Hippeastrum pallidum* (Herb.) Pax, a synonym of *Rh. advena.*

The species was collected by Philippi in a place called "Guadal". The most similar name which I detected in the province of Mendoza is "Guadales", a locality placed near the town of San Rafael. Guadal means sandy place or dune.

*Rhodophiala elwesii* (C.H.Wr.) Traub, possibly is a mere subspecies of *Rh. mendocina.* A photograph of the latter was published by Böcher et al. (1968), under the name *Hippeastrum bagnoldi* (Herb.) Bak. (= *Rhodophiala bagnoldi*), a Chilean species which is not found in Argentina. Our figure differs from it merely by the absence of leaves; it was photographed in the north of the province of Neuquen.

**Rhodophiala bifida** (Herb.) Traub ssp. **granatiflora** (Holmb.) **comb. nov.**

*Hippeastrum granatiflorum* Holmberg, An. Mus. Nac. Buenos Aires 9: 79. 1903.—*Habranthus nemoralis* Herbert, Amaryll.: 159. 1837.—*Amaryllis granatiflora* (Holmb.) Traub et Uphof, Herbertia 5: 120. 1938.—*Phycella granatiflora* (Holmb.) Traub, Pl. Life 9: 62. 1953.—Pro. syn.: *Habranthus intermedius* Herbert, Amaryll.: 160. 1837.

This subspecies differs from the type merely in the lower stature and the vermilion flowers. When plants grow at full sun, the flower color turns to a light pomegranate red.

Plants were collected recently in the type-locality (Maldonado, Republic of Uruguay) by Dr. John Christie, an enthusiast lover of plants. These revealed to be identical to those which I gathered near Balcarce in the Buenos Aires province.

Hab.—Brazil (Río Grande do Sul), Uruguay, and Argentina at

Tandil and Balcarce in the province of Buenos Aires. It grows in plains or hills, among rocks at full sun or rarely in woods.

Specimens: Argentina, prov. of Buenos Aires, Dept. Balcarce, sierra La Vigilancia; leg. R. Martinez Crovetto 2540, II-1944. Idem, sierra Del Sombrero; leg. ipse 1709, I-1943 (BAB). Idem, Tandil; leg. Clos 2232, 14/16-II-1926 (BAB).—Misiones, Bonpland; leg. Joergensen 674, XI-1910 (BAB, SI).

**Rhodophiala bifida** (Herb.) Traub ssp. purpurea Rav. **ssp. nov.**

A subspecies bifida aemantha et granatiflora floribus vinosis differt; statura et forma floribus subspeciem aemantham similis.

It differs from the rest of subspecies on account of the wine-red flowers. Size of the plant and shape of the flower is similar as in subspecies *aemantha*.

Hab.—Fields of the province of Buenos Aires. I have seen it, apparently of a paler color, on the railway side between the stations of Palomar and Rubén Darío, also near Ezeiza. Cultivated in the botanic gardens of Castelar, Buenos Aires ("C. Thays"), and Faculty of Agronomy of Buenos Aires, plants of the latter two places are of a paler color.

Specimens: Cultivated in the Botanic Garden of Castelar; leg. Ravenna 801, March 1967 (typus in Herb. Ravenna, isotypus BAB et caet.). Cultivated in the Botanic Garden of the Faculty of Agronomy of Buenos Aires; leg. Ravenna 807, April 1969 (Herb. Rav., BAA).

Key to the subspecies of *Rhodophiala bifida*

1a. Flowers of a carmine-pink or purple color.
  2a. Plant robust often to 30-45 cm. high. Flowers a somewhat pale carmine color ("china rose"), about 45-60 mm. long, 40-60 mm. in diameter ---------- a. *Rh. bifida* ssp. *bifida*
  2b. Plant not robust, to 15 cm. high. Flowers a dark carmine to wine-color about 30-38 mm. long, 30-40 mm. diameter b. *Rh. bifida* ssp. *purpurea*

2b. Flowers of a blood-red or vermilion passing to pomegranate-red.
  2a. Plant weak, not more than 15 cm. high. Tepals 7-10 mm. broad. Flower of a dark blood-red ..... c. *Rh. bifida* ssp. *aemantha*
  2b. Plant somewhat robust, about 20-30 cm. high. Tepals to 10-14 mm. broad. Flowers a vermilion passing to pomegranate-red d. *Rh. bifida* ssp. *granatiflora*

*Notes.*—According to references, white forms are found sometimes in Nature. *Rhodophiala spathacea* (Herb.) Traub, apparently is a synonym of the typical *Rh. bifida*. The latter is found, in Buenos Aires, exclusively in the slopes above the Río de la Plata and Paraná river, growing under partial shade. *Rhodophiala bifida* var. *pulchra* (Herb.) Traub, with flowers 3 cm long, seems to me doubtful; possibly

it is a variety of subspecies *purpurea.*

**Rhodophiala andicola,** transferred to subgenus **Rhodophiala** (Fig. 23)

*Rhodophiala andicola* (Poepp.) Traub, Pl. Life 9: 60. 1953.—*Amaryllis andicola* Poeppig, Fragm, Syn. Pl. Phan.: 5. 1833.—*Habranthus andicola* (Poepp.) Herb. Amaryll.: 168. 1837.—*Hippeastrum andicolum* (Poepp.) Baker, Trimen's Journ. Bot. 16: 82. 1878.—*Zephyranthes*

Fig. 23. *Rhodophiala andicola* (Poepp.) Traub, as it grows in the Cerro Chapelco, near San Martín de los Andes, Neuquen, Argentina. Photo from the archives of the Servicio Nac. de Parques Nacionales.

*andicola* (Poepp.) Baker, Handb. Amaryll.: 36. 1888.—*Hippeastrum purpuratum* Philippi, An. Un. Chile 93: 156. 1896.—*Amaryllis purpurata* (Phil.) Traub et Uphof, Herbertia 5: 131. 1938.—*Rhodophiala purpurata* (Phil.) Traub, Pl. Life 9: 60. 1953.

Plant about 17-25 cm. high. Bulb ovoid to 35 mm. long, 20-28 mm. in width, produced into a pseudo-neck for 30-70 mm., covered with brown membranous tunics. Leaves linear, canaliculate, somewhat fleshy, green,

obtuse, often spreading on the ground, present at anthesis, about 10-30 cm. long, 2.8-5 mm. broad. Scape cylindrical about 12-26 cm. long. Spathe one-flowered bivalved; valves free down to the base lanceolate subventricose purplish, about 26-50 mm. long, 6-10 mm. wide. Pedicel to 3-7 mm. long. Flowers widely infundibulate erect or slightly inclined about 28-40 mm. long (in expanded flowers) and 35-50 mm. in diameter. Tepals oblanceolate, connated at the base for 6-7 mm., subequal but the outer with a short apiculum, a light carmine-pink paler downwards, passing to a purplish black in the lower third, about 29-39 mm. long, 8-12 mm. broad. Filaments ascending pinkish, the lower episepal pair about 4-5.7 mm. long, upper episepal to 6.7-7 mm. long, lower epipetal about 7.8-8.5 mm. long, the longer epipetal pair to 9-11 mm. long. Anthers oblong curved or semilunate after dehiscences, about 4.5-5.7 mm. long, yellow. Style arquared, ascending about 18-25 mm. long. Stigma capitate-trilobed, a purplish-black, about 1.5-2.5 mm. wide. Capsule globose-tricoccous about 23-25 mm. in width; seeds black, flat with membranous margins rounded to subdeltoid, about 12-14 mm. long, 8-11 mm. broad.

Hab.—In sandy places, especially at the top of the mountains of northern Neuquén in Argentina; also in the Araucanía (Antuco, Linares, Chillán) in Chile.

Specimens: Argentina: Neuquen, Copahue; leg. G. Kraftsik, 11-III-1968 (DPN 10153), in fruit. Idem, S. Martín de los Andes, Cerro Chapelco; leg. M. J. Dimitri, 6-I-1968 (DPN 9750). Idem ibid; leg. S. Schajovskoy, 14-II-1961 (DPN 2868). Idem, Lanín National Park, Quemado de Tromen, Cañadón Grande; leg. S. Schajovskoy, 14-XII-1962 (DPN 5602). Idem, Cerro Chapelco, 1700 m; leg. Irma Gamundí s/n, 13-11-1968 (LP). Idem ibid; leg. Schajovskoy s/n, 24-XII-1968 (LP). Idem, Dept. Mina, Piedra de Gallo; Boelcke et al. 11407, 30-1-1964 (BAA, BAB, SI). Idem, 21 km de Las Ovejas, camino a las lagunas Epu-Lauquen; Boelcke et al. 11045 (BAA, BAB, SI). Idem, Lago Huechulaufquen, subida al Cerro de Los Angeles; leg. Dawson & Schwabe 2631, 7-11-1948 (BAB).

*Rhodophiala andicola* was tentatively placed in subgenus *Chilanthe* (= subgen. *Rhodophiala*), by Traub & Moldenke (1949). These authors said that "new material of this plant is needed to determine definitely its status". This was done because of the lack of data concerning the stigma. Recently, however, I discovered the species in some Herbaria from here. The identification was possible by comparing the specimens with a photograph of the type (Field Museum series, nr.). The latter was found in the Andes of Antuco in Chile.

*Hippeastrum purpuratum* Phil. was a later synonym of the species. According to Philippi, this was found in the eastern side of the Andes of Linares. This record should probably be referred to the present territory of Argentina. The citation of the species for Mendoza (as *Zephyranthes andicola*) by Hausman and Vanderveken (1917, p. 284), is probably a misidentification for some other species.

With a clearly capitate-trilobed stigma, *Rh. andicola* is transferred to subgenus *Rhodophiala.*

### **Rhodophiala laeta** revalidated

*Rhodophiala laeta* Philippi, Fl. Atacam.: 51. 1860.—*Hippeastrum laetum,* (Phil.) Philippi, An. Un. Chile 93: 157. 1896.—*Amaryllis atacamensis* Traub et Uphof, Herbertia 6 (1939) : 151. 1940.

*Rhodophiala laeta* Phil. was tentatively placed, by Baker (1888), under the synonymy of *Rh. pratensis* (Poepp.) Traub (as *Hippeastrum pratense*). This concept was followed by Traub & Uphof (1938) and Traub & Moldenke (1949).

Although rather related with the latter, *Rh. laeta* shows characters which prove its distinctness as an independent species. In fact, the plant has light pink narrower tepals with a white band in the lower third, stamens and style are shorter, and the inflorescence is, as far as I have seen, always 4-flowered. *Rh. pratensis* has brilliant orange-red flowers with somewhat wider tepals and longer stamens and style; umbels are 1-5-flowered. Moreover, geographical area and ecology of both species are quite different.

I have studied and collected *Rh. laeta* in the hills of Paposo (prov. of Atacama, Chile), which is the type locality. Bulbs were introduced in my collection but unfortunately they did not survive.

Hab.—Hills of Paposo, prov. of Atacama, Chile. It grows in sandy or hard soil at the top of the hills, near *Alstroemeria violacea* Phil., *Croton chilensis* Muell. Arg., *Tigridia* sp. (*Iridaceae*), with yellowish flowers, *Cereus* aff. *iquiquensis,* and others.

Specimens: Chile, prov. of Atacama, top of the hills of Paposo; leg. Ravenna, XII-1961 (Herb. Ravenna).

### **Rhodophiala maculata** (L'Her.) Rav. comb. nov.

*Amaryllis maculata* L'Heritier, Sert. Angl.: 10. 1788.

L'Heritier's original description says: "A. spatha uniflora diphylla lineari, flore pedunculato, genitalibus declinatis. Habitat in Chile, Dombey. Scapus punctis lineatis maculatus. Corolla campanulata".

The clear reference to a bivalved spathe, and a one-flowered inflorescence, suggests a *Rhodophiala* species (possibly in the subgenus *Rhodophiala*). An examination of the type-specimen in the Paris Museum (at present not available on loan), should probably disclose that *Rh. rhodolirion* (Bak.) Traub, is a later synonym of *Rh. maculata.*

## III. STUDIES IN THE GENUS **HABRANTHUS**

Among the bulbs collected during my trips to Brazil and the northwestern region of Argentina, were several new species of the genus *Habranthus.* One of the species included here is described from dry material. Moreover, the correct name for the plant formerly known as *Habranthus andersoni* Herb., is revealed.

**Habranthus ruber** Rav. **sp. nov.** (Fig. 24)

Planta ad 18-47 cm. alta. Bulbus ovatus ad 23-31 mm. longus circ. 17-21 mm. latus tunicis exterioribus brunneis membranaceis et collo usque 25-75 mm. longo instructus. Folia serotina crassiuscula viridia basin versus rufescentia canaliculata (canalis pallidior) cum marginis rotundato-incrassatis (ut in *H. gracilifolius*) longitudinis scaporum circ. 3 mm. lata. Scapus teres ad 20-42 cm. longus circ. 3-3.8 mm. latus pallide viridis basin versus erubescens. Spatha uniflora (raro biflora?) viridi-

Fig. 24. *Habranthus ruber* Rav. *Left,* wild, and *Right,* as cultivated in Buenos Aires. from bulbs collected near Cruz Altinhae, R. G. do Sul, Brazil. Photo S. Magno.

rubescens ad 25-37 mm. longa circ. 17-20 mm. bifida. Pedicellus usque 50-57 mm. longus. Flos utrinque ruber concolor vel raro ad basin vera viridis ad 44-56 mm. longus circ. 35-48 mm. latus vel 40 mm. in diametro horizontale et 48 in diametro verticale. Ovarium oblongo-clavatum obtuse angulatum ad 5 mm. longum circ. 2.2-2.3 mm. latum. Tepala oblanceolata ad 3.3-5 mm. concrescentia, exteriori-superius ad 36-52 mm. longum circ. 10.2-11.8 mm. latum tuberoso-apiculatum, apiculo circ. 0.8 mm. longo, exteriori-lateralia ad 37-54 mm. longa circ. 10 mm. lata, interiora ad 35-50.2 mm. longa circ. 8.3-10.2 mm. lata acuta. Filamenta declinata, sepalina lateralia ad 12.5-20 mm., sepalinum superius usque 16.5-25 mm. longum, petalinum inferius ad 18-31.6 mm. longum, petalina lateralia ad 22-35 mm. longa. Antherae semilunatae luteae usque 3-4 mm. longae. Stylus declinatus ex ovario circ. 27-39 mm. longus; stigmae lobi patentes usque 1.6-1.8 mm.

Plant about 18-47 cm. high. Bulb ovate about 23-31 mm. long, 17-21 mm. in width, produced into a pesudo-neck for 25-75 mm.; the outer tunics of a dark brown, membranous. Leaves serotine, somewhat fleshy,

green, somewhat reddish downwards, canaliculate (the canal paler), with rounded—thickened margins (as in *H. gracilifolius*), as long as the scapes, to 3 mm. broad. Scape cylindrical, to 20-42 cm. long, 3-3.8 mm. wide, a pale, green, reddish downwards. Spathe one-flowered (rarely two-flowered?), a reddish green, to 25-37 mm. long, bifid for 17-20 mm. Pedicel to 50-57 mm. long. Flower uniformly red or rarely green at the very base, to 44-56 mm. long and 35-48 mm. in diameter, or 40 mm. in its horizontal diameter and 48 mm. in its vertical diameter. Ovary clavate-oblong, obtusely angled, to 5 mm. long, 2.2-2.3 mm. in width. Tepals oblanceolate, concrescent for 3.3-5 mm.; the upper outer to 36-52 mm. long, 10.2-11.8 mm. broad, tuberose-apiculate, the apiculum about 0.8 mm. long, the outer lateral to 37-54 mm. long, 10 mm. broad, inner about 35-50.2 mm. long, 8.3-10.2 mm. broad, acute. Filaments declined, the lateral episepal to 12.5-20 mm. long, upper episepal about 16.5-25 mm. long, lower epipetal to 18-31.6 mm. long, lateral epipetal about 22-35 mm. long. Anthers semilunate, yellow to 3-4 mm. long. Style declined about 27-39 mm. long; lobes of the stigma spreading, to 1.6-1.8 mm. long.

Hab.—In grassy fields at woods' margins near Cruz Altinha, also near Caracol, State of Río Grande do Sul, Brazil.

Specimens: Circ. 1 km ad orientem Cruz-Altinhae (mun. Passo Fundo) civit. Río Grande do Sul Brasiliae; leg. Ravenna 1001, II-1968 (typus in Herbario Ravenna). Río Grande do Sul, mun. Jaguarí, Caracol, Salto de Caracol; leg. K. Emrich, febr. 1953 (PACA 52819). Idem, Caracol; leg. ipse, 24-II-1948, spathe 2-flowered (PACA 37193). Idem ibidem; leg. ipse, II-1951 (PACA 50219).

This pretty species I have found about 1 km east of Cruz Altinha between Passo Fundo and Lagoa Vermelha, in the State of Río Grande do Sul, Brazil. It was growing at the margins of small woods near the road.

*Habranthus ruber* is closely related to *H. gracilifolius* Herb. to which it resembles by the quite similar but broader leaves. *Habranthus cardinalis* C.H.Wr., from Jamaica, has orange-red flowers, but tepals are blunter and the leaves flat.

Our plant has the most pure red (vermilion) flowers, an unusual color in the genus. The flower of the type-specimen, collected in the field, is somewhat smaller than usual, possibly because it was found at the end of the flowering time.

**Habranthus niveus** Rav. sp. nov.

Planta circ. 25-30 cm. alta. Bulbus ovatus ad 5 cm. longus circ. 3-3.3 cm. latus in collo productus, tunicis exterioribus fuscis. Folia basalia ad anthesin nulla serotina post anthesin 2-4 usque 16 cm. longa circ. 7.5-10 mm. lata cinereo-viridia pruinosa leviter canaliculata ad apicem obtuse. Scapus teres circ. 15-17 cm. longus. Spatha univalvata uni-flora usque 48 mm. longa circ. 25 mm. tubulosa ad apicem fenestrata vel paullo longior) albus senectutem versus erubescens usque 55 mm. longus circ. 45-50 mm. latus. Ovarium oblongum ad 8.6 mm. longum circ. 3.4

mm. latum. Tepala oblanceolata ad basin breviter concrescentia, exteriora ad 52-54 mm. longa circ. 15 mm. lata ad apicem crassiuscule apiculata, interiora ad 51-53 mm. longa circ. 18-19 mm. lata. Stamina fasciculato-declinata, dua breviora ad 15 mm. longa, dua longiora circ. 31 mm. longa, intermedia usque 20 et 23 mm. longa. Antherae arquate semilunatae usque 8 mm. longae; pollen loculique lutei. Stylus declinatus ex ovario circ. 35-37 mm. longus; stigma trifidus, lobis recurvatis usque 4-4.5 mm. longi.

Plant to 25-30 cm. high. Bulb ovate to 5 cm. long and 3-3.3 cm. wide, produced into a pseudoneck, covered with dark coats. Leaves none at anthesis, serotine, 2-4, to 16 cm. long, 7.5-10 mm. broad, a grayish green, pruinose, slightly canaliculate, obtuse. Scape cylindrical to 15-17 cm. long. Spathe one-flowered to 48 mm. long, tubulose for 25 mm., the apex fenestrate or bifid. Flower cernuus, pedicellate (pedicel equaling the spathe or somewhat longer), white, pink-tinged with age, to 55 mm. long, 45-50 mm. in diameter. Ovary oblong, to 8.6 mm. long, 3.4 mm. wide. Tepals oblanceolate, shortly connated at the base, the outer about 52-54 mm. long, 15 mm. broad, the apex with a somewhat thick apiculum, inner ones about 51-53 mm. long, 18-19 mm. broad. Stamens fascicled, declined, the shorter pair 15 mm. long, longer pair about 31 mm. long, intermediates about 20 and 30 mm. long. Anthers semilunate to 8 mm. long; pollen yellow. Style declined to 35-37 mm. long; stigmatrifid, its lobes recurved, to 4-4.5 mm. long.

Hab.—Argentina, sandy plateau between Chilecito (prov. of La Rioja) and Andalgalá (prov. of Catamarca). I have collected it at La Aguada, near Andalgalá; it grows near *Habranthus andalgalensis* Rav. and *Opuntia* sp.

Specimens: Argentina: Catamarca, Andalgalá, La Aguada; leg. Ravenna 113, XII-1961 (typus in Herbario Ravenna). Idem, abundante en el campo seco; leg. P. Joergensen 1214, 6-XII-1915 (BA, SI). Idem, El Candado; leg. Joergensen 1214 bis, II-1915 (BA).

This species is separable from *H. jujuyensis* (Holmb.) Traub, on account of its leaves, which are more or less flaccid and not so pruinose. In the latter species the tepals are greenish inside near the base, with grayish lines in the outside; filaments are greenish.

*Habranthus niveus* grows along the sandy xerophytic uplands of the provinces of La Rioja and Catamarca. It is very floriferous; the very large flowers make a pretty effect among bushes and cacti. The natives call it "sacha cebolla" or "cebolla de zorro".

### **Habranthus riojanus** Rav. **sp. nov.**

Planta circ. 17-18 cm. alta. Bulbus ovatus ad 3-3.5 cm. longus circ. 2.5-2.7 cm. latus in collo circ. 3-5 cm. vel ultra longus productus, tunicis brunneis vestitus. Folia basalia ad anthesin saepissime nulla, post anthesin circ. tres ad 15 cm. longa circ. 4 mm. lata viridia haud pruinosa. Scapus gracilis ad 13-14 cm. longus circ. 3 mm. latus saepe ochraceo-roseus. Spatha uniflora valva unica ad 3.5 cm. longa circ. 12 mm. tubu-

losa superne fenestrata. Flos roseus infundibulatus ad 4 cm. longus circ. 3 cm. latus. Pedicellus usque 13 mm. longus. Ovarium obovatum obtuse triquetrus viride ad 55 mm. longum circ. 3.5 mm. latum. Tepala oblanceolate ad basin circ. 4-4.5 mm. concrescentia, exteriora usque 35 mm. longa circ. 11.8 mm. lata, interiora subaequalia circ. 11.3 mm. lata. Stamina fasciculato-declinata, longiora circ. 16.5 mm. longa, breviora circ. 7 mm. longa, sepalinum superius ad 8 mm. longum, petalinum inferius circ. 9 mm. longum. Stylus declinatus ex ovario circ. 23 mm. longus; stigmae lobi paullo recurvati ad 2.8-3 mm. longi.

Plant to 17-18 cm. high. Bulb ovoid about 3-3.5 cm. long, 2.5-2.7 cm. wide, produced into a pseudo-neck for 3.5 cm., covered with dark brown coats. Leaves almost always none at anthesis, about three, to 15 cm. long, 4 mm. broad, green, not pruinose. Scape weak to 13-14 cm. long, 3 mm. wide, often of a brownish-pink. Spathe one-flowered about 3.5 cm. long, tubulose for 12 mm., then fenestrated. Flower pink, funnel-shaped about 4 cm. long, 3 cm. in diameter. Pedicel to 13 mm. long. Ovary obovate, obtusely trigonous, green, about 5 mm. long, 3.5 mm. wide. Tepals oblanceolate, concrescent for 4-4.5 mm., the outer to 35 mm. long, 11.8 mm. broad, inner subequal, about 11.3 mm. broad. Stamens fascicled, declined, the longer pair to 16.5 mm. long, shorter pair about 7 mm. long, upper episepal about 8 mm. long, lower epipetal to 9 mm. long. Style declined about 23 mm. long; lobes of the stigma somewhat recurved, about 2.8-3 mm. long.

Hab.—Grassy slopes, at 2900-3100 m. over the sea level, in the province of La Rioja, Argentina; I collected it near Mina del Oro, above Chilecito. It grows near *Eustephia marginata* Pax.

Specimens: Argentina, prov. La Rioja, Mina del Oro, above Chilecito, about 2900 m.; leg. Ravenna 107 (type in Herb. Ravenna). Idem, Sierra de Famatina, Rio de las Cuevas; leg. A. Krapovickas & J. Hunziker 5565, 25-I-1949 (BAB, SI). Idem, dep. Lamadrid, entre Las Palomas y Las Lampsvas; leg. ipses 5553, 24-I-1949 (BAB).

This species is closely related to *H. mendocensis* (Bak.) Sealy;[1] whereas, its leaves are of a dark green, not pruinose, and somewhat narrower from the latter. Moreover, its tepals do not have incurved margins and they are less obtuse. It grows near *Eustephia marginata* Pax.

[1] **Habranthus mendocensis** (Bak.) Sealy, Journ. Roy Hort. Soc. 62: 208. 1937; **Zephyranthes mendocensis** Baker, Handb. Amaryll.: 36. 1888; **Habranthus reedii** Traub, Pl. Life 7: 42. 1951.
**Habranthus mendocinus** Phil. **(=Rhodophiala mendocina)** and **H. mendocensis** (Bak.) Sealy, bear different specific epithets; therefore the later name **H. reedii** Traub, appears to be superfluous.

## **Habranthus irwinianus** Rav. **sp. nov.**

Planta ad 13-14 cm. alta. Bulbus subglobosus ad 16-18 mm. longus circ. 13-16 mm. latus in collo saepe brevi productus, tunicis exterioribus fusco ochraceis. Folia basalia ad anthesin incipientia pauca vel subnulla lineari-filiformia circ. 0.6 mm. lata. Scapus ad 9-10 cm. longus circ. 1.3 mm. latus (?). Spatha uniflora circ. 17-18 mm. longa ad 12-13 mm. tubulosa circ. 6-7 mm. bifida. Pedicellus ad 13-26 mm. longus. Flos

usque 12 mm. longus circ. 20 mm. latus colore incertus. Ovarium obovatum parum obtuso-triquetrum ad 2.8 mm. longum circ. 1.5-1.8 mm. latum. Tepala oblanceolata ad 1.5 mm. connata, exteriora ad 33.5 mm. longa circ. 4.8 mm. lata apiculata, interiora paullo breviora. Filamenta declinata, sepalinum superius ad 5 mm. longum, sepalina lateralia inaequalia usque 9 et 14 mm. longa, petalina lateralia ad 14.5 mm. longa, petalinum inferius circ. 15.5 mm. longum. Stylus declinatus ex ovario circ. 22 mm. longus; stigmae lobi recurvati circ. 2-3.5 mm. longi.

Plant to 13-14 cm. high. Bulb almost globose about 16-18 mm. long, 13-16 mm. in width, produced into a pseudo-neck; the outer tunics of a dark brown. Leaves incipient at anthesin, few, or practically absent, linear-filiform, about 0.6 mm. broad. Scape about 9-10 cm. long, 1.3 mm. wide (?). Spathe one-flowered about 17-18 mm. long, tubulose for 12-13 mm., then bifid for 6-7 mm. Pedicel about 13-26 mm. long. Flower to 12 mm. long, 20 mm. in diameter, its color unknown. Ovary clavate, apparently obtusely trigonous, about 2.8 mm. long, 1.5-1.8 mm. wide. Tepals oblanceolate, connated for 1.5 mm., the outer to 33.5 mm. long, 4.8 mm. broad, apiculate, inner somewhat shorter. Filaments declined, the upper episepal to 5 mm. long, lateral episepal unequal, about 9 and 14 mm. long, lateral epipetal to 14.5 mm. long, lower epipetal about 15.5 mm. long. Style declined about 22 mm. long; stigma's lobes recurved to 2-3.5 mm. long.

Hab.—Mountains of south-western Minas Gerais, Brazil, at Casa de Pedra (near Congonhas do Campo) Serra da Piedade, and other places.

Specimens: Brazil, Minas Gerais, mun. Caeté, Serra da Piedade, campo; leg. Mello Barreto 8809, 19-II-1938 (type Herb. Ravenna, isotype BHMG, NY, TRA). Idem ibid.; leg. ipse 5174 (BHMG). Idem ibid, Campo Itabirito; leg. ipse 618, 28-XII-1933 (BHMG) et 619, 6-V-1934 (BHMG). Idem mun. Conselhero Lafayette, Casa de Pedra pr. Congonhas; leg. ipse 5504 (BHMG).

*Habranthus irwinianus* is related to *H. gracilifolius* Herb. The latter—an inhabitant of Río Grande do Sul, Uruguay and Argentina—has leaves with rounded thick margins and its flowers are larger.

The specific name was given in homage to Dr. Howard S. Irwin, of The New York Botanical Garden, whose important work of collecting in Central Brazil, will help a lot to the knowledge of the neotropical flora.

**Habranthus concordiae** Rav. **sp. nov.**

Planta ad 40-45 cm. alta. Bulbus ovatus in collo plus minusve longo productus. Folia serotina late linearia pallide viridia valde pruinosa leviter canaliculata ad 20 cm. longa circ. 6 mm. lata. Scapus usque 27-35 cm. longus circ. 4-5 mm. latus pallide viridis pruinosus basin versus roseo-ochraceus. Spatha 2-3-flora raro uniflora ad 24-33 mm. longa circ. 10-13 mm. tubulosa ad apicem usque 7-11 mm. bifida. Flores anguste infundibulati pulchre rosei ad 5-6.5 cm. longi circ. 3.5-4 cm. lati. Pedicelli ad 67-80 mm. longi. Ovarium subclavatum ad 5.8-6 mm. longum circ. 2.6-2.9 mm. latum. Tepala oblanceolata perangusta ad 2.5 mm. connata striis fusco-roseis notata, exteriora ad 50-57 mm. longa circ. 10 mm. lata, interiora subaequalia. Filamenta declinata rosea ad apicem

leviter incurva, sepalina lateralia ad 20 mm. longa, sepalinum superius ad 21 mm. longum, petalinum inferius circ. 25 mm. longum, petalina lateralia usque 28 mm. longa (in floris minoris filamenta breviora). Antherae oblongae leviter arquatae ad 3.5-4.1 mm. longae. Stigma trifidus, lobis recurvatis usque 1.4-1.8 mm. longis.

Plant about 40-45 cm. high. Bulb ovoid produced into a pseudoneck. Leaves serotine, broadly linear, of a pale green, rather pruinose, slightly canaliculate, to 20 cm. long and 6 mm. broad. Scape to 27-35 cm. long, 4-5 mm. wide, of a pale green, pruinose, a brownish pink toward the base. Spathe 2-3-flowered, rarely one-flowered, to 24-33 mm. long, tubulose for 10-13 mm., then bifid for 7-11 mm. Flowers narrowly funnel-shaped, pink, about 5-6.5 cm. long, 3.5-4 cm. in diameter. Pedicels about 67-80 mm. long. Ovary almost clavate, to 5.8-6 mm. long, 2.6-2.9 mm. wide. Tepals oblanceolate, very narrow, connated for 2.5 mm., marked with dark pink lines, the outer to 50-57 mm. long, 10 mm. broad, the inner subequal. Filaments declined pink, somewhat incurved at the apex, the lateral episepal about 20 mm. long, upper episepal to 21 mm. long, lower epipetal about 25 mm. long, lateral epipetal to 28 mm. long (in small flowers filaments are shorter). Anthers oblong, somewhat curved, to 3.5-4.1 mm. long. Stigma trifid, its lobes recurved to 1.4-1.8 mm. long.

Hab.—Fields in the region of Concordia, province of Entre Ríos, Argentina.

Specimens: Argentina, prov. Entre Ríos, region of Concordia; cult. in SI; leg. Burkart 21687, 24-III-1961 (type SI).

This pretty species was found by Prof. A. Burkart near the town of Concordia in the province of Entre Ríos. Each spathe bears one to three narrow light pink flowers. The only species from that region which has more than one flower is *H. teretifolius* (C.H.Wr.) Traub (sensu Hunziker 1969); however, this has cylindrical fistulose leaves. *Habranthus gracilifolius* Herb. has rarely a two-flowered umbel, but its leaves are practically filiform. *Habranthus pedunculosus* Herb. (a true *Habranthus* species) has a much longer spathe of a different shape. *H. longipes* (Bak.) Traub, from the Republic of Uruguay, has a fenestrated one flowered spathe.

## **Habranthus tubispathus** (L'Her.) Traub (Fig. 25)

a previous name for the plant known as **H. andersonii**

Since I was entrusted to carry out the monography of the *Amaryllidaceae* of Patagonia and the Province of Entre Ríos I was occupied with the problem concerning the application of the names *Zephyranthes commersoniana* Herb. and *Habranthus tubispathus* (L'Her.) Traub. The former was based on specimens collected by Commerson in the Cerro de Montevideo, during Bougainville expedition around the world.

A time ago I asked for photographs of three sheets of Commerson's collection of *Zephyranthes commersoniana* Herb. Two photographs were

received from the Paris Museum through the kindness of Dr. Alicia Lourteig, the third, by courtesy of Kew Gardens, from a collection of negatives taken from Commerson's collection, deposited in the Linnean Society of London. On the label of one of the Paris specimens is written: "Uruguay, Montevideo, dans les pâturages de Montevideo ceux surtout qui sont au pied du Morro, en May 1767". At foot of the second sheet, we can read: "Uruguay, Montevideo, du pied du Morro de Montevideo et par les pâturages des environs de la Baye en 9bre. 1767; flos rubicundus in scapo unicus. Bulbus tunicatus. Plantes retardées des rochers de Montevideo mi-9bre. 1767". On the third specimen which is the holotype (deposited in the Linnean Society of London), it is only

Fig. 25. *Habranthus tubispathus* (L'Her.) Traub, ssp. *macranthus* Rav., from the province of Entre Ríos in Argentina; *Left,* side view; and *Right,* front view. Photo S. Magno.

written: "Montevideo, Commerson". The three sheets represent a sole species: a plant with small flowers and linear, somewhat broad, leaves.

In 1966 I was in the Cerro de Montevideo and found that there grow only two *Habranthus* species: *H. gracilifolius* Herb. and *H. andersonii* Herb. the first has almost filiform leaves, and the latter linear, to 3-5 mm. broad, leaves. Notwithstanding, *H. andersonii* has sulphur-yellow flowers, tinged with purple in the throat and the outside. How could this plant have had its flowers misinterpreted as pink? Following the process of drying on several flowers, the answer arises. In some of them it prevails the purple color (anthocyanine) of the throat and the outside of the perianth and they turn to a light pink. After a time, the latter color practically disappears and a brownish yellow remains.

*Amaryllis tubispatha* L'Her., was founded on specimens collected also by Commerson in Buenos Aires. A photograph of the type-specimen (received from the Paris Museum) shows two floriferous scapes, apparently of two different species. Differences are found in the size and shape of the flowers. At foot there is a label from Dr. Traub which says: "The scape in flower on the right hand is designated as the lecto-type of *Amaryllis tubispatha* L'Her." Obviously he noted that there was a mixture on the sheet and he decided to select one of the inflorescenses as the lecto-type of *Amaryllis tubispatha* L'Her. (= *Habranthus tubispathus*).

If we examine accurately the element on the left of the type-sheet, we should realize that it apparently represent . . . *Zephyranthes candida* (Lindl.) Herb. The lecto-type, on the right side, can readily be identified as *Habranthus andersonii* Herb. The shape and size of the flower are evidences which support the latter conclusion. Both *Z. candida* and *H. andersonii* (= *H. tubispathus*), are still quite frequent in the neighbourhoods of the city of Buenos Aires. *H. gracilifolius* Herb. with pink flowers grows in the hilly region of the south of the province, and in the province of Entre Ríos. The latter species does not inhabit the area of the Capital of Argentina.

*Amaryllis tubispatha* is quoted, in Index Kewensis, as a synonym of *Habranthus robustus* Herb. ex Sweet. Traub (1951) accepted that concept, but, due to priority, he proposed the new combination *H. tubispathus* (L'Her.) Traub. As I have pointed out (see Ravenna 1967), *H. robustus* has no affinities with *H. tubispathus;* it is a much more robust plant and it is an inhabitant of the State of Santa Catarina in Brazil. Recently it had been dried also from the State of Paraná by Prof. G. Hatschbach. In spite of this fact, *H. robustus* was included by Fabris (1969) in the "Flora de la Provincia de Buenos Aires". This author followed Cabrera (1953), who recorded the species to this area, basing his statement on a dry specimen (Boelcke 5121) which was apparently lost. It is possible that Cabrera's record of *H. robustus* should be referred in the future to another species. In fact, Fabris describes it as "flores solitarias o geminadas"; inflorescences in *H. robustus* are always one-flowered.

*Amaryllis atamasco* Linn. var. *minor* Red., which Herbert included under synonymy of *H. robustus,* is a true *Zephyranthes* species, possibly not a native of South America.

The complete synonymy of *H. tubispathus* follows below: *Habranthus tubispathus* (L'Her.) Traub, Pl. Life 7: 42. 1951. Syn.—*Amaryllis tubispatha* L'Heritier, Sert. Angl.: 9. 1769; *Habranthus andersonii* Herbert, Edwards' Bot. Reg. 16. tab. 1345. 1830.—*Habranthus andersonianus* Herbert, Amaryll.: 167. 1837; *Zephyranthus commersoniana* Herbert, loc. cit.: 174, tab. 29, f.3. 1837; *Zephyranthes andersonii* (Herb.) Steudel, Nom. Bot. ed. II, 1: 70. 1840; *Amaryllis andersonii* (Herb.) Grisebach, Goett. Abhandl. 24: 320. 1879; *Zephyranthes andersoniana* (Herb.) Bentham et Hooker f., Gen. Pl. 3(2): 724. 1883, Excl. syn.: *Habranthus robustus* Herb. ex Sweet (1831), and *Zephyranthes*

*atamasco* Linn, var. *minor* Red. (1816).

Hab.—Plains and hills of Southern Brazil, Uruguay, Eastern Argentina and Central and Southern Chile. It is also found in Texas (United States).

Specimens: *Argentina:* Buenos Aires; leg. Commerson; Herb. Poiret in Herb. Moquin Tandor (photo from the type of *Amaryllis tubispatha* L'Her., in part, P). *Uruguay:* Montevideo; leg. Commerson, V-1767 (photo P). Idem; leg. Commerson, XI-1767 (photo P). Idem ibid; leg. Commerson (photo of the type of *Zephyranthes commersoniana* Herb., Linn. Soc. London).

*Habranthus tubispathus* also inhabits Chile. It was quoted in this country by Gay (1853), and Baker (1888). Years ago, I received seeds collected in Chile by Dr. R. Wygnanki; when the plants flowered here in Buenos Aires, they were identified as this species. Flowers had somewhat acuter segments than the ordinary ones, but they were in other respects similar to the forms which grow naturally here. The Chilean *Amaryllis depauperata* Poepp. probably is a further synonym of this species.

**Habranthus tubispathus** (L'Her.) Traub ssp. **macranthus** ssp. nov.

A subspecie tubispatha floribus majoribus (ad 30-35 mm. longi et 30-35 mm. in diametro) differt; colore ut in typo.

Differs from the subspecies *tubispathus,* on account of its larger flowers (to 30-35 mm. long and 30-35 mm. in diameter); the color as in the type.

Hab.—Fields of the province of Entre Ríos, Argentina.

Specimens: Argentina, prov. Entre Ríos, Concepción del Uruguay, Estación Experimental Agropecuaria, potrero 64; cult. in Buenos Aires; leg. Ravenna 807, XII-1967 (typus in Herb. Ravenna). Concepción del Uruguay, aerodromo; leg. Burkart et al. 20593, 16-XII-1957 (SI). Dept. Gualeguaychú, ruta 12, km. 180; leg. Burkart et S. Crespo 22944, 22-XII-1961 (SI). Idem, arroyo Gualeyán; leg. Burkart et Troncoso 24139, 8-IV-1963 (SI).

**Habranthus tubispathus** (L'Her.) Traub ssp. **variabilis** ssp. nov.

Recedit a subspecis tubispatho et macrantho floribus colore variabile extus haud purpureo-striatis basin versus valde attenuatis.

Separable from the subspecies *tubispathus* and *macranthus,* by virtue of its flowers of variable color, externally not purple-striated, and narrower toward the base.

Hab.—Dry fields in the east side of the province of Corrientes, Argentina. It grows near *Habranthus teretifolius* (in the sense of Hunziker, 1967).

a. *H. tubispathus* ssp.. *variabilis* Rav. var. *variabilis*

Flos aurantiacus. Flower orange. Specimens: Ad viam ferream inter Paso de los Libres et Monte Caseros prov. Corrientes Argentinae; leg. Ravenna 446, III-1965 (typus in Herbario Ravenna).

b. *H. tubispathus* ssp. *variabilis* Rav. var. *bicolor* Rav. var. nov.

Recedit tepalis albis ad apicem fulvo-tinctis. Distinguishable by its white tepals stained with fulvous at the apex. Specimens: Eadem locis; leg. Ravenna 447, III-1965 (typus in Herbario Ravenna).

c. *H. tubispathus* ssp. *variabilis* Rav. var. *roseus* var. nov.

Flos roseus. Flower pink. Specimens: Eidem locis; leg. Ravenna 448, III-1965 (typus in Herbario Ravenna).

**Habranthus pedunculosus** Herb.

Herbert, Amaryll.: 161, Pl. 26, f.3. 1837.

Despite its distinctness in the genus *Habranthus,* this species was tentatively included by Baker (1888), under synonymy of *Hippeastrum bifidum* (*Rhodophiala bifida*). This concept was accepted in Index Kewensis, by Traub & Uphof (1938), Traub & Moldenke (1949), and Traub (1956). Notwithstanding, Herbert's description is clear: . . . "absque foliis. Scapo unciali bifloro; spatha tubulosa apice bifido". . . . Moreover, there is a figure, from the hand of Herbert, made after the type-specimen. The latter dry material shows clearly the tubular spathe, which is an important feature in order to separate *Habranthus* from *Rhodophiala.*

An accurate examination of the type should possibly reveal that the plant known as *H. teretifolium* (C.H.Wr.) Traub, is identical to this species. Whereas, it must be noted that the original description of the latter is very poor and inconclusive. Moreover, I was informed from Kew Gardens, that no type-specimen exists. Despite this fact, *H. teretifolius* was quoted in the flora of Argentina by Hunziker (1967). Description and figure of the work represent the same plant which Traub & Hayward named *H. juncifolius.* The latter species was overlooked by Hunziker (1967). Wright's description says "flowers of a pale pink", which is not the case of *H. juncifolius.*

*Hippeastrum tubispathum* Pax, is apparently the same as *Habranthus juncifolius* Traub & Hayward. Unfortunately, the former name cannot be used because of *H. tubispathus* (L'Her.) Traub. If it can truly be proved that *H. teretifolius* (C.H.Wr.) is the same species as *H. juncifolius* (Traub & Hayw.), then the latter must be kept under synonymy. Furthermore, studies on living plants of *Habranthus holmbergii* (Hicken) Traub (from the type-locality), are needed.

Specimens: Buenos Aires; leg. Tweedie (Herbarium Hookerianum, photo-type from K, neg. 9859).

**PLANT LIFE LIBRARY**—continued from page 69.

THE PLASMODIOPHORALES, 2nd ed., by John S. Karling. Hafner Publishing Co., 31 E. 10th St., New York, N.Y. 10003. 1968. Pp. 256. Illus. $17.50. Marked progress has been made in the understanding of the Plasmodiophorales in the past twenty years. The new information is incorporated in this completely revised new edition of a standard work. About half of the space is devoted to the fungi which comprise the Plasmodiophorales—cytology, sexuality, life cycles, etc., description of family, genera and species, phylogeny and relationships. The rest of the space is devoted to the economically important diseases which these fungi cause—club root of crucifers and its control; powdery scab of potatoes; crook rot of watercress; and rhizomania of the sugar beet. Highly recommended to phytopathologists, botanists and biologists in general.

ORGANOGRAPHY OF PLANTS, by K. Goebel, translated by I. B. Balfour. Facsimile of the 1900 English Edition. Part 1. General Organography. 1969. Pp. 270. Illus. $32.50; Part 2. Special Organography. 1969. Pp. 707. Illus. $32.50. Hafner Publishing Co., 31 E. 10th St., New York, N. Y. 10003. We are grateful to the publishers for reprinting this classic work of Goebel on organography which has been unavailable for two decades. Thus, it is now again available to the students in the 1970's. Volume 1 is devoted to general considerations, and volume 2 to special organography. Very highly recommended to all interested in plant science.

A FLORA OF NORTH AMERICA, by John Torrey and Asa Gray. Facsimile of the 1838-43 Edition. Hafner Publishing Co., 31 E. 10th St., New York, N. Y. 10003. Vol. 1. Pp. 711. $45.00. 1969; Vol. 2. Pp. 505. $45.00. 1969. Although not completed, this is a basic reference work for those interested in the systematics of the indigenous and naturalized plants growing north of Mexico. It contains abridged descriptions of the plants included up to 1843. The groups are arranged according to the natural system. Dr Joseph Ewan has added an illuminating introduction detailing the history of the collaboration between Torrey and Gray. Very highly recommended to all interested in the flora of North America.

VASCULAR PLANTS OF THE PACIFIC NORTHWEST, PART 1, VASCULAR CRYPTOGAMS, GYMNOSPERMS, AND MONOCOTYLEDONS, by C. Leo Hitchcock, Arthur Cronquist, and Marion Ownbey. University of Washington Press, Seattle 98105. 1969. Pp. 914. Illus. $25.00. Parts 2 through 5 of this outstanding series appeared previously, and have elicited high acclaim as definitive guides to the Dicotyledons of the Pacific Northwest. The first volume, including the Cryptogams, Gymnosperms and Monocotyledons of the Pacific Northwest, has now been published, and it measures up to the high standard set in the previously published volumes. The area covered includes Washington, Northern Oregon, Idaho north of the Snake River, the mountains of western Montana, and southern British Columbia.

The genera **Allium** and **Calochortus** in the **Liliaceae** have been contributed by Ownbey; the vascular cryptogams and **Cyperaceae** by Cronquist, and all the other groups by Hitchcock. Complete regional synonymy, type collections, geographic ranges, common names, and chromosome numbers where determined, and economic importance are given. Part 1 also includes several sections relating to the work as a whole: an index to plant families, a glossary, a key to aquatic plants; and a general index to common, generic and specific names. This basic contribution to the vascular plants of the Pacific Northwest is very highly recommended to the professional plant scientist and also to the amateur.

**PLANT LIFE LIBRARY**—continued on page 125.

# 3. GENETICS AND BREEDING

## THE ATTRACTIVE MINIATURE AMARYLLIS

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For sheer mass of color, the large-flowered Amaryllis hybrids are of course unsurpassed, but for graceful charm and intriguing possibilities in form and color, the smaller-flowered hybrids reign supreme. True, there are not many miniatures on the market today, and few of them are very graceful, but the ruffled miniatures that have been showing up in some of the writer's crosses are among the most graceful flowers that he has yet seen. It is also very probable that the first true yellow hybrids will be in this Miniature division, perhaps through the Senorita hybrids, or the yellow species recently introduced. It is rather surprising that the large bulb growers have not developed the miniature hybrids to any great extent, for they are ideal in making corsages and table center-pieces, useful alike to florist and hostess. They attract considerable attention at every flower show, and it is quite evident that their popularity is increasing from year to year. The writer found himself in the field of miniature hybridizing more by chance than by choice, since his first crosses with *Amaryllis striata,* made to secure recurrent bloomers, have given him many miniature flowers. In fact, the majority of his crosses prior to 1969 either have or will produce flowers belonging to the Miniature or to the Belladonna divisions.

Perhaps the term "Miniature" should be clearly defined, since it has been used rather loosely in the past. It is now being recommended that only those flowers measuring 4″ or less across the face of the flower be included in this division, larger flowers being classified under the Belladonna-type division. To this definition the writer conforms, with one slight modification; he has also included those flowers whose tepalsegs are so reflexed or ruffled that even though they may actually measure up to 4½″ in diameter, they give the appearance of being much smaller. In fact, the reflexed or ruffled condition of the tepalsegs often shows a marked increase after the flowers have been open for a day or two, thus making them not only more graceful, but often smaller in size. It should also be remembered that the size of the flowers may vary somewhat from year to year, depending upon the vigor of the bulb at blooming time. Therefore, some clones are always going to be borderline cases, and this should be taken into consideration when classifying the flower.

Thus far, twenty-one of the earliest crosses made by the author have produced miniature flowers, although six of these twenty-one crosses have also produced hybrids with larger flowers which would have to be placed in the Belladonna division. When these twenty-one crosses were analyzed, some interesting facts emerged. It was found that *A. striata,* primarily the variety *fulgida,* was directly involved in seventeen of them; so these hybrids could almost be called "Striata hybrids".

Also, two Indian Miniatures, one scarlet in color and one a very dark red, were involved in twelve of the crosses. The ruffled flowers have all come from crosses having the dark red Indian Miniature as one of the parents, usually the seed parent. The old Houdyshel orange-scarlet hybrid was also involved in ten of the crosses, and South African or Dutch hybrids in eight more, with various other hybrids only being used once. In addition, seven other crosses not made by the writer but raised by him from seed, have produced miniature flowers. Included in this group are the "Peruvian Miniatures" raised from seed secured from R. D. Goedert. The clones raised from these twenty-eight crosses have bloomed in various months of the year, extending from January to October, with most of them blooming in April. All that bloomed naturally in January or February had *A. striata* as one of the parents, and this was under outdoor growing conditions; in a greenhouse they would probably bloom even earlier, and might be recurrent bloomers. The shape of the flowers has also varied considerably; some had plain tepalsegs of trumpet shape, some had tepalsegs which were much reflexed and even twisted, and some were highly ruffled. The best one to bloom in 1968, a dark scarlet ruffled miniature, was pictured and described in the 1969 Year Book, and several others have also been described previously. Five more crosses, worthy of mention, have bloomed in the past year, and here is a brief description of them.

The best one of the five had the dark red Indian Miniature as the seed parent, with the pollen coming from a cross between the scarlet Indian Miniature and *A. striata fulgida.* The flowers were slightly over 4″ in diameter but the tepalsegs were both reflexed and ruffled. They were a light scarlet in color, with a small chartreuse green star in the throat, blooming in April, and were almost as beautiful as the dark scarlet one that bloomed in 1968. Another bulb of this same cross also bloomed this year, with flowers very similar in color, but having a much longer trumpet.

The second miniature of the five had *A. striata* var. *striata,* as the seed parent, with the pollen coming from a cross between the Houdyshel hybrid and a dark red Mead (?) clone. The 4″ flowers in April plainly revealed their species ancestry, with tepalsegs that were much reflexed, but it was their color that made them so attractive. This was a vivid crimson with a small yellow star in the throat, edged with dark red. The reverse of the segs was a blend of red, green and brown.

The third cross worthy of mention was a cross between the Houdyshel hybrid and a Peruvian Miniature. Reference was made in the 1968 Year Book to this cross, and particularly to the unusual appearance of the leaves which were very thick, a grayish green in color, and quite hardy. The first two bulbs have just bloomed, both in April. The first one had 4″ flowers of excellent shape, with broad overlapping tepalsegs and just slightly reflexed. In color it was a dark red with a large dark green throat, the reverse being a dark red with green ribs. A pot of this with several scapes in bloom would make a real sensation at the Christ-

mas season, since all who viewed the flowers were reminded of "Christmas". The second bulb had even smaller flowers, but somehow did not seem to be quite as attractive as the first one. However, it did set seed with pollen from both *A. starkii* and *A. evansiae,* which trait makes it very useful in breeding work.

The fourth miniature came from a cross between the dark red Indian Miniature and a Senorita hybrid. Only one seedling of this cross has bloomed so far, but it was sufficiently different and attractive to arouse hopes of what may come from other crosses made with the Senorita hybrids. This flower was slightly over 4″ in size on a 10″ scape, and bloomed in April. The color was a pale red with *a decided yellow cast to it,* and the throat was *also yellow,* but each tepalseg was edged with a narrow strip of white, and this white edging was very prominent on the reverse side. The shape of the flower could be improved for the bottom segment was very narrow, although all were somewhat reflexed and ruffled.

The fifth one of these crosses would never win a prize in a beauty contest but it was decidedly unusual. The seed parent was a hybrid between the dark red Indian Miniature and *A. striata fulgida;* the pollen parent was one of the Calyptrata hybrids originated by Mr. Quinn Buck. These hybrids are supposedly sterile, but this flower was proof that at least one cross has been successful. The flowers were only 3″ in size on a scape about 7″ tall, with very small foliage, and blooming from a bulb only 1¼″ in diameter. These flowers were in fact much smaller than either of the parents, and clearly resembled a species; there was little or no overlapping of the segments, and they would probably be considered a long-trumpet type of flower. However, they did not display the "Swan's neck" so typical of Striata hybrids. In color, the flowers were a red orange with a fairly wide pale greenish white stripe on each of the tepalsegs, extending from the base of the throat to within one inch of the tip of each seg. This cross bloomed in October, which trait may come from the Calyptrata hybrids, since the two clones of these in the writer's possession do bloom in the late summer or fall under outdoor culture.

Several years ago a friend in Pasadena gave to the author one bulb of a cross between *A. striata fulgida* and a Boshoff-Mostert clone named 'Skildway'. This also has proven to be a beautiful miniature, blooming in the fall under outdoor culture. The flowers are almost 4½″ in size when they first open up, but the tepalsegs soon become so reflexed and even twisted that they appear to be much smaller. They are rose red in color and have a small green star in the throat, the reverse side being a blend of salmon and white. The Striata ancestry is clearly seen in the size and posture of the flowers, in the leaves which are very wide and short, and in the shape of the bulb. The 'Skildway' pollen parent has contributed the color and good shape of the flowers. Under greenhouse culture, this clone would make a beautiful pot plant, probably evergreen and recurrent-blooming, since it has bloomed in August, and in October, and tried to bloom in January.

In the next few years, the writer expects to see a constant procession of new miniatures. Some forty-eight crosses made prior to 1969, which have not yet bloomed, should produce miniature flowers. The parentage of these crosses is quite varied, with many interesting hybrids and species having been used, the objectives always being to produce either ruffled flowers or pastel colors, particularly yellow or lavender. This spring (1969) four small-flowered species, *A. evansiae, A. starkii, A. argilagae,* and a pink *A. belladonna,* were used in various crosses, but only a few of these were successful. However, many of the writer's bulbs have been very slow in starting to grow this spring, and on June 1st a number of scapes are still just coming, plus those which naturally bloom later in the year, thus providing many more opportunities to work toward the attractive miniature Amaryllis.

## HYBRIDIZING WITH AMARYLLIS SPECIES—1969

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In species hybridizing, there are many failures scattered in with the successes. For me, 1969 was a year with a few successes and a number of failures, some of which should be recorded.

### POLLEN FROM SOUTH AMERICA

Sometimes, success and good luck come mainly from having good friends. This was the case when I was very fortunate to receive pollen of *A. fosteri, A. tucumana* and both the yellow and red forms of *A. aglaiae* direct from South America from Mr. J. L. Doran during October, 1968. *A. forgetii* and *A. yungacensis* were the first species to flower for this season in Baton Rouge in December, 1968, and January, 1969, respectively. Since each had only two florets, mixed pollens were used; small amounts of pollen from *A. fosteri* and the yellow form of *A. aglaiae* were mixed; similarly *A. tucumana* and the red form of *A. aglaiae.* The fosteri-yellow aglaiae pollen gave viable seed and fairly vigorous seedlings with both *A. forgetii* and *A. yungacensis.* The tucumana-red aglaiae pollen gave only one seedling, with *A. forgetii.* While it is hoped that both possible crosses (with each seed parent) were achieved with the fosteri-yellow aglaiae pollen, it is interesting to speculate about which cross was successful if only one was. Since *A. fosteri* is in the aulica group and crosses within this group are generally successful, it appears likely that the crosses *A. forgetii* x *A. fosteri* and *A. yungacensis* x *A. fosteri* were successful. On the other hand, crosses between members of the aulica group and members of the striata or belladonna groups are frequently unsuccessful and therefore crosses with the A. aglaiae pollen (both yellow and red forms) seem less likely to succeed.

Pollen from *A. fosteri* (alone) was used, also, on a wide variety of species and hybrids, including *A. striata* and *'Constant Comment'* (which generally set seed well) without success except for one interesting

hybrid which gave four good seedlings. The seed parent was derived from [(*A. evansiae* x *A. aglaiae*) x *A. evansiae*] x sib. This evansiae hyscape and the floral segments are very narrow. These characteristics are similar to those of *A. fosteri,* scapes with 5 or more florets and narrow floral segments. This similarity of characteristics and the successful cross may be (probably are) entirely coincidental but they appeared sufficiently interesting to record. If a species is going to be very difficult to maintain in cultivation (as *A. fosteri* may be), the next best thing is to quickly get hybrids of the species. These hybrids may be easier to maintain and may still retain some of the characteristics of the species. No other successful crosses resulted with any of the other pollens obtained from South America (*A. tucumana* pollen failed with *A. fragrantissima*) although numerous attempts were made. It will be interesting to flower these same species in this country and see if similar results are obtained with freshly desiccated and refrigerated pollen. Delivery of pollen from South America required 6 to 8 days even though it was sent by air mail. This may have been sufficient exposure to ambient conditions to appreciably shorten the viability of the pollen.

Fig. 26. Left, Hybrid *Amaryllis* ('White Christmas' x *A. yungacensis*). Right, Hybrid *Amaryllis* [(*A. evansiae* x *A. aglaiae*] x 'Maria Goretti'). Note fluted edging. Photos by Fred Buchmann

## THE QUEST FOR YELLOW HYBRIDS

In the continuing search for yellow hybrids, eight clones of [(*A. evansiae* x *A. aglaiae*) x *A. evansiae*] x 'Maria Goretti' (cross 655) flowered, generally with two scapes and four florets per scape. None of these intermediate-sized flowers was very yellow; all showed some pale

yellow in the throat, especially immediately after opening which changed to light green as the flower matured. The background color was white with all showing some streaking, generally orange-red in color, but one showed a tendency toward lavender-pink streaks (see Figure 26). All eight clones from cross 655 were selfed on one or more florets and 15 to 20 sib crosses were made. From all of these attempts, no seed pods matured or even showed any indication of fertilization. What immediately comes to mind is a sterility allele of the type that inhibits pollen tube growth and prevents fertilization. Apparently to the contrary, pollen from several of the 655 hybrids back-crossed on the seed parent, (*A. evansiae* x *A. aglaiae*) x *A. evansiae*, gave mature and viable seed (3 pods out of 4 attempts) and a number of fairly vigorous seedlings were obtained. Regardless of the theory in this case where self- and sib-crossing failed completely, it appears that back-crossing will be a valuable tool for keeping the line breeding going forward at least one more step.

Also this year, a few seedlings were obtained from each of the following crosses:

[(A. evansiae x A. aglaiae) x A. evansiae] x White Christmas
A. evansiae x seedling from cross 655
A. evansiae x various white leopoldii hybrids.

It will be most interesting in future years to find out whether fertility will be achieved or not in each of the large number of potential crosses offered by these hybrids. The attempts at crossing A. evansiae with various white leopoldii hybrids ('Maria Goretti', 'Nivalis', 'White Christmas' and 'Christmas Gift') were disappointing. Four clones of *A. evansiae* were available and at least two florets of each were pollinated, one floret with pollen from a single white Dutch hybrid and the next floret with premixed pollen from two or more white Dutch. Only one clone gave mature seed pods (4 out of 4 attempts) and the other three clones gave complete failures, 2 out of 2, 3 out of 3 and 4 out of 4, respectively. So all clones of a given species are not equivalent in their seed bearing capabilities as has been pointed out by a number of other writers in the past. Unfortunately, the one fertile clone showed a high tendency toward deformed flowers and, of course, we will have to wait and see if this is passed on to its seedlings.

### A. YUNGACENSIS

Another series of puzzling and mostly disappointing events concerns *A. yungacensis* starting with pollen obtained from the University of Southwestern Louisiana in January, 1966. This pollen was used generously on a number of species and leopoldii hybrids with a complete lack of success except for a small, mal-formed pod on 'White Christmas' (cross 619). In view of the general lack of success, it was easy to suspect that this was really a somewhat incomplete self-pollination of 'White Christmas' and to chide oneself for such a carelessness. However, the few seed were planted and four vigorous seedlings resulted.

As the seedlings developed, it became clear that there was much reason to hope that true hybrids had been obtained since their foliage showed a strong resemblance to that of *A. yungacensis* which is quite different from the foliage of 'White Christmas'. All four seedlings bloomed this Spring and any remaining doubt that they were hybrids of *A. yungacensis* was quickly dispelled. Each had two florets per scape and the florets were the same bell shape and color pattern as *A. yungacensis.* The prettiest one was about 6½ inches across with a very large green center blending into white far out on the segments, each of which had a broad red band around the outer edge (see Figure 26). The other three were slightly smaller with more red and less white. Now here was an opportunity for improvement; selfing or sibbing or back-crossing on white Dutch might give larger, flatter florets with four per scape and with a broad picotee-type border (especially if you have lots of imagination). But here again we were doomed to disappointment; no seed pods resulted from any of the selfing, sibbing or back-crossing. Pollen from the 619 hybrids was used on 'Maria Goretti' and 'Nivalis' without success. However, Joseph Mertzweiller used some of this pollen and obtained two seed pods as described by him in an article in this volume. The original pollination of 'White Christmas' x *A. yungacensis* has been repeated a number of times with pollen from a different clone of *A. yungacensis* without success and the same is true for a number of pollinations on other white Dutch hybrids. On the contrary, pollen from this latter clone of *A. yungacensis* gave viable seed this year with 'Constant Comment' (which sets seeds quite readily with most other *Amaryllis* species and hybrids), a clone of SA63-20 x (*A. evansiae* x *A. aglaiae*) from Joseph Mertzweiller and Tarakan (2 pods out of 2 attempts).

If there is a moral to all of this, it seems to be, "If at first you don't succeed, try, try again." It is very easy to arrive at a line of reasoning which suggests that many crosses will succeed in a very large percentage of attempts (frequently approaching 100%) almost regardless of the timing and manner in which the pollination is made. Some clones successfully accept pollen from a very wide variety of species and hybrids; others are much more limited. Some crosses proceed with great difficulty approaching zero percent success. In these cases, it is not clear whether some physical variable (i.e., timing, temperature, humidity, et al.) is responsible for the successes that are achieved. There are a number of theories which explain fundamentally why these crosses fail: (1) a sterility allele, (2) a different number of chromosomes, (3) dissimilarity of chromosomes even though they are of the same number. In some cases, there is not enough information available to determine if No. 2 is a major reason (e.g., *A. yungacensis*). In most of the cases reported here, it appears likely that No. 1 or No. 3 is responsible. It may be possible for the amateur hybridizer to design a program of pollinations which will help elucidate these possibilities although firm conclusions may not be reached without a detailed study of the chromosomes involved. One thing that I have resolved to do is

to keep a better record of the failures, and this may be instructive. Similar information on successes and failures obtained by others and reported in this Journal may lead to some useful generalizations.

## AMARYLLIS BREEDING PROJECT-1969 REPORT

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By the summer of 1968 it had become apparent that my glass-enclosed patio would no longer be able to contain my amaryllis collection and also serve my family in a functional manner. Since winter temperatures in Baton Rouge do reach levels which would be fatal to species and some hybrids, total outdoor culture is not practical. The only answer was to provide a greenhouse. So by late summer a location on the east side of the house was selected and work began in earnest. The size chosen for this first venture in greenhouse construction was 8 by 16 feet; in retrospect a somewhat larger size would probably have been more appropriate. Redwood 2 x 4 framing set on a reinforced concrete foundation was provided with a 45-degree pitch roof. This was done to facilitate cutting of the roof beams, but other distinct advantages became apparent later. The high pitch roof gives sufficient overhead space that double deck benches can be provided with the upper bench about 6 feet off the ground. The upper bench is ideal for seedling flats. The redwood frame is covered with 40-mil acrylic fiberglas plastic on the outside and 6-mil polyethylene on the inside. An exhaust fan and a 1600 watt electric heater, both on thermostat control, maintain temperatures in the range of 55-90 degrees in winter and spring. The total cost of this greenhouse (materials only) was about $700. The cost can be decreased about $150 by using treated pine lumber in place of the expensive redwood.

Performance of the greenhouse has been generally satisfactory but experience has to be gained in making the transition from the culture previously used to the new greenhouse culture. One unfortunate experience was that the heating facilities were not installed until mid-winter and the collection was subjected to conditions of damp cold. Although temperatures remained above freezing the damp cold is very injurious to certain species and hybrids. Injury was not apparent until it was too late and several plants of *A. striata* and several large bulbs of 'Senorita' were lost.

### BLOOM SEASON HIGHLIGHTS

Early in February bloom was obtained on a plant obtained from Dr. Cardenas and identified as *A. belladonna* (variety No. 2 collected by Dr. Cardenas at Rurrenabraque Beni, Bolivia). This amaryllis was received in December, 1967 and had made exceptionally vigorous growth and a relatively large bulb. Growth features were not characteristic of *A. belladonna,* a fact confirmed on blooming. The 16-inch scape bore

two 4½ inch florets, almost blood red in color, with much green in the throat and with conspicuous greenish white line markings on each segment, these markings extending to within about one inch from the tips of the segments. In color and color pattern this *Amaryllis* bore some resemblance to *A. yungacensis* but it certainly was not *A. yungacensis.* It was a very striking species and it pleases me to have it in my collection. The mystery as to its identity continued until early summer when I received the 1969 PLANT LIFE. Upon reading Dr. Cardenas' description of the new species, *A. escobaruriae,* my plant was unquestionably this species. Dr. Cardenas collected *A. escobaruriae* in Youngas of La Paz, Bolivia, in July, 1967, and the bulb I received for *A. belladonna* in December, 1967 apparently was mixed in with other bulbs Dr. Cardenas sent to the late Prof. Claude Davis for distribution. My bloom may have been the first bloom of *A. escobaruriae* in this country, and my only regret is that I did not make a more extensive effort to use it in hybridizing. This species grows very well and undoubtedly it will bloom again next season.

Also in February a hybrid of *A. belladonna* var. *haywardii* X *A. striata* made first bloom; the plant was obtained from Mr. Alek Korsakoff in 1967. The 2-inch diameter bulb made two scapes, each three flowered. In color and form this hybrid is closer to *A. belladonna* var. *haywardii* than to *A. striata.* The 4-inch florets were carmine rose with darker rose veining and had the characteristic *A. belladonna* throat markings and flower form.

Several more seedlings derived from a 1965 cross, SA 63-20 X (*A. evansiae* x *A. aglaiae*), bloomed for the first time. The SA 63-20 parent is one of Mr. Goedert's imports belonging to the Belladonna group and which I have described previously. All of these are rather small star-shaped flowers, but they exhibit some of the most exotic color patterns I have observed in any plant species. Describing such colors is virtually impossible, and it is equally difficult to record them photographically. I believe the blends and patterns of color in this group of hybrids rivals or exceeds the coloring of the 'Senorita' hybrids. The most interesting of these hybrids to bloom this season had a picotee color pattern. The 4-inch flower had a greenish-yellow throat shading practically to white along the centerline of the segments, the white blending into pale pink, then blending to a distinct deeper pink border about ¼ inch wide along the edges of the segments. The overall effect is that of a diffused picotee pattern. There is still a dozen or more of this group which have not bloomed. All of the group are highly fertile, a characteristic inherited from the SA 63-20 parent.

Several years ago I produced many seedlings by using my fertile 'Senorita' hybrid or the Morris hybrid as pollen parents on white Dutch varieties. The Morris hybrid is a greenish-yellow hybrid produced by Mrs. Lloyd Morris of Baton Rouge and is believed to have the parentage white Dutch X *A. evansiae.* Most of these seedlings were planted in outdoor beds and the results have been very disappointing. Although the first season's growth was very vigorous, only two

or three have bloomed, and only a dozen or so survive. Like 'Senorita' they seem to resent the damp cold of our winters. A few of these seedlings were cultivated in pots and five of these bloomed. All are fairly large 5-6 inch flowers with pale pink ground color and varying amounts of orange veining. Those having the least orange veining are the more striking blooms and these are being used for further breeding as a possible route to large flowered yellow hybrids.

In 1965 I obtained from the late Prof. Ira Nelson pollen from a beautiful rose-pink form of *A. belladonna*. This pollen was used to set seed on 'Nivalis' and 'Queen of the Whites'. Most of the seedlings have been grown outdoors and a few were pot cultured. One of the pot cultured seedlings bloomed with a 2-flowered scape with 5½ inch florets of Leopoldii form. The color was a beautiful and uniform coral orange with the usual *A. belladonna* throat pattern in green and white. The excellent quality of this seedling sustains anticipation of bloom of a dozen or more plants now making good growth in outdoor beds.

First blooms were obtained from a group of seedlings derived from *A. starkii* (1965 pollinations). Two seedlings of the parentage *A. starkii* X mixed pollen from a red *A. belladonna* and (*A. evansiae* x *A. aglaiae*) X *A. evansiae* were light coral pink in color and probably resulted from the (*A. evansiae* x *A. aglaiae*) X *A. evansiae* pollen parent. Neither showed the up-thrust posture of *A. starkii,* the blooms being held in an approximately horizontal position. Another seedling of the parentage *A. starkii* X mixed pollen of 'Marie Goretti' and SA 63-20 was segregated prior to blooming on the basis of foliage characteristics as probably derived from 'Marie Goretti' as the pollen parent. The 5-inch blooms coral-orange in color and Leopoldii form confirm the parentage, but again there was no evidence of the *A. starkii* posture. Finally an F-2 seedling of *A. belladonna* X *A. starkii,* distributed in 1966 by the Louisiana Society for Horticultural Research, bloomed with a single 4-flowered scape. The 3½ inch florets were crimson-rose with *A. belladonna* throat markings. Flower form was much closer to *A. belladonna* than *A. starkii.* These observations suggest (1) the *A. starkii* flower posture is probably a recessive characteristic, and (2) judicious use of mixed pollen is a useful technique in hybridizing with amaryllis species.

Another species which bloomed in late spring was *A. vitatta* (probably var. *vitatta*). The seedling bulb was obtained from Mr. Korsakoff in 1967. This bloom, although in no way disappointing, was not really what I had expected of *A. vitatta.* The scape was 2-flowered. The flowers were 4½ inches across, quite full and orange-red in color with a narrow white keel extending slightly more than half the length of the segments. I really expected more white in *A. vitatta,* and also a more pronounced tepaltube compared to the ¾ inch funnel-shaped tube shown by this bloom. Still, it is not difficult to visualize a plant of these characteristics as a parent of *Amaryllis* x *johnsonii.*

## HYBRIDIZING HIGHLIGHTS

In many respects the 1969 season was the most successful I have enjoyed from the standpoint of obtaining seed from a wide variety of species and F-1 hybrids. More than thirty seed pods were obtained from well over a hundred pollinations. But mother nature has already assured that I will not be too badly handicapped by lack of space to grow the seedlings. Less than a third of the seed pods gave good germination (more than 50%), about a third gave fair germination and the remainder germinated very sparsely or not at all. Space and time do not permit detailed comments on these efforts but I will describe a few of the highlights.

Perhaps the most interesting hybridizing experience in 1969 was setting seed with 10-month old pollen of *A. viridiflora* which had bloomed in late spring, 1968. The very small blooms of *A. viridiflora* were described previously (PLANT LIFE, 1968). Since suitable pod parents were not available at the time, the pollen was dried and frozen. The pollen was placed in a cotton-stoppered glass vial and the vial was placed in a screw-cap jar containing a ¾ inch layer of indicating "Drierite" (dessicant). The jar was placed in a food freezer where it remained from May, 1968 until February, 1969. About three days before use the jar was removed from the freezer and placed in the refrigerator. Seed pods were obtained by using this pollen on SA 63-20 and on SA 63-20 X (*A. evansiae* X *A. aglaiae*). Fair to good germination was obtained, but the seedlings are rather non-vigorous growers at this time. Seed pods were also obtained by using mixed pollen of *A. viridiflora* with white Dutch on a white Dutch pod parent, and mixed pollen of *A. viridiflora* and *A. evansiae* on *A. evansiae*. Good germination was obtained and growth characteristics are fair to good; however, it remains to be determined if any of these seedlings resulted from *A. viridiflora* as the pollen parent. This experience shows that techniques can be worked out for storing pollen at least from one season to the next.

The high degree of fertility and striking coloration of practically all of the seedlings derived from SA 63-20 X (*A. evansiae* X *A. aglaiae*) make these seedlings particularly desirable pod parents. Improvements in form and substance are desirable and this is being sought by crossing with appropriate large flowered and small flowered hybrids. Particularly noteworthy are two successful pollinations accomplished in 1969. The previously-described diffused picotee seedling was pollinated with a picotee seedling of Fred Buchmann derived from *A. yungacensis* and a white Dutch hybrid. This pollen parent which is described by Fred in this issue is the most outstanding picotee-patterned amaryllis this writer has seen. A good crop of seedlings of average growth vigor resulted. Anticipated characteristics include the picotee pattern in pastel colors. Towards the direction of miniature flowered amaryllis several successful pollinations were achieved with *A. evansiae* X *A. incachacana* as the pollen parent. The potential here is towards pastel

colored miniatures. These seed germinated well and are showing a fair rate of growth.

Although the SA 63-20 X (*A. evansiae* X *A. aglaiae*) parent almost invariably sets seed, the germination of the seed and growth of the seedlings are not always satisfactory. Considerable difficulty is being experienced with germination of seed derived from pollination with white Dutch hybrids. Repeat of an earlier cross which gave only 4% germination now gave only 10% germination. A seed pod was set with pollen of *A. fosteri* but only two of 17 seeds germinated. Growth characteristics are so poor that one seedling has already died and the other is making virtually no growth at all.

The 1969 seedlings showing the most vigorous growth are those obtained by selfing, sib crossing and inter-crossing the hybrids of 'Senorita' and the 'Morris Hybrid' as pollen parents on white Dutch hybrids. All of these should have some potential for producing pale yellow or greenish yellow offspring.

One other highlight of the 1968-1969 season merits mentioning. Through the courtesy of Mr. J. L. Doran I obtained one flowering size bulb and two very small bulbs of *A. fosteri.* These rare bulbs were collected in 1968 by Mr. Doran and represent much time, effort and expense. His kindness in sharing these bulbs with other amaryllis species enthusiasts is greatly appreciated. A few words about culture and performance of *A. fosteri* are appropriate. The large bulb is about 1¼ inches in diameter and is unquestionably flowering size since it contained the remnants of a bloom scape, the smaller bulbs were about ½ inch in diameter. According to Mr. Doran and Mr. Foster the culture of *A. fosteri* has not been successful with bulbs collected in the past by Mr. Foster. At this writing all of my bulbs are making leaf growth. The smaller bulbs have two and one leaves each (leaves about 10 inches in length) while the larger bulb has two leaves 3-4 inches long. Because of the known tendency of this species to rot, direct watering has been avoided. The bulbs were received in late fall and the small bulbs were potted in 2-inch pots and the large bulb in a 3-inch pot using my regular potting mixture. The pots were kept indoors through the winter. Light watering from the bottom of the pots was applied every two weeks. By early spring the bulbs were firmly set in the pots and apparently had made root growth without making leaf growth. In May the pots were sunk in damp sand under the greenhouse benches, and leaf growth began on the small bulbs almost immediately. The larger bulb did not start leaf growth until about mid-summer. I plan to continue this semi-dry culture with this species.

ACKNOWLEDGEMENTS

I would like to take this opportunity to express my appreciation to Prof. William Adee, Mr. Fred Buchmann, Mr. J. L. Doran, Mrs. Ira Nelson and Dr. Hamilton P. Traub for the bulbs and pollen they so kindly supplied.

# AN APPARENT SPREKELIA—AMARYLLIS CROSS

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When I was 14 years old, I made an apparent cross between *Sprekelia formosissima* and an *Amaryllis* species; its name was unknown to me, but it belonged to the Striata Group. Only one seed pod developed, and out of the many seeds only three germinated. Finally only one survived which four years later produced the first flower.

Fig. 27. Reported cross by Udai Chandra Pradhan between *Sprekelia formosissima* and an *Amaryllis* hybrid belonging to the striata group. Photo by B. N. Pradhan, 1969.

Since 1967, it has produced flowers much like those of *Sprekelia formosissima,* but some of the characters are shared between the two parents (see Fig. 27). In size the blooms are much larger than those of *S. formosissima.*

The second generation hybrids of this cross will most likely flower this coming year. My aim is to obtain hybrids with flowers like those of *S. formosissima,* but in various colors as in the Leopoldii *Amaryllis* hybrids.

# MODERN SCIENCE AND AMARYLLIS HYBRIDIZING

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In this age of rapidly changing conditions you may wonder if the awe-inspiring discoveries in the chemical, mathematical and biologic fields have any bearing on new methods in developing new *Amaryllis* hybrids and in the growing of them.

Some ten years ago it became the fashion to expose flower seeds and bulbs to X-rays (Röntgen or Becquerel rays are rays emitted by radio-active bodies), but in *Amaryllis* seeds the cobalt (an artificial radio-active isotope, which latter is one of two or more forms of an element differing from each other in weight of atoms) treatment killed the germinating power of the *Amaryllis* seeds, which, to say the least, proved that normal growth (i.e. division of living cells) was hampered or entirely inhibited.

The cobalt treatment was also extensively applied to flowering sized bulbs, including *Amaryllis* bulbs of the Ludwig Strain. After treatment I found that the bulbs bloomed normally without any deviations, so much so that at first I thought that the rays had not affected the bulbs at all.

When crosses, however, were made between flowers produced by cobalt treated bulbs, the seeds developed blooms after three years, which showed great variances.

The object of the cobalt treatment was to cause changes or mutations both in color and shape and with regard to colors there were changes indeed, but then even Darwin nor Mendel, who laid down the laws of whimsical Nature, could probably have stated with certainty, whether the color changes were occasioned by the cobalt treatment or if they were mutations resulting from the whims of Nature.

Anyhow, let us be generous enough to give the cobalt treatment credit for the changes; as to shape the treatment certainly affected the flowers, but unfortunately only adversely. This led me to believe that the cobalt treatment had some influence on the chromosomes, but first allow me to explain the term without being too technical.

Chromosomes may popularly be called the color threads or color rods into which the chromatin (the tissue that can be stained) of the cell nucleus is transformed before cell division (i.e. growth). Chromosomes exist in pairs, called haploids, and two equal haploids make up the diploids.

A modern theory holds that if the number of pairs of chromosomes of the two parents is not equal, the results of a cross is bound to develop into a kind of freak, which accounts apparently for mongolism in the human race.

I certainly had my share of freaks, but having been at the Cobalt treatment only for some nine years, should I have drawn the rash conclusion that I was destroying Nature? Such a conclusion was rather

too welcome to me, as I had not accomplished anything at all but upset the laws of heredity, which proved no longer to be applicable in any way. The inference that I committed something against Nature that I should stop, was just a trifle too convenient for me, for I had certainly not tried out all possibilities, which would probably take a life time.

The $10,000 question is: "What is against Nature". It is a well-known fact that in nature bees are color-sensitive; if a bee hive is put in a greenhouse full of flowering Freesias, say yellow and purple ones, each bee will pick and choose one color, flying from yellow to yellow, and another bee from purple to purple, thus pollinating only Freesias of the same color, never causing a mix-up, but should we conclude from the bees that it is against Nature to make a cross between a white and a red colored *Amaryllis?* Neither Darwin nor Mendel thought so, otherwise the latter should never have drawn up his color diagram of the probable results of crosses between two different colors. Moreover the bees will occasion a lot of self-pollination, which leads inevitably to inbreeding and degeneration, but though bees merely follow their natural instincts it is generally admitted by celebrated hybridizers that so-called "selfs" are taboo in hybridization, as selves will undoubtedly cause disasters in later generations.

Of course, there is no rule without exceptions; a medical friend of mine drew my attention during World War II to a family, whose parents were second cousins; of their numerous offspring of 13 children, eleven landed temporarily or permanently in a mental institute, but two of them were wonder children, prodigies of learning, extremely musical, rather inventive and resourceful, physically normal and mentally adequate. In the botanical world it might prove that "selfs" may serve some purpose, provided a conscientious selection is applied later-on, which is quite possible, and therefore highly recommendable in plants.

It is a well-known fact that the famous painter, Henri Toulouse-Lautrec, was born out of first cousins, which probably crippled and deformed him into a misshapen, hideous dwarf, for a simple fall from a horse could hardly account for it; nevertheless his artistic talents were far above those of his contemporary artists. Unchristian and indifferent though it may sound, the human race is not (yet) propagated vegetatively (I put the "yet" between brackets, as I recently read somewhere that an Englishman, a Dr. Gurdon succeeded in propagating frogs, not by taking the seed cells of male frogs, but by developing intestinal cells into new frogs, which is asexual or vegetative propagation in animals, to which world we cannot but admit we belong) and therefore we should not allow inbreeding in the human race, until scientists can artificially develop an embryo and fetus, destroying it in time, when it should grow or develop into abnormalcy, to which some may object on moral grounds, but let us return to the realm of plants, where we are not likely to be charged with murder, when we destroy the freaks we have developed.

In *Amaryllis* self crosses or selfs need not "a priori" be failures,

and once in a while we may come across a really outstanding novelty, if we have a selective taste, but such a novelty is not likely to be an ideal parent for further crosses, and certainly not for another self cross. What is extremely important in self crosses is a relentless selection, so that some super variety may be developed; to select very conscientiously it would be necessary to sow all the seeds from the self cross, and when the seeds have developed so much after three years (after two years there may be some flowers, but they should not be taken as a criterion, as they may still be fairly small) that they bear flowers, to destroy all the plants that have inferior blooms (and they are bound to be a good many). For me this is only part of the selection, for I should then cut up the ideal mother bulb selected, and watch very carefully how many bulbs the "cuttings" would produce, whether or not the new bulbs would be liable to disease, especially virus, whether or not the bulbs would grow big enough, whether or not they could be warehoused for some months, so that they are exportable etc. etc.

A clever hybridizer will never burn his boats, but continue growing some of the older varieties, keeping a register of what crosses he made with them, knowing when he committed inbreeding, so that when degeneration sets in and he has come to a dead end, he may fall back upon the older varieties, making another cross where he went wrong.

Above I mentioned the word *Virus*, by which I mainly mean *Mosaic Virus*, which I personally consider the nightmare of any *Amaryllis* grower. In a previous article I did on behalf of Plant Life, I pressed my point and advised all Amaryllis fans *to do away with all virus infested plants.*

This raised a lot of criticism, and as we fortunately live in a democratic world, my advice is not a brazen law, so that any person may grow *Amaryllis*, even though they are badly infested with virus, for virus infested plants will flower in spite of the disease. I certainly did not mean to talk with an air of superior wisdom, but on the other hand nobody should pretend to be able to cure *Mosaic Virus*, for in this case he would most probably have found a remedy against cancer at the same time. As a matter of fact *Virus* may also cause mutations both in color and shape of the flowers, so that some 15 years ago I was tempted to grow some virus infested *Amaryllis* on an isolated spot, making crosses between two virus plants; theoretically all seeds are virus-free, but the plants developed from such seeds whose parents suffered from virus, show "a great aptitude towards catching the disease."

The experiment in a nutshell amounted to developing a very fine novelty, which we named 'Spring Dream', but however much care and attention we gave the novelty, we could not eliminate the virus, so that in the long run we had to give up and 'Spring Dream' disappeared. Hundreds of hybridizers have made the same experiment, but as far as I know, none was successful in the long run.

As I stated in a previous feature, *Virus*, though contagious is mainly spread by insects, so that I advised my readers to try and kill

as many insects as possible. Twenty years ago everybody believed that D.D.T. was the ideal insecticide, but meanwhile we have learned that when administered to the soil in great quantities, it does great harm to the structure of the soil. Parathion and Undeen seem to be very effective, but they are a danger to all animal life, so that one should proceed very carefully. But is not here a task and challenge for the chemical world to find a better insecticide that is less dangerous for other animal life and does not develop an immune insect strain either?

I do not agree with futurologists predicting that we shall work only some four hours a week in the next century. There is such a tremendous amount of scientific research work to be done. The Horticultural University of Wageningen, Holland, showed the results of X-rayed potatoes on Dutch television last year. Commercially speaking the mutations caused by the treatment were not a success at all, for the potatoes were very unshapely, but then who am I to criticize such experiments, as I applied the treatment only unsuccessfully to some hundreds of *Amaryllis* clones. If the treatment were applied in a far larger way and the data were mathematically elaborated by computerizing them, we might have astounding results. Nobody should be in the way of scientific research, for twenty years ago the moon landing would have been considered impossible (like driving nails into the moon) and all of us saw the impossible come true, when Neil Armstrong hesitantly set foot on the lunar surface.

Lastly I may make two remarks that are rather reassuring: (a) In discovering the awe-inspiring secrets of Nature we should not be too scared to destroy Nature, for Nature will assert itself in the long run; (b) If mutations are freaks and disappointments to the scientist, the younger generation, who has another taste in dress, falls for electronic music, which sounds hideous in our ears; and who rave about paintings that the older generation does not understand at all, may greatly admire them.

One more word about Double Flowering *Amaryllis*, to which I took a fancy, when I was in the U.S.A. Generally speaking I do not fall for the so-called Doubles, neither in Tulips, nor in Freesias, nor in *Amaryllis*, but somehow it is a challenge to me, the more so as the chances of success are 50% less than in single-flowering *Amaryllis*. The Doubles have pollen, but on the whole no pistils, which means that crosses can only be made one way, i.e. we can take the pollen from the Double and put it on a single flower, but not the other way about.

Everybody has his or her dreams, and I have mine thinking that in the far future the whole of the American Amaryllis Society will be co-operative, so that I could put 10,000 seeds from Doubles at their disposal, so that the seeds will be distributed amongst the members that are interested, who will pass their experiences to the A.A.S., who will then computerize the data, so that we could accomplish almost anything in the short space of three years, but then a dream is only a dream.

# THE TRUMPET, AND CAMPANULATE 'MILK & WINE' CRINUMS

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Last year we reviewed the 'Milk and Wine' Crinum which have open or flat faced blossoms that can be accurately identified from old descriptions (Plant Life p. 113 1969). This time we are taking up the trumpet shaped forms with campanulate or semicampanulately shaped blossoms which do not have such patent features. We find these plants far more difficult to trace as all go under assumed species names such as *C. kirkii, C. kunthianum, C. sanderianum, C. campanulatum, C. fimbriatulum* and the like. In general the plants resemble the species but in actuality they are all hybrids. And as far as can be determined no suitable descriptions are available other than what we can glean from early catalogues. These are meagre.

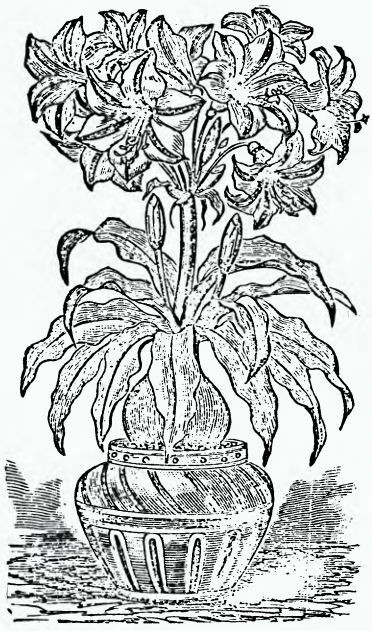
The term 'Milk and Wine' was first used by P. F. Reasoner and his brother (see L. H. Bailey's Cyclopedia of Horticulture, p. 1593) for a Crinum imported from Nassau while they operated the Royal Palms Nursery (1882-1910) near Manatee, Florida. About 1890 this bulb was keyed out erroneously to be *C. fimbriatulum*. Actually the plant appears to be a *C.* x *herbertii* form (*C. bulbispermum* x *C. scabrum*) which is common through the Caribbean (see Fig. 2). As of now the term 'Milk and Wine' applies to any Crinum having white blossoms with red keeled tepals. About ten clonal forms fall into the trumpet shaped campanulates or semicampanulates and appear in the trade under the above species names. As stated all are in error, not a single one qualifies as a species.

What is the proof? Well, in the first place one cannot grow tropical species out of doors in central California. The humidity is too low in the summer heat and the foliage withers. And the damp cold winters cause bulb rot, even in a greenhouse. Most of the trumpet 'Milk and Wine' Crinums are nearly as hardy as the *C.* x *powelli* hybrids. This first suggested that the hardy genes of *C. bulbispermum* are present. Secondly, the foliage of these 'Milk and Wine' forms is longer and far more acutely tipped than that given in any species description or found in any species re-imported. True, even species have some characteristic variants, but the foliage of the 'Milk and Wine' types all resemble the wider forms of *C.* x *powelli* more closely than they do the species, which again suggests *C. bulbispermum* genes. Thirdly, most of the plants rarely if ever set seed which is typical of many *Crinum* hybrids, but their pollen is active and will strike on *C. bulbispermum* giving what appears to be backcross B-1 hybrids. Some of these seedlings are quite striking but leave one lost as to the minor parent. Finally, we have duplicated several crosses using *C. scabrum* and *C. bulbispermum*. This gives some insight into the situation.

As a result we have come to the conclusion that most of the campanu-

late and trumpet form 'Milk and Wine' represent *C.* x *kirkii, C. scabrum* and possibly *C. zeylanicum* crosses with *C. bulbispermum album.* We can pinpoint *C. bulbispermum album* since the colored forms, *roseum* and 'Kimberley Red', yield solid pink or red hybrid blossoms with uniform shadings not unlike 'Ellen Bosanquet'. Only *C. bulbispermum album* hybrids retain the striped keel of the other parent.

The first *C. scabrum* x *C. bulbispermum album* cross dates back



**Crinum Kirkii.**

**C. Kirkii.** The flowers are large, pure white, with a reddish purple stripe on the outside of each petal, which, showing through, gives the flower a pink tinge on the inside; some 10 to 15 of these large flowers are produced at the top of a tall purple spike, and there are frequently two or more spikes of bloom from the bulb during the season. In addition, the foliage is very handsome, the numerous wavy-edged leaves forming a perfect rosette. Flowering bulbs, 35 cts. each; large and heavy, 50 cts. each.

**C. Virginicum.** A choice hybrid, originated in England; flowers very large and widely opened, white and rosy pink. One of the best. 75 cts. each.

**Crinum.**

Fig. 28. From Reasoner Bros., Oneco, Florida, 1902 Nursery Catalog. page 50. Left, **Crinum krikii;** and Right, **Crinum cl. 'Virginicum'.**

to Dean William Herbert as we find several references to these hybrids in his writings. He sent some bulbs to Dr. Carey in Calcutta, India. Thus, it is possible that one or more clones from this cross of his have remained in circulation. L. van Wavern Company of Hillegom listed a *C. herbertianum* in 1881 which appears to have been from Herberts stock. This well could be the bulb which Reasoner listed as *fimbriatulum.* Another Florida nursery listed the Reasoner bulb in 1898 with erect sword-shaped foliage so we have a fair idea of the plant shape, namely that it is a *C.* x *herbertii* form with semi-erect foliage and fragrant

carmine-striped campanulate blossoms. And it produces numerous offsets.

There are several *C.* x *herbertii* clones in circulation with broader foliage which is less semi-erect. These plants carry 20-24 inch scapes with 10-12 blossoms radiating outwards like spokes in a wheel. All buds tend to come into blossom at one time and in most instances the tepal keels are not pigmented more than a light carmine. Just which is which is a matter of conjecture as far as the name mix up is concerned. In the first place we presume that several strains of *C. scabrum* may be about which accounts for some of the minor differences in the *C.* x *herbertii* hybrids; and secondly we are not sure what the *C. bulbispermum* x *C. zeylanicum* crosses would be like. *Crinum zeylanicum* has better than a score of known variants, those from India have smooth margins to the foliage whereas the East African are finely toothed. Hybrids of the latter with *C. bulbispermum* would undoubtedly resemble the *C.* x *herbertii* cross with the shorter scape. Some may exist in the 'Milk and Wine' group and be impossible to segregate. The only clone of significance is one whose tepals have rounded tips which reflex well in a humid environment. Claude Davis lists this clone as 'Gulf Pride'.

The tall scape forms of *C.* x *herbertii* include the *C.* x *herbertii* cl. 'Virginicum' with its starry-shaped, broad-faced blossoms. As we stated last year we can trace this back to England in 1885. Its coloring makes it a striking plant. The *C. campanulatum* of the trade appears to be a related hybrid. It definitely is not the true species and is noted for the way the blossoms tend to droop. Its blossoms lack the span of *C.* x *h.* 'Virginicum.'

The *C. kirkii* x *C. bulbispermum* hybrids bear considerable similarity to the *C.* x *herbertii* hybrids. Where the latter has relatively broad foliage, particularly at the base, and the color is a deep semi-sage green with some evidence of a glaucous sheen, the *kirkii* hybrids have more strap-like foliage which grows rather erect and four to five feet long. The coloring is more of an uranium-green with no glaucous sheen. In background history Krelage and Sons first introduced *C. kirkii* in 1892. Bulbs were distributed into the Caribbean where Reasoner obtained a start. The true species is surface growing and the bulb often gets 10 inches or more in diameter. It is quite frost sensitive. The scape is 30-36 inches in length, not 20 as stated in Bakers description.

In 1900 Reasoner Brothers listed their *C. bulbispermum-C. kirkii* hybrid (see Fig. 28) stating that the bulbs were deep growing and frost hardy. There are several variations of floral size in circulation passing under the name of *C. kirkii* and *C. sanderianum.* The foliage is long and strap-like with acute tips. The blossoms tend to open over a period of several days and have quite a reflexed trumpet. About noon they tend to droop becoming quite campanulate. The keel is quite richly colored. Since the original *C. kirkii* species comes from relatively high elevations in Kenya the hybrid is somewhat hardier than the *C. scabrum* crosses. Like the latter the *C. kirkii* hybrids are seed sterile.

Since we are suggesting evidence that P. F. Reasoner first developed the *C. kirkii* hybrid it is fitting that the hybrid be named after him. It is rather obvious that the hybrid has survived when severe frosts eliminated the species. It's bad enough to confuse the hybrid with the species but to continue to call the hybrid *C. kirkii* is most undesirable.

*Crinum* 'P. F. Reasoner' *hyb. nov.* L. S. Hannibal (Hyb. *C. bulbispermum alba* x *C. kirkii*).

At the moment the writer has no name to suggest for the *C. bulbispermum album* x *C. kirkii* clone with the smaller blossom. Obviously *C. sanderianum* is in error, but the clone is not worth recognizing.

In describing the above hybrids one will note no mention of bulb size. The writer has one *C.* x *herbertii* clone which yields 20 inch bulbs under ideal conditions. Presumably some of the others approach 15 inches and the *C. kirkii* hybrids may be 8 to 10 inches when properly grown. We also mentioned that the pink or red flowered *C. bulbispermum* species gave red flowered hybrids when crossed with *C. scabrum*. There is no record of such in the older literature but one was found in a Los Angeles garden, and both Thad Howard and the writer have similar plants.

The writer wishes to express a rather delayed appreciation for the assistance furnished by Wyndham Hayward, the late Mr. and Mrs. Cecil Houdyshel, the late Mrs. Grace Primo and many others in trying to unravel the 'Milk and Wine' mess. We also wish to thank Peter Hyypio for locating early historical information.

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**PLANT LIFE LIBRARY**—continued from page 104.

FUNGICIDES, AN ADVANCED TREATISE, edited by Delwayne C. Torgerson. Vol. 1. Agricultural and Industrial Applications, and Environmental Interactions. 1967. Pp. 697. Illus. $29.00. Vol. 2. Chemistry and Physiology. 1969. Pp. 742. Illus. $35.00. Academic Press, 111 5th Av., New York, N. Y. 10003. This two volume treatise covers all aspects of agricultural and industrial fungicides, providing an integrative source of reference for advanced students and research and development workers concerned with the basic or applied fungicide research and development of new fungicides. Volume 1 contains a comprehensive discussion of fungicide usage and application, and the effects of environmental interactions. The chemistry and physiology of fungicidal compounds are discussed in Volume 2. Very highly recommended.

TROPICAL NEMATOLOGY, edited by Grover C. Smart, Jr., and V. G. Perry. 1968. University of Florida Press, 15 N. W. 15th St., Gainesville, Fla. Pp. 153. Illus. $8.50. The objective of the present volume is to compile some of the knowledge pertaining to nematodes in the tropics in the hope that problems in connection with agricultural production and human health may be solved. The topics discussed include some nematodes of the banana, citrus, coconut, pineapple, sugar cane, rice, coffee; nematological problems in the former French tropical African regions and Madagascar; relation of plant parasitic nematodes to soil management practices; and nematode problems of humans in the tropics. Very highly recommended.

RECENT ADVANCES IN PHYTOCHEMISTRY, Vol. 2, edited by Margaret K. Seikel and V. C. Runeckles. Appleton-Century-Crofts, Educational Div., 440 Park Av. So., New York, N. Y. 10016. 1969. Pp. 175. Illus. $9.75. This is the second volume in this series prepared under the auspices of the Phytochemical Society of North America. The topics discussed by outstanding authorities include nuclear magnetic resonance studies of plant biosynthesis; methods of attacking the problem of lignin structure; plant tissue culture as a technique for the phytochemist; utilization of mass spectrometry in natural product chemistry; and scope and limitations of gas chromatography of terpenes in chemosystematic studies. Very highly recommended.

THE BIOLOGY OF PARASITIC FLOWERING PLANTS, by Job Kuijt. University of California Press, 2223 Fulton St., Berkeley, Calif. 94720. 1969. Pp. 246. Illus. $15.00. This is the first general book on the biology of parasitic higher plants and will be welcomed by the scientist and general reader as a reference source. The nine chapters are concerned with parasitic flowering plants and man; the mistletoes, sandalwoods and relatives; broomrapes and parasitic figworts; Rafflesiaceae, Hydnoraceae and Balanophoraceae; **Cuscuts,** Cassytha, Lennoaceae and Krameriaceae; the haustorium; physiological aspects of parasitism; and evolutionary aspects of parasitism. Very highly recommended.

PLANT COMMUNITIES, by Rexford Baubenmire. Harper and Row, publ., Keystone industrial park, Scranton, Penna. 18512. 1968. Pp. 300. Illus. $9.75. Subtitled, "A Textbook of Plant Synecology", this excellent new text on plant communities as components of ecosystems, is aimed at understanding how these communities originate, develop, and maintain themselves, and at elaborating a classification to show relationships. The subject matter is grouped under the headings, the nature of plant communities; analyses and description of plant communities; plant sussession; vegetation and ecosystem classification; and vegetation as an objective of study. Very highly recommended.

ADVANCES IN PEST CONTROL RESEACH, edited by R. L. Metcalf. Vol. 8. 1968. John Wiley & Sons, 605 3rd Av., New York, N. Y. 10016. Pp. 255. Illus. $15.00. This 8th volume in the series contains contributions by outstanding specialists in the fields covered, including not only comprehensive reviews but also critical evaluations of new concepts and developments. The subject matter has been selected from recent significant research trends related to all phases of pest control, with emphasis on the fundamental aspects, including behavior and fate of s-triazines in soils; insect sex pheromones; and the bipyridylium herbicides. Highly recommended.

THE POCKET ENCYCLOPEDIA OF PLANT GALLS IN COLOUR, by Arnold Darlington. Philosophical Library, 15 E. 40th St., New York, N. Y. 10016. 1968. Pp. 191. Illus. $7.50. This pocket-sized, profusely illustrated (in color) cyclopedia of plant galls will be welcomed by the student, teacher and amateur naturalist. It provides a means of identifying plant galls; outlines the mode of life of the principal gall-causing agents, and suggests investigations which can be carried out in the field. The colored illustrations alone are worth the price. Very highly recommended.

**PLANT LIFE LIBRARY**—continued on page 162.

# 4. AMARYLLID CULTURE

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

## OUTDOOR PRODUCTION OF AMARYLLIS SEEDLINGS

ALBERT P. LORZ, *Rt. 4, Box 357 E, Gainesville, Florida 32601*

Our interest in raising *Amaryllis* from seeds started when we moved from Indiana to Florida in 1948. From seeds saved from a beautiful unnamed specimen, we had started a group of seedlings in an old style coffee can in which a hole had been punched in the bottom so that a wick passing through it provided a continuous supply of water by capillarity from a receptacle underneath.

This seemed like a good method but little did we suspect that our interest in *Amaryllis* hybridization would expand to the point where it would become limited not only by the number of available coffee cans but by available indoor space and our capacity to handle hundreds of containers.

### 1. GERM PLASM: BREEDING MATERIAL

How we acquired the basic materials for a hybridization program resulting in a considerable number of lots of seeds each year is a story in itself, but briefly we tried to assemble as many different forms of *Amaryllis* as we could and to test their ability to survive under outdoor conditions in Florida.

Being weak on taxonomy, we cannot say with any accuracy just how many species and clones were involved. There were representatives of the Mead strain, *A.* x *johnsonii, A. belladonna, A. striata fulgida* and a form known locally as *A. rutila* (= *A. striata*) but whose characteristics seemed to fit not too well the description of *A. striata* although it perhaps could be a form of this species. Also involved were a few McCann doubles including 'Helen Hull'. Yet to be heard from as mature flowering bulbs are numerous young seedlings from pollinations with *A. aulica, A. aulica platypetala, A. elegans, A.* x *ackramanii* and a clone of bulbs traceable through several intermediaries to the late Professor Ira Nelson and believed to be Senorita hybrids. Pollinations were also made with some undetermined species supplied by Mr. Robert Goedert.

As the outdoor material increased in quantity and flowering capacity, we embarked on a program of upgrading the flower type by using the best Dutch germ plasm available. Each season we would order a few of the best Dutch clones and use their pollen on the heterogeneous outdoor material. Fortunately, the new bulbs, fresh from Holland, would come into bloom just ahead of the outdoor material, and we would carefully husband the pollen supply and use it sparingly in order to stretch its use as far as possible. To accomplish this, we dried the anthers

carefully on a small square of aluminum foil in a low humidity air-conditioned room. Then, with two pairs of fine-tipped forceps we would strip off the pollen onto the foil and scoop up all of it into a size 00 Gelatin capsule (obtainable from any prescription druggist). The capsules were then stored in a refrigerator while not actually being used. A word of caution about accidentally wetting the capsules with dew or rain drops is in order. Otherwise, they will soften and collapse.

The bulk of the pollen can be accumulated in the bottom half of the capsule after it has been shaken in order to coat the sides with a thin layer. Patches of this layer can then be rubbed off by inserting one or more of the lobes of the stigma. In this way, it is possible to make a hundred or more pollinations from a single Dutch bulb, especially if it should produce two four-flowered scapes.

We have thus spread far and wide the pollen of 'Goliath', 'Ludwig's It', 'Winter Carnival', 'Bouquet', 'Gypsy Giant', 'Silver Lining', 'Salmon Tower' and others, and now we feel that some of our newer seedlings, having generous amounts of Dutch germ plasm, are as good as their Dutch ancestors. We like to think also that we have some new combinations of floral characteristics not offered as commercially available clones, and that we have made some progress in flower form and structure beyond the usually available types.

## II. THE PLASTIC-FRAMED WINDOW METHOD

Realizing that outdoor seedling production would be the only way we might expand our operation, we began to explore ways and means of growing seedlings without the arduous hand labor of weeding and cultivating. Our explorations led to three methods, each of which offers certain advantages so we shall attempt to describe them all.

The first method: It occurred to us that one might make use of *black polyethylene plastic film* such as has been used so successfully for vegetables, strawberries and other row crops. Instead of using the heavier four and six mil thicknesses commonly employed for soil fumigation, we decided upon the cheaper and completely expendable 1.5 mil material obtainable in three-foot width at certain garden supply stores at less than $15.00 per roll of 1000 linear feet.

Strips of three-foot wide plastic were laid out over a lightly moistened, smoothly prepared seed bed and their edges sealed by covering them with packed, wet soil from the pathways between the strips. The delivery tube of a methyl-bromide dispenser (also obtainable at garden supply stores) was inserted under the edge of the plastic in the center of every thirty feet of bed and a can of pressurized methyl-bromide discharged through it. The delivery tube was then removed and the opening sealed by compacting the soil over it.

Ordinarily at temperatures of 65 degrees F., or higher over a period of twenty-four hours or longer is sufficient time for fumigation and the bed is ready for planting.

To assist with the planting operation, one should construct a two to three inch deep rectangular frame with thin wood or metal strips.

A convenient size is eight by fifteen inches. An eight inch long piece of the framing material should be cut for use as a movable partition. It then becomes possible to use the form as a guide to cut out rectangular windows in the plastic and the size of the rectangles can be varied by moving the partition in order to cut out larger or smaller eight-inch wide windows as needed to accommodate larger or smaller lots of seed.

With the frame still in place, a single lot of seed is spread out over the area of soil in the window created by removing the cut out plastic cover. With a little practice, one can learn quickly to judge what size window will be adequate to allow a given lot of seeds to be planted one layer deep with little or no overlapping of their membranous edges. The seeds are then covered with sand or sterilized soil to a depth of about three fourths of an inch.

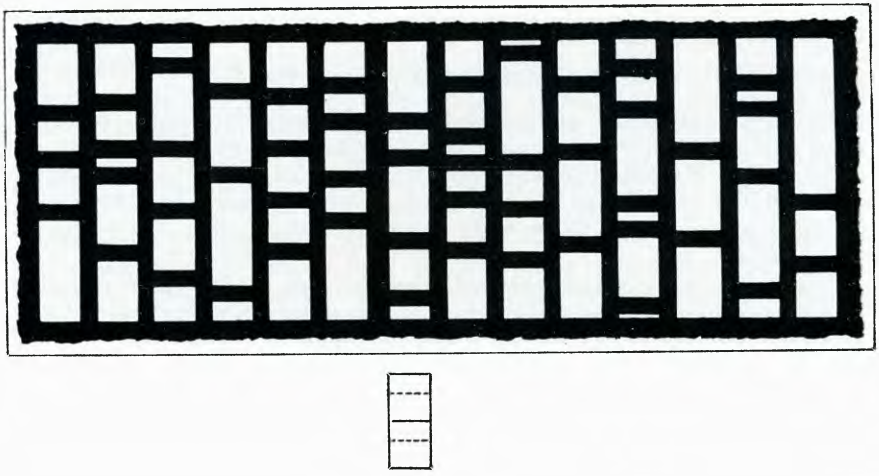

Fig. 29. Scale representation of a black polyethylene-covered (3′x14′) bed with 8″ windows of various lengths cut out to accommodate seed lots of various sizes. The small rectangle above indicates the inside dimensions of a frame with a snug fitting moveable partition for use as a guide in cutting the plastic and for confining the seeds during the planting operation. Plastic framed-window method.

The planted rectangles should be separated by about three inches of intact plastic film. After the bed is planted, these three inch strips should also be covered so as to prevent the soil from washing away from the seeded areas. Thus, after the bed is planted it will have the appearance of an ordinary planted seed bed with no plastic exposed. Daily wetting about 1:00 P. M. will keep the surface layer of soil from drying out until the seeds germinate.

Reasonably satisfactory weed control can also be obtained with the

plastic, without previous sterilization, if one covers the seed bed with a weed seed free medium such as builders' sand or a sandy subsoil taken at some depth below the top layer. A three fourths inch layer of such a medium will allow *Amaryllis* seedlings to emerge but will usually discourage the germination and emergence of most of the small-seeded weeds, some of which require light to satisfy conditions for germination. Weed-free peat is not recommended because of the danger of slime-mold growth which occurred in our experience when the peat cover was kept continuously wet for a long enough period to ensure germination of the *Amaryllis* seed. Naturally, some weeding will be necessary but this is minimal and the Amaryllis seedlings will soon take over.

Seedlings thus produced can generally be left in place for two growing seasons, after which each lot will usually be represented by a dense cluster of small bulbs which have invaded the three inch wide strips separating the different lots. At this time these clusters should be separated and transplanted.

### III. THE PAPER SANDWICH METHOD

Although the above method has been eminently successful, we soon found that we preferred an alternative method out of deference to an aching back. We found that stooping to spread carefully on the ground the individual lots of seed from upwards of 500 crosses, self pollinations and open pollinations (likely to be naturally selfed) was too taxing to the sacroiliac.

Necessity being the mother of invention, we finally came up with an idea which enabled us to take care of the most arduous aspect of the planting operation while sitting down comfortably indoors while casually watching TV in the usually vain quest for an entertaining interlude between commercials.

Basically, the method consists of spreading the seeds out on a single one-ply section of paper towel and covering with a second, to form a sandwich composed of two plies of absorbent paper with a layer of *Amaryllis* seeds between them. Sandwiches of different sizes can be made by folding a single ply or by allowing two or more sections of towelling to remain attached to each other. It is also feasible to place more than one small lot in the same sandwich if the lots are reasonably spaced and each identified with a small piece of plastic label.

Sandwiches of the same size can be constructed one on top of the other and the pile placed in a rectangular container such as a plastic dishpan so that it can be wet thoroughly with water. The water should not completely inundate the pile, for the top layers may tend to float with resultant complications. Any excess water should be drained off, but the papers can be kept moist for four or five days or even longer if the seeds show no signs of either advanced germination or incipient spoilage. The wet sandwiches, either before or after germination has just started, can be lifted off the pile and laid out on a previously prepared seed bed. After covering with three fourths inch of soil, the

bed can be maintained as previously indicated.

For very large bulked lots of seed, it proved to be entirely feasible to make large sandwiches between two opened out sections of newspaper laid out on a waterproof flat surface. Sandwiches this large are extremely subject to tearing as wetting weakens the paper and contributes to its weight. It was found, however, that these large sandwiches could be folded several times before attempting to lift them, and then unfolded again after placing on the seed bed.

As already pointed out, one signal advantage of this second method is that the most arduous facet of the planting operation can be circumvented and the careful arrangement and proper spacing of the seeds can be done while seated indoors when it may be too dark outside or the weather too inclement. Also, the papers can be laid out quickly while maintaining the already predetermined optimum seed spacing.

Another advantage is the complete elimination of the wind hazard which can sometimes be a problem when trying carefully to sow light and membranous seeds. This applies especially to the large bulk lots where the wet newspaper safely keeps the seeds from blowing around.

Ordinarily we plant all of our bulked seeds, as well as the smaller individual lots, immediately after harvesting, but the year before we developed the newspaper technique, we were unable, because of the pressure of other matters, to get sufficient space ready. Having learned about the general inability of Amaryllis seeds to retain viability when stored at ambient room temperatures, we put two large grocery bags full in an old refrigerator and kept them there for a full year. When they were finally brought out and planted beside the new crop, there was no indication that there was any differences in the stands of the two lots of seedlings obtained. Both lots were planted as newspaper sandwiches and the newsprint ink appeared to have no adverse effect on germination.

## IV. SINGLE ROW METHOD

After a consideration of the two methods just described, one might wonder about the need for further experimentation along this line. Both of these methods, however, involve the production of seedling bulbs in such dense clusters that it becomes imperative to separate and transplant them after the second growing season. While it is not unreasonable to assume that this should be the inevitable result of any extensive seedling production in limited space, and we will describe later our handling of this phase of the operation, we had the additional thought that a third method might even eliminate this stoop labor so that it might thus become possible to produce seedlings in such a way that they could be left in place three or more years until flowering.

If seedlings could be produced *in a single row at close spacing,* the enlarging bulbs could push each other aside in a more or less zig zag fashion toward the center of the area between the rows. It remained

then to devise a method of planting in a single line with some precision. The obvious one of placing the seeds by hand in a single file was immediately vetoed by the sacroiliac. Finally, we came up with the idea that the seeds might be placed individually on ¾-inch masking tape. Knowing that doing this at the fastest possible rate would be time consuming, we had to consider the time involved in comparison with that which might ultimately be saved in bypassing the transplanting operation. Our decision was that there would indeed be enough of a saving to justify at least an effort to explore the method's potentialities.

We, therefore, devised a mechanism which involved two small wheels mounted on a board in such a way that the original reel of tape mounted around one of the wheels was fed onto a second reel mounted around the other wheel with about a foot of the exposed adhesive surface facing upward between the wheels. The receptor reel was equipped with a flat cardboard plate on each side to prevent the tape from slipping off. The seeds were then taken individually from a shallow container and placed in single or zig zag file on the tape as it was rolled from the original reel to the receptor reel, and a small piece of plastic label was placed at the end (which will be the beginning when the tape is unwound for planting) for identification purposes.

In our operation the seeds were placed closely enough that their membranous edges were touching, leaving thereby one half to three fourths inch between adjacent germinating seedlings. Wider spacing could, of course, be used at one's discretion but allowances should be made for the total amount of space available as well as the possibility of something less than 100% germination. The seed-laden tape was then laid in furrows 14 inches apart separated by foot-wide strips of 1.5 mil black plastic.

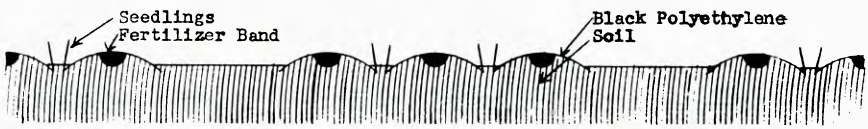


Fig. 30. Profile showing position of seedlings, fertilizer band and black polyethylene film. Single row method.

Due to the varying germinability and vitality of the various individual lots of seeds, our results from this method were likewise variable. Some lots gave good stands, indicating nearly 100% germination; other lots had low germination percentages, leaving wider spacing between the surviving seedlings; still other lots were weak germinators or ill-adapted to outdoor culture and, therefore, failed to survive without coddling or protection from pests or the elements; and finally there were some empty spaces due to inferior lots of seed apparently incapable of germination.

All things considered, however, this appears to be a method worthy

of further consideration especially if one were to sterilize the seed bed, which we did not, and otherwise extend the tender loving care which we neglected to do, because of other more demanding personal considerations.

While we believe that this method could result in significant time saving in the overall picture, in that the time necessary is more than compensated for later on, we could not use the method as extensively as we would have liked. The number of lots we usually have after our spring harvest is too large for us to get them all planted by this slower method in time to take advantage of the immediate growing season. We have, therefore, abandoned this method for the present until such time as retirement may permit us to renew efforts to take advantage of it. For the present and the near future, we will continue to use the paper sandwich method as the one which best combines convenience, ease of manipulation, speed and whatever degree of precision spacing one may desire.

In connection with the seed tape method, we mentioned that the tape was placed in furrows fourteen inches apart with the area between almost totally covered with foot-wide strips of 1.5 mil thick black plastic. In creating the furrows, they were purposely made deeper than necessary for planting the seeds at optimum depth. We did this in order to draw sufficient soil toward the middles so that their level would be raised appreciably above the level of the remaining only partially filled furrows after the seed-laden tapes had been covered to the three fourths inch depth. The result of this then is a series of immediately adjacent fourteen inch wide ridges which when covered with the foot-wide plastic strips will leave a lower uncovered area two inches wide for the emergence and development of the seedlings. We use essentially the same method for planting established seedling bulbs except that a wider spacing of 20 inches between the rows is used with the middles covered with 18 inch plastic strips.

The purpose of this was to direct the drainage from rain or overhead irrigation from the centers toward the furrows. Ordinarily one might expect the soil to wash into the incompletely filled furrows covering the seeds or seedlings beyond their optimum depth. This is, however, prevented by the plastic which keeps the soil from washing. The plastic also protects a band of commercial fertilizer which is placed on top of each ridge before the strips are laid. We put down a heavy band of a 10-10-10 analysis, completely inorganic. To facilitate this, we placed a section of two inch rigid plastic pipe on the soil in the center of the ridge and, pressing down, created a furrow in the top of the ridge into which we poured the fertilizer. One need not fear that the presence of such a heavy band of highly soluble salts will kill the seedlings, because the plastic, in covering the band, prevents the rain or irrigation from washing the fertilizer directly toward the seedlings. What apparently happens is that the fertilizer moves only very slowly toward the plants by capillarity and in becoming slowly available has lasting ability comparable to that of the organics.

Since there are some problems associated with keeping the plastic strips in place, a word about our experience is in order. We found that it was impractical to try to cover the edges of twelve or eighteen inch wide strips with soil but that the ends of the strips could be anchored by burying them. We used various devices to keep the strips in place until the overhanging Amaryllis leaves became large enough to take care of the situation. We weighted down the strips with any natural litter we could find such as sticks, pieces of wood, moss, grass clippings, etc. Where neatness was a factor, we fashioned wire staples which we pushed through the edges of the plastic into the soil. Plastic laid in cold weather can be stretched snugly, for it will only loosen somewhat when the weather gets warmer, but plastic stretched tightly in warm weather may contract sufficiently to tear if there is a severe drop in temperature.

## V. THE VIRUS DISEASE PROBLEM

Apparently one way to keep ahead of the virus problem is to have an abundance of new seedlings coming into flower each year. For a few years at least they remain free of the disease until a new disease-free crop comes into flower. Through the years we have lost many beautiful *Amaryllis* to virus, in one case a full double measuring nine and one half inches across. We have been somewhat philosophical about this, realizing that such superior germ plasm is being passed along to new crops of seedlings yet to be heard from. We are in the midst of an *Amaryllis* population explosion and if the older ones failed to die we would have no room for the newer material. We have come to regard our *Amaryllis* somewhat as an annual crop in that we plant large quantities of seed each year and each year a new crop of seedlings from several years previous planting comes into bloom.

We have had so many new seedlings to engage our attention that we have had no time to give to the maintenance or vegetative propagation of the better selections. We are constantly looking for virus free individuals for use in further breeding, and our attention is currently focused on one apparently virus free plant completely surrounded by virus infested material.

*A. evansi* appears to have good resistance, but we are in no position to make any statements about its absolute strength or heritability.

In one instance we tried heat inactivation of the virus by using a well established clone which had obvious symptoms but which had enough tolerance to be able to continue to grow and establish a large cluster of bulbs from offsets. We subjected individual bulbs from this clone to one half hourly increments of exposure to a temperature of 50 degrees Centigrade in a water bath and then planted the bulbs. Exposures of two and one half hours killed the bulbs but any lesser exposures which failed to kill the bulbs failed also to inactivate the virus.

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As we close this account of some of our experiences with large scale outdoor production of *Amaryllis* from seed, may we express the

hope that at least a few who may persist to the end will enjoy the reading of it as much as we have writing it. We have put a lot of hard work into what is supposed to be a hobby, but it has been a labor of love and we wouldn't have it otherwise.

## THE AMARYLLIS CYCLE

W. J. PERRIN. *The Article Also Appeared In Men's Amaryllis Club Of New Orleans, Inc. News Letters, 1968-69.*

Most of us know what to do with certain plants but somehow don't know when to do and then there are some who know both and invariably skip the latter. We will attempt to go through the Amaryllis Cycle with hopes you will make allowances for the particular climate (temperature) in which you live.

Let's start the cycle in *Spring* at end of blooming season or at close of Spring Amaryllis Shows. Potted plants should be buried up to the rim in beds or some special location. Any moving or transplanting of bedded plants should be done at this time. Give half-day shade if possible. Start fertilizing program for both potted and bedded—this should run April through August. Don't use commercial fertilizer (powdered or granular); if you must, use it lightly and very low in nitrogen. Amaryllis roots are very tender and burn easily. Liquid fertilizer with a formula of 7-6-19 or near has proved more successful when used according to directions. This may be used twice monthly. Four feedings of commercial fertilizer may be used; one each month. Again be careful, it will burn roots especially if used with high nitrogen content. Bulbs should be planted eight inches apart in the ground. Potting may be done in seven inch clay pots. Make sure to put enough drainage material in bottom of the pot to prevent the pot from becoming water-logged. During the growing season two sprayings of Malathion Insecticide should be done in early Spring, then visible pests to watch are chewing caterpillars, slugs and snails. Chlorodane, snail and slug pellets usually overcome New Orleans pests. A lot depends on your locality; different insects have their special homing grounds. Water during this period should be generous, providing you have good drainage, and this drainage problem is a must.

This brings us up to the *Fall* season. Continue watering at a moderate rate through October or better until signs of first frost. Much depends on your locality, temperatures, etc. As soon as you note a potted plant which has shed all of its foliage stop all water and move this pot to winter rest location—it has gone to sleep for the winter. During October make preparations to protect bulbs against coming winter, always remembering it is possible to get a freeze in November. Bagasse or pine needles may be used to mulch. Bagasse (outer bark of sugar cane) is much neater for city gardens plus its decaying values make a good soil additive for the future. Outdoor plants will have to be given a good mulching well in advance of first freeze. Potted

plants (in most cases, show prospects) must be moved to shelter at sign of first frost. Their location should be one free from direct sunlight with a temperature range of 35 to 55 degrees F. Care must be taken not to place pots in an area where temperature is subject to go below 32 degrees F.

A word about moving and transplanting. Many bulbs of other varieties are moved and planted in the fall months. The *Amaryllis* is best disturbed during the spring, the beginning of its growing cycle. Main disadvantage being when moved or planted in the fall months the root system does not have time to get established before freezing weather, ground is loose and consequently makes the bulb an ideal freezing prospect. Keep in mind *Amaryllis* bulbs are planted on the shallow side whereas many other bulbs are planted deeply. There is also no advantage in digging and storing bulbs during the winter months for resting purposes—this is done mostly in cases where the beds have to be worked over. Some grow clones in open beds then pot them as show prospects. Here we have a planting exception because the bulb is going to be protected and with thought in mind of bringing it into early or regulated bloom. Do this in October and when digging treat these as you would a tree. First wet or soak the soil then take bulb up with ball of soil attached and place it in pot, the whole idea being not to disturb the root system.

As we go into November all Amaryllis should be starting their rest period which is necessary for good spring bloom. Potted bulbs stored as show prospects should be given a treatment of Orthocide Garden Fungicide which contains 50% Captan or some similar fungicide. This is not hard to do. Use mixture as directed. With small paint brush, paint the exposed bulb from neck down with the solution, letting a generous amount saturate the extreme top of bulb. This will keep the scape from becoming scarred as the bulb blooms in the spring. We usually let pots in resting state November through February 15th. This year's show is more or less timed with outside bloom. Unless we have unusual weather outside bloom should be in progress by April 11 and 12. You may watch for buds in your garden beds before bringing potted bulbs out to light—this should be some time between February 15 and March 1st. Then start watering program with a light hand. Do this gradually, increasing as you note straps forming. The time will vary, depending on your location; in some cases as much as ten days. Those owning greenhouses will have to be doubly careful as this show is on the late side. If you push too quickly you may have a show all of your own by April 1st. Outside (bedded) plants require heavy mulching during the winter months and by all means good drainage. If in doubt about your drainage, then remove them to indoor location and replant in the spring. The question of water came up during our October meeting. Although we do not advise this you many occasionally let a small amount trickle down the pot edges, (during the resting period). This will help the root system keep fresh. Clay pots have a tendency to dry out rapidly, pulling all moisture away from soil.

You may also let active or evergreen foliage remain on your bulbs until it is burnt by frost or withers away in pots. We cut any remaining on January 1st. It will be interesting to note some hobbyists set pots on their sides during rest periods and let them dry out. As already mentioned, some type of fungicide should be used in solution or dusted as directed during rest period. When *timing for a certain date,* (in our case, April 12th), we usually guide ourselves by saying, "buds should be peeping (showing) six weeks before show date." Now you can begin to see why February 15th is so important. By starting to concentrate on your bulbs February 15th you will have two weeks to start doing one of two things: (1) Start holding back those with buds showing; (2) Bring to light and heat the ones with no buds showing.

You should mark your calendar starting February 16th, *Number 8* then decrease the number marked each week until you reach April 6th. This will be marked *Number 1,* or one week from show date. This marked schedule will create interest you never dreamed of and will help you keep a weekly watch on the progress of bloom. Outside as well as inside temperatures will have much to do with bud and scape progress. Location also comes into the picture.

The most interesting part of the cycle is "Timing the Bloom of the Amaryllis for a certain date." This takes patience, records and above all, attention. Summer care or what you have accomplished toward growing a healthy bulb will be in evidence during this period. Don't expect too much from the bulb which exerted itself the past year as a prize winner; this bulb may take one or two years to replenish itself especially if it has been forced drastically.

Assuming you have started a daily check starting February 15th (or six weeks prior to expected bloom, whatever your case may be), and have marked your calendar up to show date, the greater number of your bulbs should be showing buds on March 1st. Keep in mind heat control is very important now; some water, but not excessive. You may find water acting like alcohol to the automobile driver if too much is used. The bulb may do one of two things—either shrink or give out too much foliage. Let's mention again, protect your foliage—this is the food storer for next year's bloom. The neatest bloom will be found among the bulbs with activated root systems and scape preceding foliage. Late March warmth, coupled with the aid of greenhouse or indoor heat will enable you to time bloom very close. Some late forcing may be necessary but usually it is the opposite—we become too anxious and find ourselves with early bloom. Caution should be taken with newly purchased bulbs, remembering these came from foreign countries and have been forced (rested) in transit. Early bloom will prevail if these bulbs are given the same treatment as our native ones. Most of us have some show prospects planted outdoors; chances are these will not bloom in time or may be broken by the March winds. These may be potted and with proper heat are likely to turn out well. Some are late and will not show early. Let them take their time—forcing in this instance will cause shrinkage and damage to the bulb.

Some final tips and we will bring the article to a close. A little sun or strong sunlight is needed to give proper color value to blooms. Lowering of pots to bottom floor will help regulate and retard scape progress whereas elevation will speed up bloom. Pots should be *turned daily* to produce straight scapes. Don't be afraid to move pots from one location to another if bloom progress is too slow or fast; allow three days to note progress. Make notes for next year. Don't fertilize until show is over or blooming period has finished. If first scape arrives too fast there is always the possibility of a second. Water twice weekly, if needed, letting water penetrate entire pot. Keep soil moist, not damp.

It is hoped some parts of the cycle have been of some help to you. Much more can be said, however we must stick to basics as all localities have different environments. Last, don't miss the interesting experience, "TIMING AN AMARYLLIS BLOOM FOR A CERTAIN DATE."

## VEGETATIVE REPRODUCTION AND INDUCTION OF POLYPLOIDY IN AMARYLLIS

Russell H. Manning, *Spring Valley, Minnesota 55975*

When it was read in Traub's THE AMARYLLIS MANUAL on pages 107-108 that no effective method to produce tetraploidy in the genus *Amaryllis* had yet been devised, this became a challenge to the writer. To date, this writer can not claim any concrete results but he has several methods which may well lead to the desired polyploidy in *Amaryllis*.

Several years ago, a gift bulb of an *Amaryllis* started to rot after trying to bloom without roots. In attempting to save the bulb from further shrinkage, it was placed upside down over a pint fruit jar which had several inches of water at the bottom. Some months later in spring, it was remembered and when checked, it was found to have set a large number of bulblets tightly around the exposed "bulbstem" and new roots had been generated inside where ordinarily they did not form. Why not use this same set-up for treating an *Amaryllis* bulb with colchicine? It was tried. There are outward signs of possible polyploidy having been introduced in that there are several changes in the leaves from the norm: coarser grained, rougher, rolling of some and variances among them. There are still 3 or 4 years yet of growth before bloomtime to note anything which may further lend credence to its having been effectively polyploidized.

A more detailed treatment given another bulb is as follows. Last Fall, 1968, before killing frosts hit, a large bulb was dug and the top leaves were cut to give about a 4″ neck. Next the roots were cut-off level with the bulb's base which was then hollowed-out with a paring knife to closely resemble the rotted bulb's condition. One should exercise care so as not to cut too far outward. The hollowed-out bulb was now placed up-side-down over a pint fruit jar with enough water

at the bottom so that it came up several inches; and four toothpicks equally spaced were stuck into the side of the bulb to hold it so that there was ample airflow. Only about ½-inch of the green leaves was low enough to get into the water. Another toothpick was inserted into the pit of the hollowed-out portion of the bulb to destroy the growing point. Then a weak mixture of colchicine (.2 colchicine reduced down again with about 5 parts well water), gibbrellic acid, rootone, and a fungicide were put into the pit in the bulb. Then a cap which loosely fit over the cut portion to keep sunlight out was made of aluminum kitchen foil. This held its shape and could easily be removed for inspection during the winter. During midwinter the leaves ripened-off, then towards spring bulb shrinkage started because regeneration of tissues had started. All signs of dead tissues were removed except the leaves which were needed to steady the bulb on the 4 toothpicks. When small bulblets could be faintly discerned and "upswellings" as reticulations inside the hollowed-out base came to a standstill as to further development, the bulb was set in a 3″ pot upside-down on top of the soil and lightly watered. As a word of caution, try not to get any moisture down inside the bulb scales as it accelerates the rot which will form. All rot was removed as seen and also all the dried portions of the scales were also removed to get sunlight onto the green portions of the bulb scales. The largest bulblet (by far) failed to develop a green leaf; some of the smallest ones which were in the area in which the knife had cut through, set so many little bulbs that they almost touched one another; but only two developed of these. Altogether seven ramets are growing of this bulb and two things are true of them all: they started developing a green leaf soon and also grew roots of their own, but those that did not, died by drying-up.

For this Fall, Dr. Traub's article: COLCHICINE INDUCED HEMEROCALLIS POLYPLOIDS in 1951 PLANT LIFE, pp. 83-116 has given the writer a sharpened tool, possibly, in the REPEATED USE of the mild colchicine solution. So, instead of filling the cavity once, it will be filled several times. Further the leaves will not be immersed into the water but rather the bulb scales may get their moisture from the solution. So now, another year of anticipation is ahead and further results may follow.

## ADDENDUM

Possibly a word of caution should be added in the use of the chemical, colchicine, as it may cause cancer to the human body if not washed-off with hot water and soap immediately.

Again, others may desire to try this method for propagating a favored clone as it does not require special equipment to do so. The controls in the experiments will provide replacements for the bulbs which have been used in colchicine treatments and also may provide a clue as to whether the gibbrellic acid and rootone will further increase

the number of ramets from each bulb as these will be added each time when the colchicine solution is applied to the experimental bulbs. This will be needful as Amaryllis are sensitive plants and possibly too much of the gibbrellic acid and rootone can be as inhibitive as too much colchicine itself. Further as the writer had no surplus Amaryllis bulbs, he used large onions to gain a better skill in coring out the cavity in the bulbs' bases several years ago; others may wish to improve their skill on an onion or two before cutting a core in an Amaryllis bulb which may hold high sentimental value as well as financial value.

## 1968-1969 FLORIDA AMARYLLIS SEASON

Mrs. Fred Tebben,

*Box 12, Lake Hamilton, Florida 22 33851*

When I returned to Florida in the fall of 1968, I found all my *Amaryllis* had lost their leaves and were dormant. I do not know whether this was due to lack of rain, or to ravages of the Lubber Grasshopper. We had a few good rains in October so the *Amaryllis* put up new leaves and all looked in fine condition. However, our winter began on Nov. 9 with our first frost, very early indeed. From then on we have cold weather, not extremely cold but hovering between 30 and 50 degrees F., most of the time.

Before Christmas we had our one killing frost which took all our Poinsettias and other tropical things. Cold weather continued and I had white frost on the lawn 13 times from November until the end of March. Most of the *Amaryllis* retained their foliage as they are planted in protected places, but the blooming season was late and very unsatisfactory. Only about one-fourth of my bulbs bloomed; with only one scape per bulb and having two florets per umbel. I noted too, that the *Crinum* and Daylily bloom was very sparse, a large clump of each having only one scape of bloom, and many showing no bloom at all.

There is no loss without some small gain—we found that there were very few lubber grasshoppers. Too cold at the time they should have emerged from the ground, I suppose. The saying is that one extreme follows another, so Florida had the hottest June and July in many, many years. The rains came, however, and everything remained green and lovely. I noted that due to the cold, many bulbs had lost their roots and were just beginning to put out new ones when I left Florida in late July. Those that retained their roots and foliage were fertilized well with a phosphate and potash mixture. First application was a 6-6-6, a favorite fertilizer for almost everything in Florida, except azaleas and camellias. When I return in the fall, I shall make one more application of this same mixture, and will hope for better bloom another season.

I have been most pleased to see the hardier Dutch bulbs are forming clumps, but I am sure I have lost many of the more delicate ones that cannot stand outdoor temperatures.

# FIRST YEAR HOBBY GREENHOUSE

WILLIAM R. ADEE, *916 Sunset Av., Waukegan, Illinois 60085*

I am completing my first year of raising amaryllids in a small hobby greenhouse. Outgrowing it has been the first major problem. Friends, generous with seeds and plants, have left me overflowing with pots onto the patio. I expected everything to grow better in a greenhouse but such is not always the case. *Amaryllis reticulata* grows grudgingly. *A. reticulata striatafolia* has been with me since November 1967 and has yet to grow a leaf. Occasionally the bulb glows greener. I suspect this branch of the family is among the most difficult, yet *A. blumenavia* grew, blossomed in June 1969, and set two fat pods when selfed. It prospers in a six inch pot of soggy soil in a shaded area of the greenhouse floor.

As a collector, I am a beginner. My first plants were a pot of seedlings found in a nursery in Glendale, California labeled "probable *Amaryllis striata fulgida*". I think some of them were *A. striata fulgida* but some of the bulbs were larger in leaf and bulb with large red-orange flowers. The smaller bulbs produced smaller orange flowers. The red-orange flower is handsome with irregular form, two flowers to the scape, and none set seed pods. Vigorous seedlings have been produced from pollen used on 'Zenith', and pink Howard & Smith clones, 'Chadwick', white, (Orange Queen x Scavias Orange), and 'Carousel'.

Mr. Richard Sudd sent seed of rare *Amaryllis* in the spring of 1969, among them, *A. calyptrata*. Several of these germinated in fifteen days and have prospered in the conditions I maintain in the greenhouse. The aulicas prosper in the warm, dry condition. I like the pots to dry out quickly after each hand watering.

I have found the newly received bulbs to be touchy in their requirements, but have received so many in these few years that I like to believe I have found a few answers to some of the problems. I use a commercial soil, Baccto, for everything. I suspect this material has more absorbent quality and less sand than most of you would recommend but it works for me under my conditions. Newly received bulbs spend a month or more in a cool, dry basement under fluorescent lights before finding their niche in the greenhouse. I never water new plants at all until I see evidence of growth and I am sure root growth has begun; then water must be applied sparingly. I have lost very few plants out of hundreds of small seedlings, difficult and rare species, and hybrids received.

*A. striata acuminata,* and *crocata, A. belladonna plena,* and some other *A. belladonna* specimens are exceedingly difficult for me. I hope to eventually meet their requirements more fully and with this goal in mind I keep careful records of growth patterns, periods of even slight rest, dormancy, and hopefully, blossom time. Bulbs newly received from South America will sometimes indicate a need for rest by reacting to watering by producing pale green growth that tends to topple over

of its own weight. These are dried off, withdrawn from the greenhouse, and placed in the basement until they show signs of wanting to grow again.

I make a file card record of each plant as I receive it. I also give it an aluminum tag with a stamped number. The metal stamps are available in most hardware stores, as are easy-to-cut aluminum sheets for tags.

I keep a log book of attempted pollinations. I record the pollinations, successful or not, on the file card of the pod parent. I think it is important to know which pollens have been accepted as well as which have been rejected.

I am grateful to Mr. Alek Korsakoff, Mr. Roger Fesmire, Mr. Doran, and Mr. Paul H. Williams, Jr. for rare pollen. Mr. Williams sent pollen of *A. elegans* "albostriata" which blossomed in June 1968. I kept some for myself and sent some on to Mrs. Flores Foster of Long Beach, California to use on her extensive collection. She has made some fine crosses involving her Dutch hybrids and species.

Mr. Williams also sent pollen of *A. angustifolia* which was used on several specie hybrids. From the picture he sent of it, it must be magnificent.

I have been able to keep pollen in the refrigerator with the aid of a desiccator capsule from my children's vitamin pill jar.

One very special *A. belladonna* x *A. striata* of recurring blossom habit, lovely rose-red color and miniature size has finally set seed that have germinated. On first blossoming no seeds were set, but each succeeding attempted pollination has produced a larger yield of seeds, and the most recent yield germinated. The plant was bought from Mrs. Korsakoff. The pollens used included fourteen different pollens, seven on each blossom, some from Mr. Doran, some from my own plants, and *A. angustifolia* from Mr. Williams. I do not approve of mixed pollen, but from this pod parent I am happy to have seedlings of any pollen parent.

A handsome, recurrent blooming "Senorita" also set seed for the first time after many previous attempts had failed. Mr. Orville Fay, the talented iris and hemerocallis breeder, once told me that sometimes near-sterile plants will begin to produce seed and will become increasingly productive of seed if enough attempts at pollinating are made. He was speaking of iris or hemerocallis at the time, but I feel his theory might be true of amaryllis.

The plants I received from Dr. Ruppel have prospered but have not bloomed. Seed of *A. immaculata* and *A. yanellosianum* germinated almost 100 per cent. They are vigorous growing but the *A. immaculata* has a short dormancy after first leaves come. *A. belladonna* "minor" seedlings, delicate and fragile in their first year, grow better during their second growing season. Dr. Ruppel's *A.* "brown" from Sao Leopold is a handsome and vigorous species. *A. flammigera* is seemingly easy in pot culture. *A.* "itatiaia" makes a beautiful plant with long,

narrow, pointed leaves, an easy pot plant. "A. Mrs. Sosa" *(A. viridiflora)* has glaucous, short beautiful green leaves, although the short leaf may not be typical growth. The *Amaryllis* he calls "orange Reitz" is an attractive miniature with unbelievably strong root growth and many offsets. It is reported to be a pale orange pink, two flowers on a tall scape. Dr. Ruppel set pods on this plant with pollen of *A. apertispatha* indicating maybe that it is a polyploid. The seed that germinated did not produce strong seedlings.

Dr. Elizabeth Naundorff, Box 3073, Quito, Ecuador has been a source of some interesting amaryllids this spring. Her primary interest is bromelliads but on her collecting trips she has been kind enough to watch for amaryllids for me. She has sent *Stenomesson aurantiacum,* a pink *Callipsyche,* and *Bomarea subspicata.* Several bulbs blossomed soon after receipt and look like the pictures of *Phaedranassa* in the 1969 Yearbook. The flower had a coral tube and apple green segments. She also sent a sample of what may prove to be an *Agapanthus* she found growing near a ranch garden.

A large bulb of *Paramongaia weberbauri* was acquired this year and is a prized possession. It has just become dormant in mid July.

In addition to the *Stenomesson aurantiacum,* I was fortunate to receive bulbs of *Stenomesson variegatum.* These have pretty foliage and did not seem harmed by their transfer to Illinois.

My *Cyrtanthus* collection continues to grow and they occasionally flower. Some pollinations have succeeded and seedlings are growing. Mr. Korsakoff's lovely hybrid, "Marusia" blossomed in March. The clone "William Henry" is the largest one to flower to date. It opened a burnt-orange, matured to orange, and aged to pink.

*Hieronymiella aurea* is resting leafless this summer. It appears to resent heat. It is reputed to be cold resistant, but I am afraid to plant it outdoors.

I am trying a few nerines in pots. They are dormant this summer except for two that wanted to grow leaves. *Nerine undulata* blossomed in Nov. 1968 soon after receipt. It refused pollen of *N. filamentosa* which is a similar size.

I am grateful to generous friends for seedlings of the following species hybrids: *A. aulica* x *forgeti, A. aulica* x *pardina, A. evansiae* x *yungacensis, A. forgeti* x *yungacensis, A. reginae* x *evansiae, A. reginae* x *starkii, A. starkii* x *evansiae, A. evansiae* x *A. pardina, A. pardina* x *ambigua, A. angustifolia* x *ambigua,* and *A. yungacensis* x *johnsonii.*

This hobby has been exciting, educational, and rewarding because of the charming people with whom I have corresponded, the constant surprise and pleasure of watching the combinations of germ plasm produce their rewards.

# EXPERIENCES WITH AMARYLLIDS

HUGH L. BUSH, *109 East 33rd Street, Kansas City, Missouri 64111*

A native South Carolinian accustomed to gardening in the sandy loam of the southeastern coastal region could have no possible idea of the problems to be encountered in gardening in the "Midway—USA" area, but I quickly found out when I moved to St. Louis in the fall of 1968 and then on to a permanent location in Kansas City, Missouri, in the early spring of 1969.

Heavy cold rains, temperatures ranging to –5°F., fierce winds and a heavy clayey-muck gumbo type soil, however, are not too discouraging to one as interested in gardening in general and growing hybrid *Amaryllis* and *Amaryllis species* as is this writer.

Large beds were spaded up and generous amounts of well rotted leaf mold, rotted cow manure by the truck load, and sand were worked in; these to receive the *Hemerocallis, Iris,* and *Lycoris,* which were readily available from various nurseries.

Not so, with *Amaryllis species,* however. They are not too easily obtained. Having had an intense interest in *Amaryllis species* and hybrids since many years ago when I pollinated a bloom on one of my mother's *Amaryllis belladonna* with pollen from a beautiful Dutch hybrid obtained from the late Cecil Houdyshel, and observing the results, I decided then and there at that early age that *Amaryllis* would always be one of the main interests of my life. I know of no other plant family that offers so much beauty and variety as that of the family *Amaryllidaceae.*

Having twice lost my entire *Amaryllis* collection due to one type of holocaust or another, plans were rapidly made to grow *Amaryllis* inside the house under fluorescent "Gro-Lux" lamps as I have had previous remarkable success with this method. "Distress signals" were sent out to many of my friend *Amaryllidarians* and the response was overwhelming.

As this is written in early August, 1969, approximately sixty pots of small bulbs of *Amaryllis* species and hybrids of them, twenty-five pots full of *Amaryllis* seedlings growing from seed planted earlier, seedlings of *Worsleya rayneri,* various *Cyrtanthus* hybrids, and *Eucharis* are growing nicely under fluorescent lights. In addition, several different varieties and species of *Agapanthus, Crinums, Crinodonna, Hymenocallis, Alliums,* and *Haemanthus* are growing in pots on the patio where they receive the morning sun, and eight large *Clivias* are growing in the filtered light of a large maple tree. Twenty or more *Habranthus* and *Zephyranthes* are growing in four-inch pots in full sun.

As in the past, I shall continue to grow the *Amaryllidaceae* and send pollen, seed and offsets as available to friends in all parts of the world, for I have found my previous efforts in this respect amply rewarded.

And my digging and spading efforts here have been amply rewarded too, as I have enjoyed many fine blooms of the *Hemerocallis* and *Iris.*

After 10.39 inches of rainfall during the month of July, I am now enjoying the beautiful blooms of *Lycoris squamigera* (see Fig. 31) which have sprung up overnight as if by magic.

Fig. 31. *Lycoris squamigera* as grown by Hugh L. Bush in Kansas City, Missouri. Photo by Hugh L. Bush.

## AMARYLLIS CULTURE IN NORTHERN ILLINOIS

William R. Adee,
*916 Sunset Ave., Waukegan, Illinois 60085*

In the summer of 1968 I bought an aluminum, glass-to-ground, twelve foot by four foot, lean-to greenhouse. I erected it on the east side of an attached garage where it receives morning and early afternoon sun and is protected on its three glass sides by a six foot patio fence. The floor is of sand with cement patio blocks for the aisle. The floor of the bench is covered with one-half inch hardware cloth that permits air circulation, moisture to rise from the dampened sand floor, and sunlight to filter through the pots to the seedlings and *Clivia* on the floor under the benches.

Heat is provided by a thermostatically controlled, natural gas

heater that draws its air supply from outside the greenhouse, heats it, and redistributes it by fan. Too much heat is also controlled by a thermostat that activates a cooling fan removing stale air and replacing it with fresh. The cooling fan does dry out pots that have been too generously watered so it serves a double purpose.

I began to feel the need for a greenhouse when my plant collection outgrew the fluorescent light set-up in the basement. *Amaryllis* grow beautiful leaves under fluorescent lights and seem to enjoy the unvarying temperature and controlled moisture and feeding that can be given with this culture. I still use it for newly received, newly transplanted, sickly, and seedling plants. When new strong growth begins they go into the greenhouse.

Summer heat in the greenhouse is too much, even with fans and shading, for delicate, newly transplanted, and seedling bulbs. I lost several fine, newly acquired bulbs before learning this lesson. Five months later some of these damaged plants have still not recovered.

Seeds, however, start germination beautifully in the strong heat of a summer greenhouse, but they should be moved to cooler quarters to be grown on.

I have electricity in the greenhouse but have to carry water from a short distance. I keep a mixture of nitrogen, phosphorus, and potash in water in a squeeze type detergent bottle, adding a bit of this strong solution to each batch of water. Sudbury sells these elements in separate container which permits me to make my own combination. Trace elements are added in very small quantities about twice a year.

I use four inch clay pots for most bulbs and a commercial potting soil. The holes in the pots are easily enlarged with a chisel and hammer, covered with chips of broken pot, and filled one and one-half inch with poultry oyster chips.

I use a systemic poison on the plants every six or seven weeks, but wonder if the dry fertilizer with which it is mixed isn't too strong. Time will tell.

## GOALS

In hybridizing with species amaryllis I am looking for orchid, double, and trumpet forms and new colors. Leaf growth seems to be too large in some miniatures. I am trying to produce some smaller ones about the size of "Mrs. Garfield".

Northern Illinois gardeners dig *Sprekelia* each fall and replant in open ground in the spring with immediate blossoms. I have read that *Amaryllis elegans* types can be handled in this manner and want to experiment along these lines. With this in mind I have imported from Argentina two *A. elegans* types, but have been unable to find *A. elegans ambigua* or *A. elegans immaculata.*

## OBTAINING AMARYLLIS SPECIES

*Amaryllis* hobbyists have been more than generous in sharing offsets, pollen, seedlings and seeds. Possible sources of plant material are

people who write articles such as this, people who register *Amaryllis, Amaryllis* and other tropical plant collectors in South America. Always include self addressed, stamped envelopes when writing, and offer to pay postage costs if answers are expected.

My collection includes *A. agliae, A. argilagae,* several *A. aulica* types, *A. belladonna plena, A. b. reflexa, A. b. minor, A. b. major, A. blumenavia,* a brown species from Sao Leopold, *A. Correiensis, A. cybister, A. elegans albostriata, A. e. viridiflora, A.* "equestris" pleno, *A. espiritensis, A. evansiae, A. flammigera, itatiaia, A. moreliana,* "orange Reitz" (a dwarf omphalissa from Brazil), *A. pardina, A. psittacina, A.* "red Cochuna", *A. reginae, A. reticulata* var. *reticulata,* r. *striatafolia, A.* a dwarf from Sierra Chapada, Brazil, *A.* starkii, several forms of *A. striata, A. vittata tweediana,* and *A.* "yanellosianum." I started the collection in December 1967.

### OTHER AMARYLLIDS

My collection also includes *Cyrtanthus, Zephyranthes, Hymenocallis, Urceolina, Nerine,* and *Clivia.* Newly received are seeds of *Clivia* "Red Jasper" and an amaryllid, "yellow, many flowered, fragrant, and cold resistant," both from Argentina. The *Clivia* has been described in glowing terms by Dr. Ruppel who says it is from two undistinguished parents. Seeds of *Alstroemeria* x *orpetiae* from Dr. Traub have germinated and are growing nicely.

More northerners should raise *Clivia.* It is such an undemanding plant and blossoms in December. Constant moisture is easily supplied by plastic pots and very little light is required.

### SUMMER FLOWERING AMARYLLIS

Four *Amaryllis* blossomed in the summer of 1968. Among them was a *haywardii* x *striata* hybrid that is very vigorous, has a beautiful pink flower, recurrent flowering habit and so far has been quite sterile; but it did set one pod with pollen of white Dutch x calyptrata sent to me by a friend in California. There were only two seeds in the pod. They have been planted and I am waiting and hoping.

## VEGETATIVE PROPAGATION OF HYMENOCALLIS LONGIPETALA

Carlos G. Ruppel, *Box 370, Mendoza, Argentina*

Seven or eight years ago I saw an advertisement about an "improved Peruvian Lily", named Elisena Longipetala, now, *Hymenocallis longipetala.* After a while I had at home a strong bulb of it purchased to an American dealer.

It bloomed at home in early summer. The beauty and perfume of the flower surprised everybody. It really was a better form than *Ismene* spp., I had successfully grown in my garden, for years.

After several years culture, I am sure *H. longipetala* is a reliable

garden plant for the border, deciduous in my area, of easy culture, needs hybrid Amaryllis-like treatment. But it is a slow increaser in Mendoza. After many years, I have a strong clump of 8 bulbs.

So, on September 21, 1963 (beginning of spring) I decided to multiply it. I took *one* strong bulb and cut it into pieces. After disinfecting with a weak solution of "Zineb" and treatment with a rooting hormone I placed cuttings into pure sand, one-inch deep in four 6″ pots, covered with polyethylene bag and took them to a semi-shady spot.

Cuttings were distributed as follows:

| | | |
|---|---|---|
| Pot No. 1 | 8 | strong rooted cuttings. |
| Pot No. 2 | 18 | thick central rootless cuttings. |
| Pot No. 3 | 13 | thinner central cuttings. |
| Pot No. 4 | 14 | smaller central cuttings. |
| TOTAL | 53 | cuttings. |

At the beginning of summer several sprouts were showing and from then on, new offsets have been produced.

Pot No. 1, has been left to dry off and 10 bulbs are resting. Pots No. 2, 3, and 4 are watered to date, in order to compare results between dormant and vegetating bulbs. All three pots have sturdy vegetating plants.

Results on July 24th, '64 that is at the beginning of winter:

| | | |
|---|---|---|
| Pot No. 1 contains 10 Plants | 125,00% | Success. |
| Pot No. 2 contains 22 Plants | 122,22% | Success. |
| Pot No. 3 contains 13 Plants | 100,00% | Success. |
| Pot No. 4 contains 11 Plants | 78,57% | Success. |

General results: 53 cuttings, have produced 56 healthy plants first season, that is 105,66% success, which can be considered quite satisfactory.

## THE "AMBOINA CHALICE LILY," EURYCLES AMBOINENSIS

Alek Korsakoff, *7634 Oriole Street, Jacksonville, Florida 32208*

Well, here is a plant in the Amaryllis Family resembling no other amaryllid so far as I have seen, excepting its kin, *Eurycles cunninghamii*, a hardier relative (see Fig. 32).

*Eurycles amboinensis* (L.) Lindl. is commonly known as "Brisbane Lily" or "Amboina Chalice Lily". I obtained it in March 1959 from an elderly lady in Miami under the name, "Nassau Lily", who said that she had received it from her daughter living in the Bahamas.

On one of my walks, I spied this unusual plant in the lady's yard and knew at once I had to have it at any cost. Before I realized it,

I was ringing the door bell. . . . After I had promised to bring a dozen "Rain Lily" bulbs, especially the yellow ones, I had in my possession a plant that even now, after 10 years of growing it, I would not part with; even if it was the only plant I could keep.

At home, my newly acquired baby was potted and was watched like no other plant before or since. Very soon it pushed out another leaf

Fig. 32. Upper left, *Eurycles amboinensis,* in a 5-inch pot, top view. Upper right, the same plant, side view. Lower left, *Eurycles cunninghamii,* in 7-inch pot. Lower right, Ripening fruit of *E. cunninghamii.* Photos by Alek Korsaoff, 7-21-69.

and I knew it was all right. With the coming of autumn, it went to sleep.

None of Floragoof friends knew the plant; none of the nurserymen contacted could tell what it was and how to care for it. I simply had to watch and improvise. Then, the 1961 PLANT LIFE came, and there was my darling—*Eurycles amboinensis*—foliage and flowers. (See PLANT LIFE 17: 38—40. 1961). In June of 1962 my plant bloomed.

While in Miami, it was grown in the half shade slathouse and developed the best in 10″ pots. I still can visualize these lovely vigorous clumps. Here in the greenhouse, I keep it as single bulb specimens in 5″ and 6″ pots and probably enjoy it more in detail.

During the 10 years, I found, or think I did, that it grows best in a rich gritty mixture that drains well. It is fed once in a while during the active growth phase with anything that is handy and in lower concentrations than recommended.

In Miami some winters it stayed evergreen; some winters it was dormant for two to three months. Here it gradually loses foliage late in December or January and rests until early May, about the same as my *Haemanthus multiflorus* does. When the last leaf starts changing color, I stop watering and expose about 2/3 of the bulb so that, when it gets monthly watering during dormancy, no water gets in the deep depression in the top of the bulb—the last drying leaf leaves a hole in the top, which I fill with a little "Fermate."

With the coming of spring, I hover over the pots of my beloved "Amboina Chalice Lilies", watching for the sign of the green in the dark hole in the top of the bulb. As soon as I see the tip of the new leaf, I give the soil in the pot a good soaking and fill the pot with new soil within about an inch of the top. Every two years, I remove the offsets, if any, and repot.

The temperature in winter on the greenhouse benches so far never dropped below 52° F. In summer, the temperature in the greenhouse rises to 110—112° F. on the hottest days of 98—100° outside.

If I had to choose, and I could keep only one plant, *Eurycles amboinensis*, the "Amboina Chalice Lily" would be it.

## EURYCLES AMBOINENSIS

Hugh L. Bush, *109 East 33rd Street, Kansas City, Missouri 46111*

For many years the beautiful *Eurycles amboinensis* (L.) Lindl., the "Amboina Chalice Lily," was nearly unobtainable. It was recognized by Linnaeus as *Pancratium amboinense* L. (1753). In 1965 the writer entered into correspondence with a Miss Emory, a very gracious lady of the Saba Islands, who offered to share bulbs of her *Amaryllis* with those who bought of her beautiful needlework. And indeed, it is beautiful.

This information was passed along to my *Amaryllis* friend, Mrs.

Flores Foster of Long Beach, California, whom I had earlier interested in *Amaryllis* species. In the purchasing of Miss Emory's beautiful needlework and subsequent receipt of bulbs, Mrs. Foster received several bulbs which Miss Emory had labeled "White Lily". Two of the bulbs were sent to me and they were determined to be *Eurycles*. The foliage, when examined, led me to believe this was the long last *Eurycles amboinensis* (L.) Lindl., and later the blooms facilitated definite determination. (See also PLANT LIFE 17: 38-40. 1961.)

Bulbs and seed of this beautiful *Amaryllid* have been distributed and now at least one *Amaryllis* enthusiast offers *Eurycles amboinensis* (L.) Lindl. on a commercial basis.

## DAYLILY REPORT—1969

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

The 1969 season was marked by unfavorable weather, temperatures, or moisture in many parts of the South, while the Midwest had fine rains, with resultant good bloom. The overcast weather of June in the writer's area was more prolonged than usual, but in general temperatures were somewhat more favorable for both performance and for seed set.

The really remarkable development this year was the progress in the breeding of lavenders and purples in a number of important gardens. One enthusiastic breeder of tetraploids has reported that in Georgia, Frank Child's lavender diploid seedlings in 1969 far outshone his block of some 2000 tetraploid seedlings blooming for the first time. In Chicago James E. Marsh numbered almost forty new tetraploid lavender and purple seedlings, and Orville W. Fay flowered some magnificent new diploid seedlings derived from 'Lavender Parade' and 'Beautiful Lady' lines. In my own California garden some fine lavenders and purples continue to appear in crosses of 'Lavender Parade' (Fay) with 'Blue Jay' and 'Lavender Flight' (Spalding), and among treated plants used in my breeding work in 1969 were 'Little Wart', 'Lavender Flight', and 'Wannetta' (Spalding); 'Lavender Parade' (Fay); "Primavera' (Wynne); and D65-78 ('Lavender Parade' x 'Blue Jay') and 64-37 ('Breaking Dawn' x 'Lavender Parade'), both from Steve Moldovan, and both of outstandingly clear lavender-purple color.

Mr. Marsh expects to introduce his lavender T69-25, probably the most admired of his many new tetraploid seedlings in this color. He also flowered a particularly good new red tetraploid, T69-50, which will be released. Mr. Marsh's 'Prairie Moonlight' won the President's Cup at the American Hemerocallis Society Convention for 1969 because of its superb clump effect; this variety has been most outstanding in my California garden for the last two seasons.

Hubert L. Fischer had many new seedlings, including tetraploids, in his Hinsdale garden. Two outstanding new things were his light red

'Red Spinel', and darker wine red 'Oriental Ruby', both diploids not yet introduced.

In the Nathan Rudolph garden in Aurora many new yellow and pink tetraploid seedlings were flowered this year. Visitors found his tetraploid 'Yellow Champagne' and diploid 'Coral Lace' very good and most attractive.

In the Fay garden in Northbrook, Ill., in addition to the new diploids already mentioned, there were many fine new yellow, pink, and lavender tetraploids. Visitors especially liked the pink 'Twilight Sky' and 'Shell Pink', and melon 'Dark Copper' and 'Lynn Markham'.

Bro. Charles Reckamp had another amazing year with his hundreds of fine tetraploid melon seedlings at Mission Gardens. His beautifully ruffled 'Magic Wand', and 'Samoa' were the favorites of garden visitors.

One correspondent reports that the 1969 A. H. S. Convention in Austin and Albert Lea, Minn., had two very outstanding new varieties, 'Alpine Air' and 'Mildred Krueger', both from Minks Gardens.

Dr. Peck this year flowered a remarkable new line of yellows out of two induced seedlings, crossed with her 'Bonnie John Seton'. These yellows begin opening about noon and remain in good condition until almost noon of the second day thereafter. Her most outstanding new red this year was seedling T2-71-69 (T2-1-66 x 'Bonnie John Seton'), representing a group of 1967 crosses of dark red x wide-petaled yellows. This very large red seedling seemed to have every good quality, including being sunproof. Dr. Peck also bloomed a most interesting new line of rose-red pinks. Her seedling T2-125-69 proved to be an exceptionally good breeder and is one of her best new lavenders. Seedling T2-141-69 was "a wide-petaled cream with rose brushing and very crimped deep pie crust gold edging"—and completely sunfast.

Some of the new varieties evaluated by correspondents included 'Catherine Woodberry' (Childs), 'Silver Shadows' (Munson), both superlative lavenders; 'Ice Carnival' (Childs), considered the best of the whites by some; and the late David Hall's apricot 'My Kind', pink 'Family Party', and especially the magnificent pink 'Master Touch', all of which have been reported most favorably from over the country.

In my own garden this year the most beautiful of the new diploids grown were 'Fabula' (Wild-Hardy), a rounded creamy pink, 'Orient' (Wynne), bright salmon peach with dark eye, and '23d Psalm' (MacMillan), a ruffled flat pink with darker pink eyezone. Two very satisfactory new tetraploids were 'Seed Setter' (Hardy), and 'Adela' (Griesbach), both melons. 'Northbrook Star' (Fay) was a spectacular big light yellow, and 'California Butterfly' (Traub) was a massive yellow of great beauty. Very fine performances were given by 'Mary Todd' (Fay), one of the best yellows available; velvety red 'Sir Patrick Spens' (Peck); pinks 'Bonnie Barbara Allen', 'Fair Annet', and 'Queen Eleanor' (Peck). Treated plants of great promise as parents included 'Vivacious' (Munson), a bright, glowing rose; 'Toyland' (Bro. Charles Reckamp), apricot melon miniature; 'Little Rainbow' (Bro. Charles), a lovely small melon; 'Marguerite Lloyd' (Lloyd), large eyed yellow;

'William Munson' (MacMillan), huge melon; 'Louise Russell' (Fay), superbly branched rose; 'Fashion Model' (Lester), one of the finest melons; 'Cloth of Gold' (Wynne), gold with extraordinary substance and beautiful ruffling; and 'Annie Welch' (Claar), made far more beautiful by the treatment with colchicine.

It was a good year for all of us daylily growers, in spite of weather and other hindrances.

## AMARYLLIS SEASON, 1969

ROBERT D. GOEDERT, *P. O. Box 6534, Jacksonville, Florida 32205*

Over a number of years I have been accumulating a large collection of *Amaryllis* hybrids and species. I have dreamed of retiring and having that leisure time I desired to work with these plants. I felt I could develop a strain of *Amaryllis* much easier to cultivate both as pot plants and as garden subjects here in the south. I am quite sure these improvements would greatly enhance the commercial value of this spectacular flowering plant.

In preparing for my retirement I developed an *Amaryllis* import business. I felt this would supply that little extra cash I would need after I retired to pursue my interest in *Amaryllis* as well as other things I had longed to do.

Since retiring last year neither the extra time nor the extra cash has developed. As the business grew so did its problems and the more time it consumed the less profit it made. I found I was spending untold hours at chores and details that deprived me of the enjoyment I had once received from my hobby when the business was only a small part of it. I have found, as others before me, that the amaryllis bulb business has inherent difficulties built into it that doom one to failure. The larger that business gets the more risk one has to take. Eventually the risks become so great that the probability of failure is certain.

The Amaryllis Import business is very fascinating and has been an interesting experience. I am quite sure the problems in it fascinated me as much as anything. I still do not want to admit I could not lick these problems; however no one whom I know of has been successful in building an exclusive amaryllis business. The problems are enormous and the product is not sufficiently reliable to promote commercial confidence in the product. This results in complaints from customers which is a mental and physical strain as well as a financial one in trying to satisfy them. One can not do all things and eventually what started out as fun turns into a nightmare.

I am now a littler older than when I started (but then not too much older), a little poorer (but not broke), exhausted but I hope somewhat wiser. I have learned among other things that one should not try to turn a hobby into a business for if you do it will become a burden and any mention of the subject will mean work rather than

pleasure. This is about the state I find myself in today.

I do not plan to discard the business but I do plan to reduce it and return it to the hobby it started out to be. I have found much enjoyment working with my amaryllis and meeting many real and most interesting people and friends. I feel sure my interest in amaryllis will greatly increase again as my chores are reduced. So at this time, still with some difficulty, I turn to set down some impressions of the past season and pass on some information that may be of interest to amaryllis fanciers.

The past two winters in Florida have been mild. Outdoor planting of amaryllis as a result of this have flowered much better than in previous seasons. Even with the better flowering season interest in amaryllis is not as great as it has been in past seasons. The demand for new imported bulbs slowed down and many were unsold at the end of the season. Most customers indicated that they experienced cultural difficulties. Some say that newly imported bulbs were in poor condition and failed to respond. Waterfront strikes during the past several years have made importing difficulties and delays have occurred in delivery. This has no doubt had an adverse effect on the performance of newly imported bulbs but this is not the only problem nor the greatest problem. There is an undercurrent that persists in most complaints. This is that many fans experience cultural failure. They can not carry over their bulbs to flower year after year. Two things are needed badly; More cultural information and more suitable varieties for potting as well as border culture. I doubt that much progress is being made in this direction. Most Dutch varieties are greenhouse grown where requirements in cultivation can be met more exactly than can be provided by fans. The Dutch amaryllis are grown more for winter forcing and are not particularly adaptable to the average pot or border conditions provided by the fancier. There is not enough commercial nor private interest in amaryllis in this country to economically support research in the culture of the plant. This is a pity for without such research great improvements in cultural practice or the development of more vigorous hybrids will be slow. Fanciers have to accept this. He must accept the fact that many varieties he buys will only give a good showing the first season.

The fan himself is partly responsible for this condition as most have sought improvement in size and color of flower rather than vigor in plants. Before much improvement is made the fancier will have to demand vigor in the plant possibly at some sacrifice in flower size and color at least to start with. The fan can help himself by growing seedlings of crosses on plants that seem most adaptable to his particular area. Like English gardeners do, hobbyists should develop their own strains of amaryllis from those that do best in their area.

For several years I have tried to pass on my impressions of the past flowering season and make comments on varieties that might help fans in choosing new varieties. One must understand in doing so I can only comment on the varieties as I have seen them in my area and

impressions I receive from friends who write me regarding the season.

For the past few years I have quit trying to grow every variety introduced. Many of the new varieties of certain growers I have not seen and can not comment on them. Generally I have grown most new varieties of the Hadeco African and Van Meeuwen Dutch Strain and can provide you particular comments on these that may be of value to you. In my comments one must keep this in mind and if your favorite varieties are not mentioned the reason may be that I am not familiar enough with it to comment on it.

I have had numerous requests to comment on the differences in the several strains of amaryllis grown in Holland. This is rather a difficult task for there are surely exceptions to anything I say as many varieties will do better for you than for me. We all have our personal likes but being of a daring nature I will try.

There are three main Dutch firms; Ludwig & Co., W. S. Warmenhoven and Van Meeuwen & Co., who grow amaryllis to offer for sale in the United States. A fourth firm from South Africa, The Harry Deleeuw Co., also sells fine amaryllis in the United States as the Hadeco African [grown] Strain.

Ludwig & Co. specializes in named clones and all his varieties are registered by name and color to the show table trade. They have the largest listing of varieties and offer the greatest number of different colors and shades. Once a year they issue a beautifully illustrated color catalog and sell both to the wholesale and retail trade. Their varieties, 'Apple Blossom', 'White Giant' and 'Ludwig's Dazzler' along with others, have been some of the few varieties that have become standard commercial varieties.

Ludwig & Co. is possibly best known for their pink varieties as they are the only firm who offers amaryllis in the lighter solid pink color. Their varieties, 'Dutch Belle', 'Flora Queen' and 'Eastern Dream', are outstanding in this color. However I have some difficulty in growing them as I feel they get their pink color from *Amaryllis reginae* which I also find hard to propogate. 'Flora Queen' does best for me and it appears to have genes from the species *A. psittacina* in it. *A. psittacina* grows better here and so does 'Flora Queen' (than other Ludwig's pinks). Their older variety, 'Pink Favorite,' is a most popular darker pink or rose pink. It is one of the giants in amaryllis. I have seen blooms twelve (12) inches in diameter on this variety.

Their more recent introduction of the picotee types have proven extremely popular and are exceptionally beautiful. This type is white edged bright red and often spotted or flushed red. They are unusually beautiful, easy to force in flower but somewhat difficult to cultivate. They do flower from very small size bulbs however and normally a 20/22 cm size bulb will make a flower. Some new varieties make larger bulbs but large bulbs are rare in this type.

Ludwig & Co., has developed a number of fine whites. Among them are 'White Giant', 'Marie Goretti' and 'Ludwig's Dazzler'. 'Salmon Bouquet' and 'Beautiful Lady' are well known. 'Trixie' is a favorite

rose variety. 'Margaret Rose' is a favorite in shrimp pink. 'Love's Desire' is a favorite pink and white. They have many other varieties in different color shades.

The W. S. Warmenhoven firm specializes in unnamed amaryllis clones and are mostly sold to the wholesaler for the garden store trade. They also list a number of named varieties. Many of these varieties have been on the market for years and most of them have been of proven merit as they have stood the test of time. However like in anything else the newer ones are the most exciting. This firm also sells quite a number of amaryllis blooms to the florist trade in Europe.

I have found the W. S. Warmenhoven strain to be the largest flowering strain under ordinary culture. They are the easiest strain, as a whole, for me to grow and hold over to flower year after year. They do not make exceptionally large bulbs or W. S. Warmenhoven does not choose to force them to large sizes. They normally flower successfully from a 26 cm size. I do believe this strain has more of the Leopolii species in it which accounts for their easier growing habit especially in my area. I have found other varieties that I am quite sure have more of the Leopolii species in them grow best here. 'Moreno' I find to be one of the easiest varieties to flower year after year. It is a dark wine rose red and has the characteristic white tip on the petal which I feel is a Leopolii characteristic. I am sure some will disagree with me on this. I feel 'Moreno' gets its color from Leopolii as this species in my opinion is where most of the purple in amaryllis originates.

The variety 'Golden Triumphator' is the most popular variety of W. S. Warmenhoven's. It is a beautiful blend of golden orange and white, is relatively large and vigorous. I find it imparts its vigor to its seedlings and in this respect makes a fine seed parent. 'Floriade' is another blended type, white striped and flushed pink. It is the largest I know of in this color but not as refined in color as other pink and whites. It is not as vigorous for me as 'Golden Triumphator' but a reasonably good variety. Both varieties are very popular. 'Little Diamond' is in my opinion, (if you have the true variety) the most beautiful pink. It is not a solid pink as Ludwig's pinks but more of a blend of pink and white. It is perfectly round with very good size flowers on a medium size spike with perfect proportions in every way. It would be on any list of my five favorite amaryllis. It is a real picture and often flowers two spikes at the same time, each with four (4) blossoms.

Warmenhoven's 'Orange Wonder' has been considered one of the best orange varieties for a number of years. It is a real wonder for most orange clones degenerate in a few years to scarlet. This one holds its color and is used extensively in breeding as a result of this quality. Their 'Queen of the Whites' I find is a good seed parent and makes strong seedlings but often it is a poor grower itself. It is loose and flaring but imparts good characteristics to its seedlings.

The Van Meeuwen firm specializes in early flowering prepared bulbs for Christmas flowering and their varieties are particularly adaptable

to forcing. They generally sell to florist and to retail garden stores. Their sales are strictly wholesale. Since many of their bulbs are for counter sales and mostly for forcing for Christmas flowers they have developed varieties that make large bulbs that hold their roots well as this enhances them for counter sales and for forcing. They have been very successful in delivering their bulbs in good condition. Their varieties have been mostly red and white, the colors wanted most for Christmas time. However recently they have expanded their color range and improved their varieties. Their newer varieties are in soft salmon, apricot, shrimp pink, pink and pink & white as well as red shades and white. Many of their new varieties have proven excellent exhibition types as they have dominated many shows in Holland.

The Van Meeuwen company has introduced practically a completely new list of varieties in the past few seasons. I have flowered all of these and have been impressed with many of them.

The leading Van Meeuwen red is 'Belinda'. It is a medium dark red of extra fine quality. It holds its roots well and is very easy to force in flower early. It makes a large well rounded and flat bloom on a medium size spike. It is one of the very best reds available today. Whether this will be true next year or in the future time can only tell. 'Athos' and 'Baruta' are two similar new red varieties. 'Athos' is possibly somewhat larger and more massive as the petals are definitely wider. 'Baruta' is darker. They both appear to be worthy varieties. They, however are not quite as early flowering as 'Belinda'.

In the brighter reds 'Carmen' and 'Volcanus' are exceptional in color having an irridescent glow. One is a brilliant carmine and the other a fiery glowing orange red. These two while not as large as most reds make up for their size by their brilliance.

A real giant in amaryllis was introduced by the Van Meeuwen company last season. This was 'Valaspar'. It is massive in every respect; the plant, the spike and the flower. It is a huge variety and a very beautiful one of orange red color. One year's performance was spectacular. Let's hope it continues this performance. A similar clone, 'Cicero', performed quite well also. Both of these varieties appear to be improvements in this color amaryllis. 'Samson' also is a new large flowering amaryllis. It is a wine or burgandy red. I would describe it as in the wine red class that would have 'Red Master' as a rival. It is large like 'Red Master' but more cup shaped. I feel it has better color and makes four flowers per spike while 'Red Master' generally makes two to three. Also one can not compare size of amaryllis as a spike flowering only two blooms will generally be larger. The older wine red variety, 'Mars', is liked by many. It has a crepe paper textured petal that is delicately beautiful. It however sunburns easily and has to be protected.

In the orange colored varieties Van Meeuwen's 'Adinda' has created a great deal of favorable comment especially down New Orleans way. It is a soft light orange self color and extremely flat and wide open. 'Fire Flame' is another orange that has caused quite a lot of comment.

It is more of a fiery orange. It has very intense color.

In orange and salmon blend 'Loveliness' is very similar to Ludwig's 'Margaret Rose' and Warmenhoven's 'Sweet Seventeen' and is exceptionally free flowering. Fans will disagree about which is best as all are good varieties. The Van Meeuwen Company introduced 'Glorious Victory' last season. It is a golden orange and white blend, practically an exact copy of 'Golden Triumphator' and appears to be much like that variety. The real eye catcher is 'La Paloma', a new apricot and white blend, much more refined and softer colored than 'Loveliness', 'Margaret Rose' or 'Sweet Seventeen'. It is a beautiful thing and apparently a very good variety as everyone I know had wonderful success forcing it last season. It is I believe an outstanding introduction.

The Van Meeuwen company has offered two pink and white varieties consistently for several seasons. They are both similar to Ludwig's variety 'Love's Desire'. 'Rose Marie' is extremely early and may be somewhat larger than 'Rose Elegance' which flowers just a little later. 'Rose Marie' is best when purchased and flowered immediately. 'Rose Elegance' appears to stay dormant in storage much earlier and makes a better late flowering variety.

'White Christmas' has been Van Meeuwen's leading white for several years. It is an extremely free flowering white particularly for forcing for Christmas and will flower from rather small size bulbs.

The South African firm of Harry Deeleeuw & Co. which raises the African grown Hadeco strain offers named and unnamed clones for early forcing. These bulbs are raised in open fields from offsets and many fanciers in the south prefer them to the Dutch strains as they feel they are more vigorous for outdoor planting. They also increase by offsets more rapidly than most Dutch varieties. Being raised in the southern hemisphere newly imported bulbs flower the first year in the fall and are used for early flowers as they, being harvested in June and held under cold storage, will generally flower in five (5) weeks when potted up. The Hadeco African grown amaryllis usually arrive in October and are held under refrigeration until sold to the retail or florist trade.

The Hadeco African grown strain amaryllis were developed from some amaryllis that had *naturalized* in South Africa. They were mostly Dutch strain bulbs. The original naturalized varieties were orange red and medium in size. Their first introductions show this influence as most are of the orange red color and a few had smaller medium size flowers as well as bulbs. 'Tangerine' is possibly the best known early introduction. It makes clones not much larger than 24 cm but will throw as many as three spikes having four flowers five to six inches in diameter. It is a nice orange color and makes a wonderful pot plant. It also multiplies rapidly.

Another early introduction was Clone 65, an exceptionally beautiful scarlet of good size. Bulbs of this variety tend to be rather small and a 26 cm is large. It is exceptionally free flowering. It is now registered under the name, 'Africana'.

'Orangedale' was another early introduction in a beautiful light orange color. It has now been discontinued due to propagation difficulties. I, however, have several bulbs of this variety and everyone I know who has them prize them as it appears to like the south.

Possibly the most sensational of the early introductions, still an orange tone, was 'El Toro'. This is a beautiful golden orange and I am proud to have named it. It is still offered by the company and has proven to be a fine variety.

Hadeco Clone 71 originally offered for sale under the name, 'Satsuma', was extremely popular last season. It has officially been named 'Swahilio'. This is a beautiful orange red or scarlet.

More recent introductions have been some very beautiful rose red varieties. They have been well received by the public and are possibly among the very best available in this color today. 'Coral Seas', 'Red Sails' and 'Watusi' are fine varieties in this color. 'Calabash' is a fine variety in old rose and one that is different from other varieties. By accident I listed this variety as 'Tabasco' last season. It, however, is registered 'Calabash' and should go by this name. Hadeco Clone 242, a beautiful red and white that has been popular for several years has now been officially registered under the name of 'Masai'. The clone introduced as 'Rosetta', an extra large salmon rose has been withdrawn and will be later renamed when officially introduced. It is one to look forward to as it is the largest flower I have seen of the Hadeco strain.

There has been some confusion concerning the names of the Hadeco Strain amaryllis I can report that all clones they considered of sufficient quality and quantity have been officially named and you should be able to buy the same clone anywhere under the proper name. They have many fine clones coming on and will be introducing others from time to time. I was instrumental in naming several of the Hadeco African grown amaryllis, however in the future most varieties will be given a South African name as the manager of the company prefers these names. I am quite sure most of you will recognize the varieties I named such as 'Coral Seas'.

This season I grew a number of varieties from growers other than those mentioned. Two clones which impressed me were 'Pink Attraction' and 'Couliere Cardinal' from S. Warmenhoven. 'Pink Attraction' is not pink but salmon as we would call it. It is a most beautiful soft blend of salmon and white, a large flower but of delicate texture. It is very finely striated. 'Couliere Cardinal' is a deep dark red, very large, free flowering variety that appears to have great merit.

Last season I flowered several hundred of the hybrids from Mexico that were developed by the late Mr. Harrison. There were quite a few large flowering types and some had exceptionally fine and different color tones. Also the small flowering sorts had salmon, salmon pink, and lavender tones.

This season I purchased several and offered them in lots of ten (10) so customers might receive a representative sample. Sales were extremely poor and 10 was obviously not a representative sample for if

all did not write me of their disappointment in them surely almost all did. People are just not interested in smaller flowering types and surely expect perfection even in seedlings. All I can do is apologize and tell about several thousand I had left to plant myself.

The Harrison hybrids received this season I believe contain many less large flowering sorts than those I got last season and generally the colors of all including the small kinds were not as good. I did pick out several large flowering sorts which I thought had special merit. These were mostly in rose shades. There were a number of the small sorts that interested me, particularly the netted and striped ones in pink and lavender shades. Generally I consider the Harrison hybrids to be an exceptionally fine strain. However Mr. Harrison made his crosses for his own pleasure and unfortunately the public does not appreciate small flowering types and expect any strain to be selected before they will pay more for them than for the most common varieties such as those sold in garden stores as Meade Strain, an American hybrid of from good to very poor quality. Very few people are interested in the small or medium size hybrids. Yet these in my opinion are the sorts that could be developed into excellent pot as well as border varieties. Their size of flower normally does not deplete the bulb's strength and they could surely be developed to flower year after year successfully whereas the larger flowering sorts seldom will give repeat performance as it takes too much out of the bulb in flowering.

Each season I receive many letters regarding the culture of amaryllis. Invariably they say that after they flower newly imported bulbs, they just degenerate and shrink to nothing in a few years. Most fans would like a fool proof method of handling their amaryllis whereby any bulb they purchased would flower year after year with little or no effort. . . . If culture were as easy as this everybody would be growing amaryllis and they would be selling for 50c each rather than $5.00.

The public wants and demands bulbs that make spectacular flowers when forced and this is what the Dutch growers provide. In order to do this they breed for varieties that have good flowers that will make a prime bulb in the shortest while possible and when potted up will normally give an outstanding flower. The size of the flower you get from a newly imported Dutch bulb is often as much due to the special care it has had rather than the variety. Also an amaryllis usually makes its best flower ever when it reaches maturity. Most varieties grow well for a few years and then become difficult to grow. The Dutch growers also experience this so why shouldn't you. They always have new varieties coming on to replace varieties that become unreliable. This is a never ending process with them. This is why some growers would rather sell clones by color as they do not really think naming them is realistic.

The amaryllis fancier can not expect a great number of varieties to be reliable enough to grow over year after year. They should accept this fact that many new clones will disappear in a few years. And even with those varieties that will grow over successfully most fans do not

have the facilities to provide the exacting requirements as the Dutch growers can under their greenhouse culture. However if one understands the basic cultural requirements and will give his plants the attention required he will be successful flowering certain varieties for a number of years. A few pointers will be helpful.

1. The soil for amaryllis must be moist at all times but never soggy. If your plants are placed outdoors in pots the pot should be only slightly larger than the bulb and never over six inches. If the soil when soaked and given a few minutes to drain still contains free water when squeezed in the hand it is no good. A heavy rain will water log it and the roots will rot. The soil for potting when the plants will be set outside should contain fairly large quantities of sand.

2. Soil for potting plants that will be protected from rain may vary a great deal as the water can be controlled but if you use a heavy soil or a soil such as pure sphagnum moss that holds large quantities of water you will surely have to avoid overwatering or the roots will be lost.

3. Do not use green organic fertilizer in the soil as it will cause gas and rot roots. Much trouble is caused by organic matter in the soil. I prefer to use a clear soil and top feed with commercial organic and liquid fertilizer. This reduces the amount of gas generated in the soil.

4. The soil should be slightly alkaline so if your soil is acid add a little lime to the soil.

5. I find it very beneficial to drench the soil to kill insects at least twice or three times a year. I use cygon, however I have heard of excellent results from the use of the nematode control, V C 13. Most of your trouble is in the root area. If you keep the soil clean of insects, gas and excess water and the plant is placed where the soil does not dry out and it gets about 3½ hours direct sun and some shade each day it will normally grow well.

6. Watch the foliage. If it is not growing well knock the bulb out of the pot and usually you will see where roots are dying. If the soil is overly wet this is probably your trouble. If it is not wet then you probably have dirty soil, too much organic making gas or insects making trouble. Wash the bulb off and repot it in clean soil. I prefer no fertilizer until I have roots again. After you get a good set of roots a little liquid fertilizer, then a top dressing and you are off again.

7. This is only for those in the south like myself who often find about August or September your amaryllis are going dormant. Usually foliage appears to be getting limp. Normally here in Florida and other areas where there is heavy rainfall especially when *Alice, Betty and other hurricanes* hit us for a straight week of heavy rainy weather this happens. You are not having an early fall. Your amaryllis have lost their roots. Sometimes they will immediately put out new roots and make more growth but remember they will loose a month or so of growth. Admit it and make plans to eliminate this next season for if you can keep this from happening (and it happens with outside planting as well as potted plants) you will see remarkable change in your amaryllis.

**PLANT LIFE LIBRARY**—continued from page 126.

NIGHTSHADES, THE PARADOXIAL PLANTS, by Charles B. Heiser, Jr. W. H. Freeman & Co., 660 Market St., San Francisco, Calif. 94104. 1969. Pp. 200. Illus. $5.95. This most interesting book about the Solanaceae or Nightshades, which includes the Chili and other peppers, the tomato, the potato, eggplant, tobacco, petunia and other solanaceous plants has been written with the general reader in mind. The author has brought together a great fund of factual information, fascinating anecdotes and stories about the members of this plant family. It should prove to be rewarding reading for all interested in plants, including the professional plant scientist, amateur gardener, the cook, and above all the interested layman. Once begun, the reviewer could not lay it aside, but had to finish reading the entire book at one reading. Very highly recommended.

THE FLORA OF NEW ENGLAND, by Frank Cokling Seymour. Chas. E. Tuttle Co., Rutland, Vt. 1969. Pp. 596. Illus. $12.50. This comprehensive text provides a means for identifying the vascular plants that grow without cultivation in New England—ferns, herbs, trees, shrubs, vines and aquatics. The area covered is 66,608 square miles in extant and the species included number 3,200. Varieties and forms as well as the larger groups have been keyed, and information on the flowering dates, habitats, and the frequency of the species is given. Very highly recommended.

CONSTITUTION AND BIOSYNTHESIS OF LIGNIN, by K. Freudenberg and A. C. Neish. Springer-Verlag, 175 5th Av., New York, N. Y. 10010. 1968. Pp. 132. Illus. $7.00. This is the second in the series, Molecular Biology, Biochemistry and Biophysics. The present volume deals with the constitution of lignin and with the mechanism of its formation in plants. Radiotracer studies have shown that lignin and related substances, which are unique in plants, are formed from phenylpropanoid substance which is found in all organisms—the essential amino acid phenylalanine. Very highly recommended.

PLANT SCIENCE, AN INTRODUCTION TO WORLD CROPS, by Jules Janick, Robt. W. Schery, Frank W. Woods and Vernon W. Ruttan. W. H. Freeman & Co., 660 Market St., San Francisco, Calif. 94104. 1969. Pp. 288. Illus. $12.00. This forward-looking text on the science of plants and the technology of crop production and distribution, has been written to cover a year's university-level introductory course in plant or crop science—agronomy, horticulture, forestry and agricultural economics. The six parts of the text deal with plants and men; nature of crop plants; plant environment; strategy of crop production; industry of plant agriculture; and the market place. Very highly recommended to all interested in plant science.

BONSAI, SAIKEI AND BONKEI, by Robert Lee Behme. Wm. Morrow & Co., 425 Park Av. So., New York, N. Y. 10016. 1969. Pp. 225. Illus. $9.95. This handsome, profusely illustrated book on **bonsai,** the art of creating natural beauty in miniature by dwarfing trees; **saikei,** the art of employing tiny living plants to achieve a similar result; and **bonkei,** created with artificial materials, are explained in detail. Data on plants for bonsai; sources of information on materials and plants; and an index, complete the volume. Very highly recommended.

1000 BEAUTIFUL HOUSE PLANTS AND HOW TO GROW THEM, by Jack Kramer. Wm. Morrow & Co., 105 Madison Av., New York, N. Y. 10016. 1969. Pp. 178. Illus. $12.95. This guide to plants for indoor growing with particular reference to their decorative uses, and cultural practices, is divided into three parts: (1) general considerations; (2) dictionary (alphabetically arranged) of 1000 house plants; and (3) a brief appendix on kitchen plants; lists of plants, and some plant societies, etc.

**PLANT LIFE LIBRARY**—continued on page 172.

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# EXPERIENCE WITH AMARYLLIDS

RICHARD E. TISCH
*Woodland Hills, Calif.*

*General.* Last winter in the West San Fernando Valley we had our dwellings and grounds well checked out by a record breaking onslaught of wind and rain. One evening during the peak of the storm I stood in my Gro-Lux lamp lighted "screenhouse" and fatalistically awaited its being torn into small shreds or being twisted into a useless heap of aluminum and plastic—or even suddenly and completely disintegrating like the wonderful one-hoss shay. However, a network of criss-cross wire strands which I had strung horizontally just above head-top height apparently added just enough to prevent collapse. They reminded me of the wire "struts" of the early fabric-and-wood biplane flying machines.

After a sustained battering from these elements we were next subjected to a persistent, relentless series of cold nights. One had the choice of either rushing out with protective coverings every evening or standing close to the comforting warmth of the fireplace, thinking, "Well, if they can't stand the freeze they shouldn't be grown in this area". Since I couldn't stand the thought of my plants being thus murdered, I protected as many as I could and was happy to have all of my outdoor amaryllids survive the severe and prolonged exposures. The coldest registered in the screenhouse was 48° F.

There is one outstanding aspect of growing plants under Gro-Lux lamps with thermostatically controlled bottom heat: it's expensive! One day last winter a solicitous employee of the Department of Water and Power called to discuss what he called an "alarming" rise in our power consumption during the Fall-Winter billing periods. Although nothing helpful could be done about it, his concern was warranted: my records show that from October 1968 through April 1969 the increase in electrical power cost averaged $22.35 per month.

Nevertheless, I adjudge that the generally better germination and faster and healthier growth is easily worth the added cost and the closer attention required. There has been a remarkably low incidence of disease and infestation; and plant losses, except for those specifically noted with respect to certain seedlings, have been abnormally low. I have even brought in potted plants from an outdoor location into the screenhouse for "sick bay" treatment, with immediate improvement in growth.

Again in 1968 the plants in plastic juice pitchers outgrew those in clay pots. Further, those in pitchers flower at least one season sooner. As usual, those not kept for breeding purposes were rogued out after flowering. When examined after removal from pitcher or pot, those in pitchers showed more vigorous root growth.

By now I have developed two basic soil mixes for seed germination, seedling growth and growth in pots to maturity: a standard *Amaryllis* soil mix and a standard "Rain Lily" soil mix. The former consists of loam, plus humus, plus oyster shell and Terralite. The latter consists of the above plus oak leaf mold, and has a higher proportion of Terralite. In the deep plastic dish pans I use for seeds, the use of a bottom layer of ¾-inch gravel has been discontinued. As I fill the flat (pan), I add bone meal to the bottom four inches of *Amaryllis* soil mix, and Milorganite to the "Rain Lily" soil mix. As I progress toward the top of the pan I mix in more and more Terralite until the top inch is wholly Terralite. Seeds are sown in holes pressed in with a blunt tool of appropriate diameter, spaced so that seedling growth can continue in the pan until the one and only shift into the final individual container or outdoor location.

*Amaryllis hybrids.* Progress was made in my four objectives: improved basic breeding stock; improved procedures for next-generation production; improved bi-generic cross techniques; increased knowledge of chemical and gas treatment techniques. The plant parents now combine repeat flowering, disease resistance, rapid maturation, generous production of viable seed, evergreen foliage, and good flower form and color. Fragrance hasn't yet been tied into the standard characteristics. The tendency to accept bi-generic crossing has been markedly increased; there are no complete successes to report, but seed production proceeds much further before final cessation of the triggered sequence.

With pollen from this stock, crossed onto *A. striata,* plants from July 1968 germination are, within 12 months, already crowding their plastic juice pitchers with numerous offsets clustered around the main bulbs which appear to be very close to flowering size.

One of the breeding stock plants combines a group of very desirable qualities with an undesirable trait of producing a scape with a slight "S" waviness. This was crossed with a plant whose repeat-flowering scapes are noticeably arrow-straight. It will be interesting to learn which tendency is dominant. Onto a white with fine red pencilling, which has no particular virtue beyond an almost compulsive desire to set seed, the pollen from another white with fine red pencilling was applied. The pollen parent sometimes has pronounced reddening of the edges and tips of its leaves. The seedlings of this cross generally have reddish leaves. Two plants have occasionally produced completely red-toned leaves, one with a white stripe running up the middle from base to tip.

This year's crop consisted of seeds mainly larger and healthier looking, with fatter embryos. Germination is more complete, more uniform and more vigorous. The best event of this year's effort is that my favorite plant, which is an excellent seed and pollen parent, is sending up its third strong scape which should be displaying flowers again by mid-August.

*Amaryllis argilagae.* A bulb which was about 13 mm in diameter when received in October 1966 is now solidly leaved out and healthy in

its plastic pitcher. One evening in February 1969, while checking over all my screenhouse plants, I saw what appeared to be a stray piece of soil up in the leaf base. It turned out to be a small bulblet which had apparently floated up on the daily water and lodged in the leaves. I plucked the pitcher out of its spot, set it on the floor, hunkered down over it and started gently removing the material surrounding the bulb base—as an archeologist might pick away soil from an interesting find. There in the top layer of ¼-inch white rock was another bulblet, and another—and another—and another! With my ever-present long-nosed surgical tweezers I continued carefully removing bulblets as I went through the ¾-inch thick top layer of rock and down an inch into the soil around the main bulb, until I had retrieved 38 bulblets! Their size ranged from 7 to 12 mm in diameter, and from 11 to 22 mm long. Others, being not completely formed at that time, were left attached to the bulb.

When I washed them, all floated lightly on the water. I planted them in a plastic dish pan in a rich but sandy-gravelly soil mix. Starting 12 months later, I periodically dug up and replanted a few of the bulblets, which remained firm and healthy but made no root or leaf growth. Many differing combinations of light hours, light intensity, bottom heat, dryness and moisture were tried with no sign of growth. Finally, on 24 July 1969, 17 months after original planting, I dug them all up and replanted 36 (two had rotted) in my standard "Rain Lily" soil mix, after dipping them in Rootone powder and blowing off the excess.

*Amaryllis striata.* Although they survived the rain and cold of last winter, my bulbs (which were in a southeastern exposure) almost stood still until the weather completely warmed up in late June. The clump bravely sent up scapes in December 1968 and January 1969. The latter had its flowers torn completely off by the wind. In July 1969 I lifted them all and potted them in a rich soil mix, preparatory to giving them the protection they will apparently need when the cold returns next winter.

*Allium unifolium.* Being unsure of the correctness of identity, some of my dormant bulbs from two sources were sent to Dr. H. P. Traub for growth and identification. Those from one source which I planted in a shaded raised planter put up lush growth and graceful scapes topped with umbels of flowers which ranged from pale pink to rose-violet. They set seed readily. When dormant, they were dug. Apparently they use up the old bulb pushing up the leaves and flowers, then form a new bulb. The seed were not sown when fresh, but were ripened and will be held over for sowing in-place outdoors in the springtime.

*Alstroemeria aurantica.* In October 1968 a baker's dozen of small roots were planted close together in a pocket of relatively sandy soil against the house in a southeast exposure. All survived the winter and have grown acceptably well. The clump increases in size by alternate spurts of rapid growth of individual stems and sudden cessation of

growth and drying up of the stems, again individually, followed by the growth of new stems, taller and stronger. The net result has been a steadily enlarging clump to 15 inches high in late July. There are thus far no signs of flower bud formation.

*Cyrtanthus rhododactylus.* Fifty-eight seeds received in June 1969 from Dr. H. P. Traub were sown in a "Rain Lily" soil mix, with bottom heat and a clear plastic cover under Gro-Lux lamps. Germination started in 17 days. By the 26th day germination was continuing, and there were 22 seedlings with flat sword-tip leaves up to 3.5 cm long. The seeds were very thin, with no sure evidence of an embryo; the vigorous growth was, therefore, a pleasant surprise.

*Habranthus andersonii* var. *roseus.* In this climate zone, this pretty little flower has demonstrated that it prefers to blossom when it jolly well feels like it. Then, when they're ready, up they pop! You had better keep an eye on them, or all you'll get to see is an emptied seed pot. In almost two years from seed sowing, mine flowered in a shaded coldframe on 10 September 1968, then 15 September, then the 16th, the 21st—then they suddenly stopped. Seed pods split open, also without advance yellowing, in about 20 days. So the scape and unripe pod must be brought indoors where it will ripen readily while standing in a glass of water under artificial light. I moved the bulbs to a Birch tree well, with morning sun exposure. This year they flowered in July, but with the same jack-in-the-box pop-up action. Between 1 July and 13 July there were 10 scapes on 7 bulbs, one bulb simultaneously supporting a scape and seed pod, a 10 cm scape and flower bud, and the pink tip of a third scape. Although short-lived, the flower and scape are gracefully proportioned, with the rose-pink flower (pale pink with very close deep red parallel lines) proudly held about 45 degrees above the horizontal. They set seed well, about 36 to the pod, and the seeds germinate with no hesitation.

*Habranthus cardenasiana.* This plant also sends up its flowers right in front of your startled eyes. Of three I have in a plastic pitcher in standard Amaryllis soil mix, one has flowered twice in rapid succession. My record shows: 30 May 1969 6 PM—first noticed when 3.5 cm tall; 31 May 7:30 AM—12 cm tall; 31 May 7:50 AM—flower opening, deanthered; 31 May 11:15 AM—free antheres open, to refrigerator; 31 May 4:00 PM—flower half open; 1 June 10:00 AM—flower full open, pink flush on petal edges, deepest at tips; 1 June 10:15 AM—applied *Amaryllis striata* pollen; 1 June 5:30 PM—flower withered. Unfortunately, neither this cross nor one tried on 14 July resulted in seed.

*Narcissus.* My seedlings continue to furnish suspense and pleasure as they flower for the first time, one after another. They also supply welcome highlights of bright color in February and March. This year another seedling has demonstrated strength and character; it holds its face up so perky and bright that I have unofficially named it 'Dottie B.,' for my sister, Mrs. Melvin E. Dawley of Bronxville, New York. She will receive some of the firm, healthy bulbs in late August, in time for her birthday and the eastern planting season.

*Nothoscordum neriniflorum* (Herb.) Benth. & Hook. f. Seeds received from Dr. H. P. Traub in October 1968 were germinated in water, then transplanted into a plastic pan in a special "sandy" soil mix containing fine decomposed granite and Terralite. Of 54 seeds, only 19 survived this treatment. In April 1969 they were set outdoors in a shaded coldframe. At that time they had onion-bulb-like swellings, 3 mm in diameter by 5 mm long at 2.5 to 3 cm below the soil level, with weak rush-like fine leaves. Only 12 survived this transplanting, but in two months time their leaves have thickened and strengthened, and they appear to be thriving.

*Rhodophiala* x *huntiana.* After excellent germination in late 1966, followed by the appearance of their second leaves, many died in 1967 from some affliction which dried up their roots and shrivelled the bulbs. After being transplanted to a shaded coldframe, the remainder flourished and developed strong, but unusual, bulbs as they pulled themselves deep into the rich soil. From the old original bulb near the surface they developed an undulating bulb growth tapering from 5 mm in diameter at 1.5 cm below the soil surface to a bulbous enlargement 16 mm in diameter at a depth of 18 cm. The roots were attached to this bottom enlargement. Leaves were strong and upright, to 45 cm. The bulbs were transplanted in September 1968 to a Birch tree well with a southeastern exposure, where they rested during the winter, then started new leaf growth in June and July 1969. There have been no flowers yet.

*Sprekelia formosissima.* As flowers emerged from outdoor bulbs in May 1969, while we were experiencing chilly weather, I tried to get them to set seed. All flowers withered quickly without setting seed, and I am now waiting for the late summer flowering so I can try again, this time supplying heat to them during the cool nights.

*Zephyranthes.* More were added to the breeding stock during 1968, so that the flowering season will be stretched out some, with more kinds available for crossing. Late July to mid-September is the flowering period for my *Z. citrina.* In 1967 and 1968 they popped up at that time in a constant succession, and produced seed copiously. Seedlings have all done well and show promise of good bulb growth supporting the excellent leaf growth. The smaller tender leaves require constant and complete protection from birds, mice and snails, similar to that required for the emerging scapes on the mature plants. As I write this I recall that I recently picked up several pieces of leaf left over from a bird visitation, during which they had plucked at the leaves which protruded through the hardware cloth screen over the plants. Happily, the bulbs produce leaves faster than they are stripped. *Z. drummondii* sent up a flower when I wasn't looking their way on 1 July 1969 and again on 3 July. They both set seed and developed fat pods which opened in 19 days to release healthy, plump seeds. The seeds from one of the pods were left in the open to "ripen" for one day; the fat seeds became hard, flat, dry discs—so I sowed them quickly with a high-moisture-control plastic bag over the flat. Outdoors the clones 'Kitty

Clint' and 'Ruth Page' have produced strong leaf growth, indicating that their flowers will be large and lovely. From Dr. H. P. Traub 22 seeds of *Z. morrisclintii* were received in June 1969 and were sowed in the standard "Rain Lily" soil mix in a deep plastic pan with bottom heat and a clear plastic cover under Gro-Lux lamps. In 10 days germination was excellent, and growth has been vigorous, with leaves up to 10 cm long in 17 days. The leaves are typically fine and rush-like.

*Chemical treatments.* Since 1962 I have been experimenting with exposure of seeds, seedlings and bulbs of several kinds of plants to a colchicine-water solution. By now there are enough results on amaryllids so treated to warrant making a few generalizations. Some of these results are described in the following. The primary effect is one of stunting root and stem growth and distorting plant and flower form. In the descriptive matter below when I speak of "the solution" I mean ½ tsp of colchicine powder (a local biochemical supply house carries it as #234115, "A" grade, in 1 gm bottles) in one litre of tap water. The expression "soaked" usually means that seeds were put into enough of the solution in a glass tray or jar to keep the seeds wet; if necessary, more of the solution was added as it was absorbed or evaporated.

*Agapanthus.* Seeds from a tall white-flowered plant were gathered 12 October 1968; 24 were put in the solution. Starting after a 48-hour soak, six seeds were sowed each 24 hours, so that the last six had been subjected to a 120-hour soak. As a control group, another 24 were sowed without being soaked in the solution. Of the 24 which had been soaked, only seven germinated, and six survived to be planted outdoors in a shaded coldframe. Of the 24 which had not been soaked, only 11 germinated and only four survived to be planted outdoors alongside the others. There is no apparent difference in the growth of the plants in the two groups, and their coloration is similar. When last lifted and transplanted to the shade of a tree, all had strong root growth.

*Allium unifolium.* Bulbs from two sources had different appearances; these were therefore identified by the source (one as "O" and one as "P"). Ten "O" and 9 "P" were soaked. The "O" were removed from the solution and potted as follows: 3 after 25½ hours, 4 after 48 hours, 3 after 63½ hours. The "P" were removed from the solution and potted as follows: 3 after 27 hours, 3 after 64 hours, 3 after 77 hours. All pots were kept indoors under Gro-Lux lamps. Growth of all was hesitant and weak; none flowered. Only one of the "O" survived to be transplanted outdoors in a raised shaded planter where non-soaked "O" bulbs had grown vigorously and flowered well. None of the "P" survived.

*Amaryllis.* From a cross made in 1964, 89 seeds were soaked in the solution for 24 hours. Germination was good (84), and almost all survived to become individually potted plants. Most were healthy and strong and, as they flowered, had long, upright leaves. In 1967 they started flowering, and a few also flowered for the first time in 1968 and 1969. Most have shown strong, upright leaf growth, glaucous, and tall, straight scapes; but of 11 which have flowered to date, only one had

what I consider good flower form. Some are being used as seed parents because of their good foliage, which tends to remain evergreen, and their prolific production of offsets.

Another experiment was made in 1964 using purchased seeds which were supposed to result in flowering size bulbs in 15 months. To try to check the results of longer soak times, 10 were sowed after a 48-hour soak and 10 after a 72-hour soak. From the first batch there were six seedlings, with strong leaves and roots. Of these, four weakened and died, and the two remaining plants, although they have not flowered, have exceptionally vigorous leaf growth and large, firm bulbs. From the second batch there were eight seedlings, all with weak leaves and roots. Four survived: one is small in leaf and bulb; one is medium sized with long, loppy leaves; one is medium sized with leaves whose edges curl inward over the shorter and smaller leaves, forming a semi-sheath from which succeeding leaves emerge with difficulty; the fourth has medium long but wide leaves, and this spring sent up a tall, straight scape bearing a brace of magnificent flowers whose color is described in my notes as a "glowing rose-purple that shows some *blue*". To one flower I applied pollen from a well-formed large white and to the other I applied *A. striata* pollen. Both produced seeds in 42 days: the white flower cross produced 42 seeds, of standard shape with extra large embryos; the *A. striata* cross produced 16 seeds, all twisted but with fat embryos. The former batch has started germination with strong, healthy leaves. The latter has not yet started germination, but sneaky examination of some seeds shows that they are still alive and appear ready to start growth. The mother plant's pollen produced top quality seeds from two selected seed parents, one being the reciprocal cross. Germination is good from these two batches. I must conclude that there is no evidence that the treatment affected the plant's reproduction. Additionally, I must confess that my strongest interest is almost always with second generation seedlings of special crosses or treated plants.

*Chlidanthus fragrans.* Along with bulbs which were not soaked, two bulbs were soaked for 102 hours. At first the soaked bulbs produced longer and stronger leaves (I failed to soak the other bulbs in plain water; perhaps it would have caused better growth). The flower seemed normal in all respects but did not set seed. When last transplanted, the soaked bulbs had divided into six small bulbs. Presently it is the non-soaked bulbs which have longer and stronger leaves.

*Ixiolirion tataricum.* Of 52 bulbs, 27 were put in the solution in September 1968; they were potted in standard Amaryllis mix as follows: 5 after 26 hours, 5 after 39 hours, 5 after 52 hours, 6 after 75 hours, 6 after 99 hours. The 25 non-soaked bulbs were also potted the same way. Under Gro-Lux lamps leaf growth of both groups started soon and vigorously, then declined. When the bulbs were transplanted to outdoor locations, 23 of the non-soaked bulbs had survived, but only 11 of the treated bulbs were still there.

*Lycoris aurea.* Of six soaked for 24 hours in October 1966, leaf

growth has been weak and they have not flowered. In November 1968 only one showed leaf growth, which was still weak.

*Narcissus.* Ten 'King Alfred' seeds were soaked for 24 hours in 1964. All grew well and, when second-year seedlings, had leaves taller and more slender than normal. In March 1969 two flowered, one a brilliant yellow self on a very short scape, the other a small bright yellow self with folded-back petals. Three had spindly leaf growth and rotted. The remaining five had slender leaf growth but, when lifted in June 1969, had hard bulbs with no evidence of disease or weakness. Many bulbs were soaked for 24 hours prior to planting. Also, some were lifted while in full growth, washed clean, soaked roots and bulb for 24 hours and replanted. To date there is no visual evidence of any effect on growth or flowering.

*Nerine undulata.* Five bulbs soaked in 1966 for 72 hours may have been affected by the treatment. Leaf growth has been weak and sporadic, and they have not flowered.

*Sprekelia formosissima.* Five bulbs soaked in 1966 for 72 hours had root and leaf growth starting when the bottom halves of the bulbs were immersed in the solution. After a reluctant start they grew well in 1967. In 1968, after being slowed down by the winter cold, they grew well during the summer, with one plant noticeably larger than the others. In 1969 their growth has been slower and did not show vigor until the full heat of late June. Leaf growth is much smaller than that of a control group of bulbs not soaked. The latter has flowered, but the treated plants don't look large enough or strong enough to put out a decent flower.

*Zephyranthes citrina.* In 1965 five bulbs were soaked for 48 hours. Their growth appears to be no different from that of bulbs not soaked. They have flowered, with no visible differences. However, although those not treated have provided several batches of good seed, there has been no seed produced by the treated bulbs.

*Irradiated seeds in special solution.* From Mr. Russell H. Manning, who described his experiments in this area in the 1969 Plant Life, I obtained 20 seeds of "mixed *Amaryllis* hybrids 15,000 Rn" and several hundred seeds of "*Habranthus robustus* 15,000 Rn". Both groups of seeds were flat and very dry, with no sure evidence of embryos. These seeds were soaked in the solution described below and were planted in four groups after 24, 48, 72 and 96 hours in solution, respectively. One of the 24-hour soak *Amaryllis* seeds and one of the 48-hour soak *Amaryllis* seeds have germinated, but they are reluctant to put out a second leaf, although such growth is long past due. Of the *Habranthus* (108 planted) only one of the 48-hour soak seeds germinated, but it quickly died. There is no sign of life in the remaining seeds, although I continue to care for the seed pans. The solution in which I soaked the seeds was my standard colchicine solution plus ½ tsp Amchem Rootone powder (USDA Registration No. 264-29) and ½ tsp Gibberellic Acid (Wonder-Brel, USDA Registration No. 2125-35) per litre of solution. *Hemerocallis* seeds received from Mr. Manning were forwarded

to my brother Rolland W. Tisch in Marne, Michigan; he is now retired from active full-scale nursery and greenhouse operation and is spending more effort on experimental breeding. It is expected that reports of his results will be forthcoming in a few years.

Several flowering size *Amaryllis* bulbs which I injected with Gibberellic Acid solution in 1966 showed early leaf growth in 1967 but did not flower as well as usual. Some of them came around to normal flowering in 1968 and 1969, but some of them have not flowered since 1966 and had a decline in leaf growth after the first flush of accelerated growth.

*Miscellaneous Observations and Random Musings.* We are gradually creeping up on a condition where we will have some amaryllids in flower the year around. And some day I hope to have nothing but my own seedlings on the place. We still enjoy the cheerful blue of *Tristagma uniflorum violaceum* each springtime; it multiplies rapidly and has now been spread out as an edging flower along the rose bed path. It also goes very well with Daffodils. This summer we added two bulbs of *X Crinodonna corsii,* clone 'Frank Howard,' just for the clear, bright pink color and the sweet fragrance, even though it cannot be used for breeding. Nontheless I have orders to get more for the shady quiet of our back yard lanai. Having reached the advanced age where a gentle Saturday afternoon nap is one of the greatest things in the world, I particularly enjoy my insect-free, cool, good-smelling screenhouse, where I have installed a comfortable chaise lounge upon which I drift away into a land where all crosses set seed, all seeds germinate and all *Amaryllis* are brilliant yellow or sky blue!

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**PLANT LIFE LIBRARY**—continued from page 162.

INTERPRETIVE FLOWER ARRANGEMENT, by Nelda H. Brandenburger. Hearthside Press, 381 Park Av. So., New York, N. Y. 10016. 1969. Pp. 157. Illus. $6.95. This profusely illustrated book on how to express yourself with plant materials is divided into three parts: (1) design elements for the arranger and exhibitor; (2) interpreting the arts; and (3) impressions of the world, seen and unseen—seasons and times, people, places and things, moods, emotions and feelings, and holidays. Highly recommended.

FLOWER GROWING FOR FLOWER ARRANGEMENT, revised edition, by Arno and Irene Nehrling. Hearthside Press, 381 Park Av. So., New York, N. Y. 10016. 1969. Pp. 228. Illus. $5.95. Originally published as "Gardening, Forcing, Conditioning and Drying for Flower Arrangement" by these outstanding authorities in this field, this revised enlarged edition will be welcomed by gardeners and flower arrangers generally. The subject matter includes garden design; shrubs and trees; annuals; perennials; bulbs, corms, rhizomes and tubers; vegetables; herbs, gourds; how to cut and condition; forcing flowering branches; plants for drying; aids for the arranger; and selecting plants by color and season. Highly recommended.

USING WAYSIDE PLANTS, 4th enlarged edition, by Nelson Coon. Hearthside Press, 381 Park Av. So., New York, N. Y. 10016. 1969. Pp. 288. Illus. $5.95. This 4th edition of this popular book on the useful plants of the northeastern United States now includes also new sections on poisonous plants, camping, and planting the wild flower garden. This book is indispensable to the outdoors enthusiast, camper, teacher, and scout. Highly recommended.

# THE GENUS **UNGERNIA** BGE.

ZINAIDA T. ARTJUSHENKO, *Komarov Botanical Institute, Popava 2, Leningrad P-22*

Bunge proposed the genus *Ungernia* in 1875, describing *U. trisphaera* (Fig. 33). The species *U. sewerzowii* was described by Regel in 1868 under the name *Lycoris sewerzowii* (Fig. 33). In 1915 B. Fedtchenko transferred this species from the genus *Lycoris* to the genus *Ungernia.*

Working on the genus *Ungernia* for the "Flora of USSR" in 1935 Vvedensky described 4 new species: *U. ferganica* Vved., *U. minor* Vved., *U. victoris* Vved. and *U. tadshikorum* Vved. Having described the species in Russian, Vvedensky did not give Latin diagnoses.

A year later M. Popov in co-authorship with A. Vvedensky described a new species of *Ungernia* with a short latin diagnosis—*U. oligostroma* M. Pop. et Vved (M. G. Popov and N. V. Androsov, 1936). It became known later that this new species is one of the species Vvedensky described in the "Flora of the USSR" as *U. minor* Vved. Since this species had no Latin diagnosis, *U. oligostroma* is the right name. In describing his species the author did not indicate any distinguishing features pointing to the affinity of the species. This made it difficult to determine the relationship among the species as will be indicated in the discussion below.

Traub & Moldenke (1949) listed eight species, *U. minor, U. victoris, U. flava, U. sewerzowii, U. trisphaera, U. ferganica, U. tadshicorum* and *U. oldhamii.*

*U. flava* Boiss. et Haussk (1884) is based on the Hausskencht specimen from southwestern Iran. Baker (1888) writes that it grows together with *U. trisphaera,* and differs from the latter only in the yellow flowers, and shorter perianth-tube gradually dilated from the base to the apex. Bossier gave an incomplete description, omitting mention of the bulb and number and size of leaves. The diagnosis was based on herbarium specimens, and thus the color of the perianth mentioned is not natural. Until living specimens can be studied, the validity of this species cannot be established.

*U. oldhamii* Maxim. (1885) was published with a question mark after the generic name *(U. ? oldhamii)* and with the notation that there are 12—15 ovules in the ovary, a condition not recognized in *Lycoris.* In spite of this, Maximowicz later wrote *"Lycoris sanguinea"* on the herbarium sheet, thus removing the specimen from *Ungernia* as far as he was concerned.

*U. minor* Vved. (1935) is a synonym of *U. oligostroma* M. Popov et Vved., as already indicated.

*U. spiralis* E. Proskoriakow (1949) was based on specimens collected by N. B. Androsov, who grew the bulbs in the Botanical Garden of Turkmenia, and described them. This description was added to by Proskoriakow, but the bulb was not mentioned in the description. In

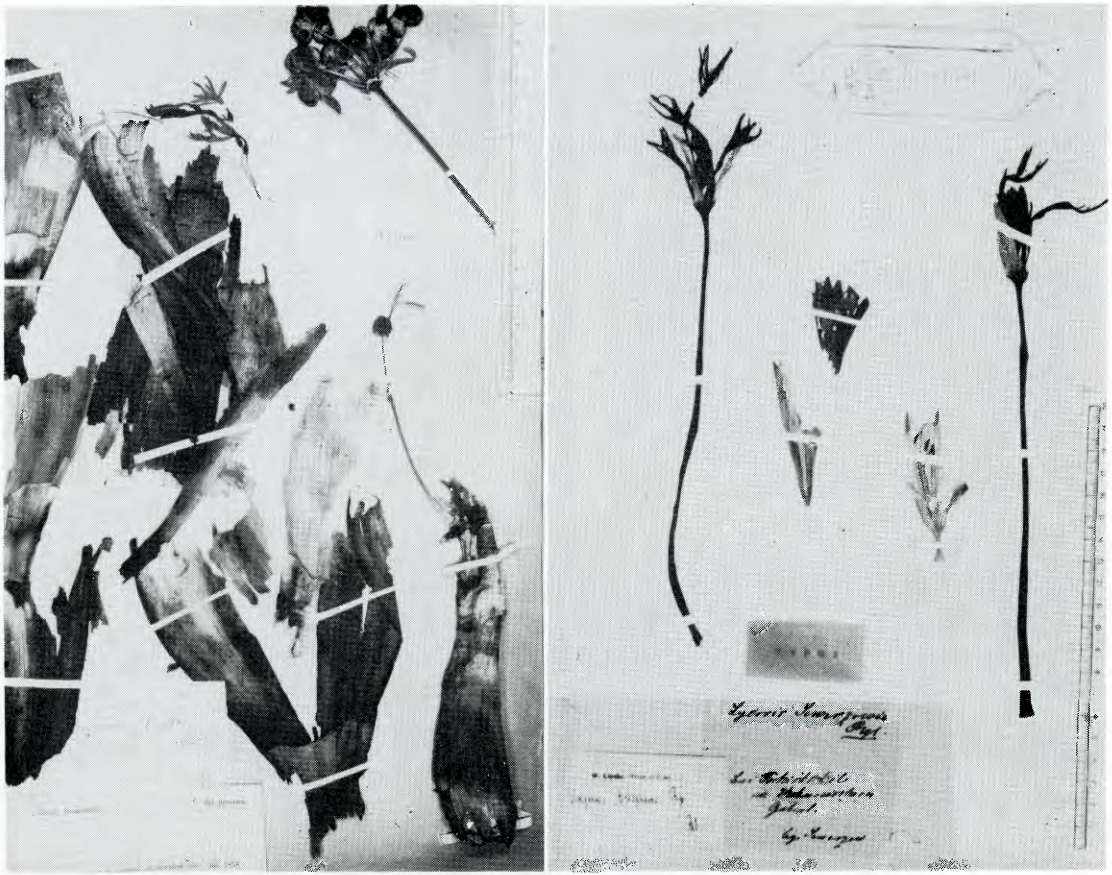

Fig. 33. Left, Holotype of **Ungernia trisphaera** Bge. Right, Holotype of **U. sewerzowii** (Rgl.) Fedsch. B. Both in the Herbarium of the Komarov Botanical Institute, Leningrad.

the color of the perianth (pinkish), *U. spiralis* corresponds to *U. trisphaera,* and differs from it in the twisted leaves. *U. spiralis* is similar to *U. flava* in the small number of flowers in the umbel. Other characters (size and shape of segments, spathe broken into parts, size, color of the scape, and so on) are the same as in *U. trisphaera.*

Until detailed studies of *U. oldhamii, U. flava* and *U. spiralis* can be made on the basis of living material, their status cannot be determined. Therefore, in the present paper, these species are not included.

Vvedensky used the following main features in his treatment of the genus: (1) The size of the bulb. (2) The number and phyllotaxis of the leaves. (3) Form and size of the scape. (4) Number of the flowers in the inflorescens. (5) The size and the color of the perianth.

Taking for a base all the features mentioned above, we compiled a table which gives the opportunity to compare all species and to show how clearly they are distinguished one from another (table 1). A study of the table shows that the species are distinguished only by the color of perianth. *U. sewerzowii* has brick-red flowers without any stripes; *U. trisphaera* and *U. tadshikorum* have pinkish flowers; the differance is that the flowers of the first species have brown stripes on both sides of the segments, the other one has a purple stripe on the inner side of the segments.

The scapes of three species are 5-20 cm high or higher, the bulbs 5-12 cm in diameter. The other three species have shorter scapes (not higher that 20 cm) and the bulbs are 2-7 cm in diameter.

It is possible to distinguish them only on the basis of the color of the perianth: *U. ferganica* light-ochre with purple tips; *U. victoris,* yellowish with a purple stripe on the inner side; and *U. oligostroma,* yellowy-pinkish segments with brown stripes on both sides.

After studing the herbarium specimens it became clear that it is impossible to judge from dry plants about the color of the perianth, neither to distinguish yellowish from yellowy-pinkish or ochre. The same may be said about the more or less dark color of the stripes on the segments since no one can judge by the herbarium specimens what color they are and if they are on both or on one side of the segments.

As to the other features used by Vvedensky, the form and the size of stem, number of leaves and phyllotaxis, number of flowers in inflorescence, they are similar in almost all of the species. It is impossible to distinguish these species on the basis of these features. In this connection we were to find some additional features useful in differentiating species. To do so we studied the epidermis of the leaves and made detailed analyses of a flower, measuring carefully all its parts. We used species of *Ungernia* from the Herbarium of Komarov Botanical Institute of the Academy of Sciences, which were determined by Vvedensky, and also type specimens from the Herbarium of State University of Tashkent.

The results from the study of flowers are shown in table 2. The comparison of the data in the table 2 with the data of the description of the species shows that the size of flower parts vary considerably

TABLE 1. Comparison of some morphological features of the species of the genus **Ungernia.** (after the data by A. J. Vvedensky, 1935)

| Species | Size of the bulb | Number of leaves and phyllotaxis | Form and size of the scape | Number of flowers in inflorescence | Sizes of segments | Form and color of the segments |
|---|---|---|---|---|---|---|
| **U. trisphaera** | 7—12 | 8—15 in tuft | rounded 10—25 cm high | (5)10—20 | 2—2.5 cm long 0.5—0, 8 cm wide | lanceolate, pinkish with wide brown stripe on both sides. |
| **U. sewerzowii** | 5—7 cm in diam. | 4—7 distichous | rounded (15)20—40 cm high | (5)7—12 | 2—2.5 cm long 0.4—0, 5 cm wide | narrow-lanceolate, brick-red, monochromatic. |
| **U. oligistroma** | 2—4 | 3—5 distichous | 5—10 cm high | 4—5 | 2—2.5 cm long 0.5—0, 6 cm wide | narrow-lanceolate yellowy-pinkish with narrow brown stripe on both sides. |
| **U. ferganica** | 4—5 | 10 distichous | flattened 10—20 cm high | 5—15 | 2—2.5 cm long 0.3—0, 5 cm wide | linear-lanceolate or narrow-lanceolate, light ochre with purple tips inside. |
| **U. tadshikorum** | 7—10 | 8—12 distichous | flattened (15)25—35 cm high | 7—17 | 2.5—3 cm long 0.5—0, 7 cm wide | narrow-lanceolate, yellowy or pinkish with wide purple stripe on the inner side. |
| **U. victoris** | 4—7 | 7—10 distichous | flattened 5—10 cm high | (2)4—7 | 2—2.5 cm long 0.4—0, 6 cm wide | narrow-lanceolate, yellowish with pink-purple stripe on the inner side. |

TABLE 2. Comparison of some morphological features of the flower structure of the species of the genus **Ungernia.** (after specimens in the Herbarium of Komarov Botanical Institute)

| Species | Where collected | The size of segments | Length of tube | Length of filaments | | Length of Staminal Cup | Length of style |
|---|---|---|---|---|---|---|---|
| | | | | 1st circle | 2nd circle | | |
| **U. trisphaera** | Mountain Turkmen. Meshed. | 2—3 cm long 0.5 cm wide | 0.8—1 cm | 2 | 2.5 | 0.4—0.6 | 2.5—3 |
| **U. sewerzowii** | Talasskij Alatau | 3 cm long 0.6 cm wide | 0.9 cm | 1.7 | 2 | 0.7 | 3 |
| **U. oligostroma** | Turkestan. ridge, basin of r. Zaamina | 3.2 cm long 0.3 cm wide | 1 cm | 2 | 2.5 | 0.6 | 3.1 |
| **U. ferganica** | Ferganskij ridge | 4.3 cm long 0.3 cm wide | 1 cm | 2 | 2.5 | 0.7 | 4 |
| U. tadshikorum | West slopes of Khodga-Mastan and on the east from Aral | 3.2 cm long 0.5 cm wide | 0.7 cm | 2 | 2.5 | 0.5 | 3.0 |
| U. victoris | North slopes of Adir, to the north of Zargar | 4.2 cm long 0.3 cm wide | 1 cm | 2 | 2.5 | 0.7 | 4.2 |
| U. victoris | Foot of the mountain Baba-Taga | 3.5 cm long 0.3 cm wide | 1.2 cm | 2 | 2.3 | 0.7 | 3 |

within a species. That is why Vvedensky did not attach importance to these features in distinguishing new species.

Peculiarities of cell structure of the epidermis can be used for this purpose (Fig. 36). So *U. sewerzowii, U. victoris, U. oligostroma* and *U. tadshikorum* have elongated, more or less right-angled cells, *U. tri-*

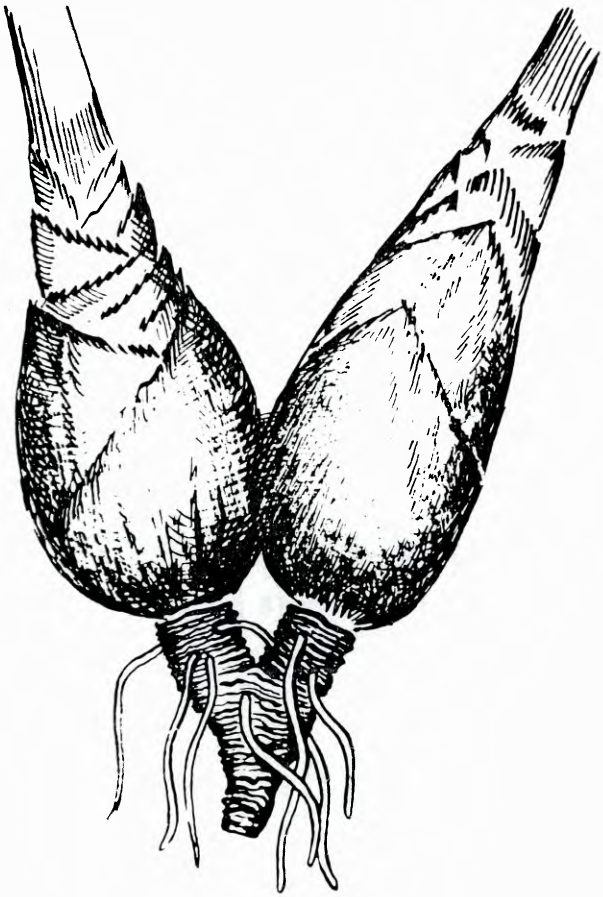

Fig. 34. Two bulbs of *Ungernia trisphaera* on a branching rootstock.

*sphaera* has elongated epidermis cells, but they are tapered, and *U. ferganica* has cells of irregular form. The difficulties were that in studing the genus we had three species only which had grown in their natural habitat. Some of the bulbs were transplanted in the ground, others were cultivated in the glasshouses. The plants did not blossom in both cases; they were only in the vegetative stage. That is the reason

why morphogenesis of *Ungernia* was studied after the specimens were received annually from Middle Asia. The specimens were sent in different stages of their development. In connection with difficulties in receiving living specimens, we also studied herbarium material, especially in the study of reproductive organs.

The basic chromosome number of the genus was determined as X=12 by Baranov and Poddubnaia (1925) for *U. sewerzowii.* Forty years later, after having studied the karyotypes of the two species of *Ungernia,* the scientific workers of the cytosystematic laboratory of Komarov Botanical Institute, O. I. Zakharjeva and L. M. Makushenko (1969), found out that the basic number of the genus had been wrongly determined. They believe that the mistake was due to the wrong methods used by Baranov and Poddubnaia in making the preparations. Zokharjeva and Makushenko (1969) used squashed preparations and discovered that the basic chromosome number of the genus *Ungernia* is 11 (X=11) for *U. sewerzowii* and *U. tadshikorum.* These authors showed also that the karyotypes of these two species are identical.

*Morphological and biological features.* The species of *Ungernia* are perennial plants, they have large bulbs covered with numerous died off and living scales. Very often in layers of dead scales to about 1.2-2 cm; it is impossible to count the number, because they are paper-like and stick together. In most of the amaryllid bulbs, the lower part of the bottom stem dies off with the dying of the outside scales. It happens in another way with *Ungernia* bulbs: the bottom lives some years without the dead scales as a short vertical branching rootstock (Fig. 34). There are fibrous roots on it which die off on the lower part of the rootstock. They are rather thick, fibrous, feebly branching, in some species up to half a meter long. So the severing of the mother bulb from a filial one happens with the dying off the connecting part of the rootstock, but not with that of the scales in the axil of which they were formed. Both bulbs are quite independent before disconnecting: every one has its own root system, they do not suffer from a mechanical disconnection and grow normally after it.

The sizes of bulbs of different species are from 4-5 cm to 10-12 cm. in diam. There are two types of *Ungernia* bulbs: some have only tunicate scales, others have tunicate and semi-tunicate scales in turn, *U. sewerzowii* and *tadshikorum* have the scales of the first type, *U. trispharera* has the scales of the second type. Unfortunately we did not have enough living bulbs of the other species to study their structure. One or two are basal scales, and 4-6 scales which are a base of assimilating leaves or a sheath, are formed in a bulb during the vegetative period (Fig. 35). As we mentioned above, in the bulb of *U. sewerzowii* the scales are tunicate and formed from the basal leaves or sheath and from the lower part of assimilating leaves. It is difficult to make out which scales are the bases of sheath leaves, and which are the lower part of assimilating leaves. All semi-tunicate scales of the *U. trisphaera* bulb are formed from the lower part of assimilating leaves and it is easy to see them at the dormant bulb. The character of the bulb-scales

is a good diagnostic feature for some *Ungernia* species.

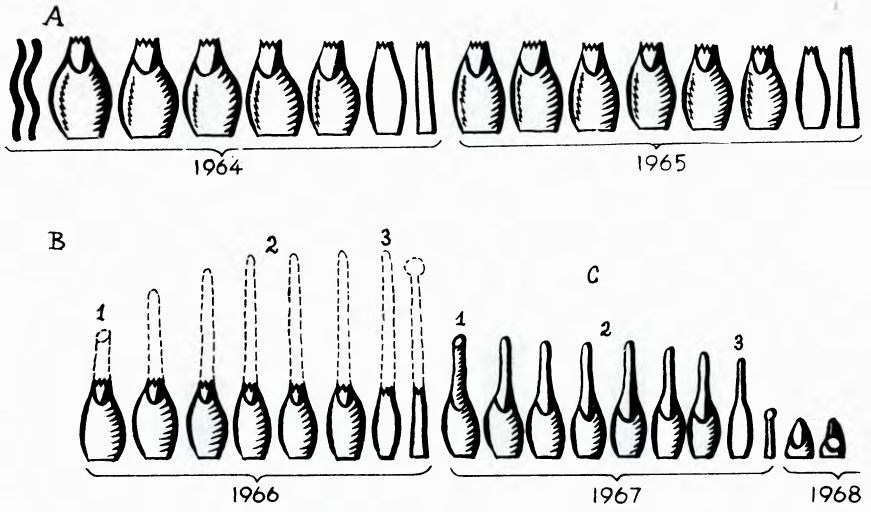


Fig. 35. *Ungernia sewerzowii,* showing structure of the bulb: (A) bulb-scales and scape of the just passed year (1964-1965); (B) bulb-scales and scape of the present year (1966); (C) young scale, leaves and scape (a bud) in (1967); and 1968, the beginning of a new bud.

*Ungernia anatomy.* External (morphologically lower) side of the bulb-scale is covered with epidermis, adjoining the parenchymic tissue, cells of which are filled with starch. The tissue is pierced through with vascular bundles; there are big colourless parenchyma cells in the scales. There are more such cells in the direction of the inner (morphologically upper) side of plate, where they make up a tissue with a great number of intercellulars and cavities, formed after the gelatinization of cells. Such structure of the bulb-scales is typical for all the amaryllids.

*Ungernia* epidermal cells are of three types. Cells of *U. sewerzowii, U. tadshikorum, U. victoris* and *U. oligostroma* are elongated, more or less right-angled, *U. tadshikorum* cells are slightly tapered. *U. ferganica* epidermal cells are slightly elongated, of irregular form, almost every cell has a stomate at the end (Fig. 36) *Ungernia* has a strongly developed cuticle, which forms protuberances of different kinds, which makes it difficult to study the epidermal structure.

Leaf anatomy of the species studied is similar. A row of palisade cells under the upper and lower epidermis, then 2-3 rows of spongy cells. Large colorless cells forming cavities adjoin them (Fig. 37).

The shape of the cavities is the same for all *Amaryllidaceae.* At the beginning the colorless cells are filled with raphides, then the

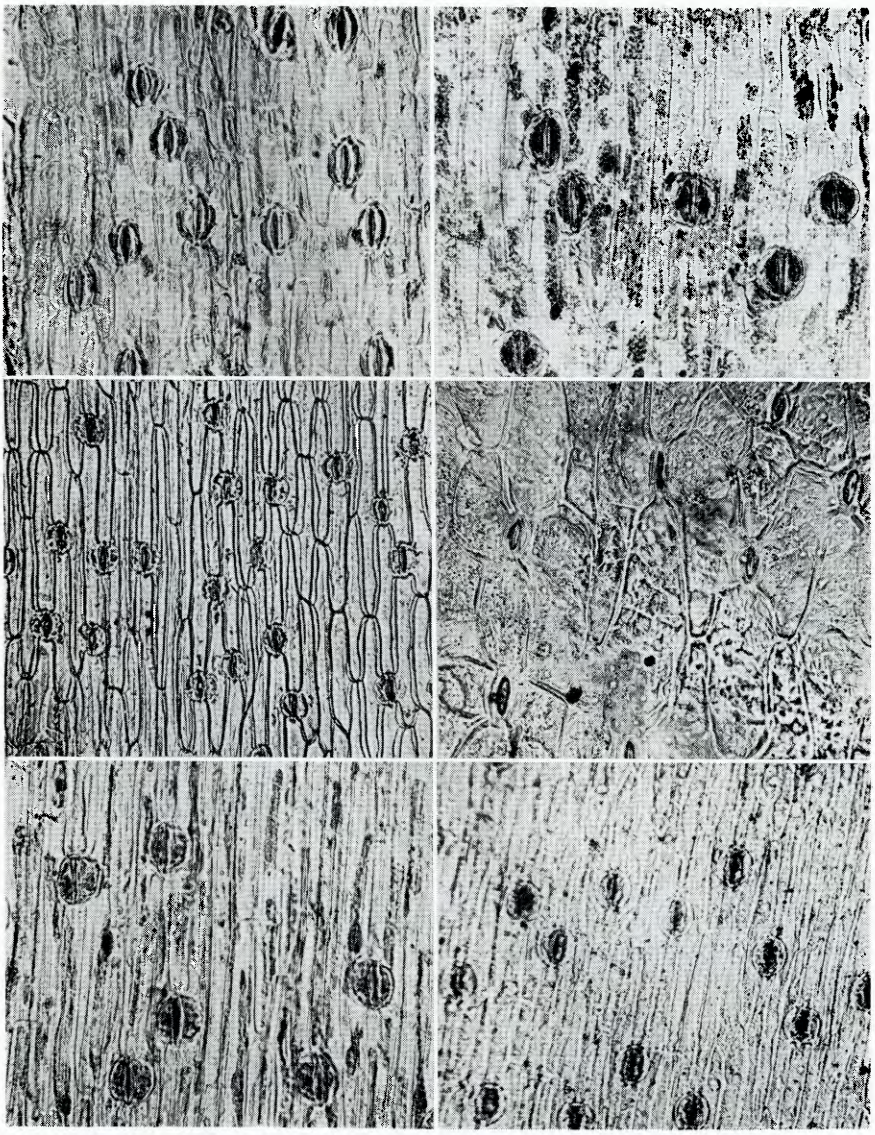

Fig. 36. Epidermis of **Ungernia** leaves showing variation in cell and stomate size and shape for the six recognized species. Originally photographed at X65; reduced to approx. X46 in reproduction.

Upper left **U. trisphaera**; upper right, **U. sewerzowii**; middle left, **U. oligostroma**; middle right, **U. ferganica**; lower left, **U. tadshikorum**; lower right, **U. victoris.**

raphides disappear, cell walls swell and slim and we see a cavity filled with slimy substance instead of raphides. Subsequent development of slimy substances is the same for all *Amaryllidaceae*. After dying off of the above-ground parts of the plants slimy substances move to the bulb scales and stay there as solid conglomerates in the cavities formed after sliming of the scale cells. Very often the conglomerates are so massive that there is no room in the cavity; then a rupture takes place and the cavity is filled with these substances in rather big clots. These substances harden in the air.

30 vascular bundles are set in a row; mechanical tissue adjoins the vascular bundles only.

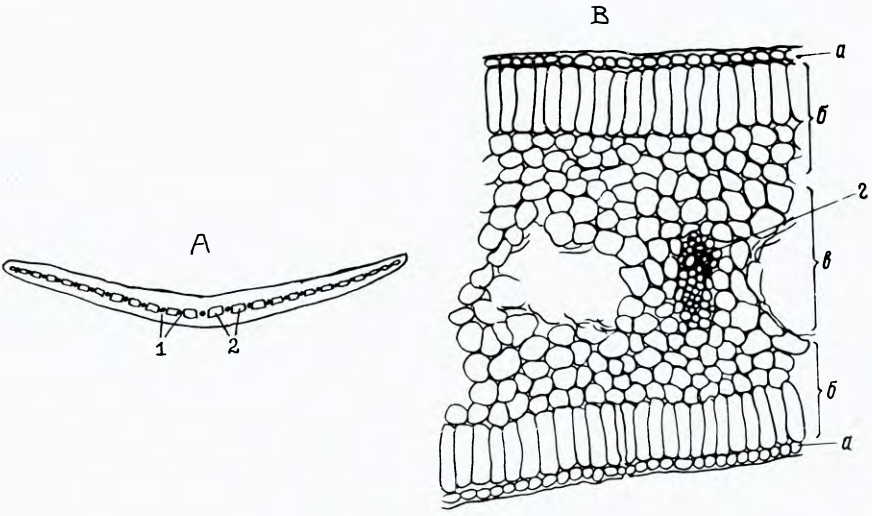


Fig. 37. Anatomical structure of the *Ungernia* leaf: (transverse section of the whole leaf; (B) transverse section of a part of the leaf (enlarged), showing epidermis, palisade cells, spongy cells, cavity and vascular bundle.

The scape of *Ungernia* on a transverse section is semi-rounded or slightly compressed, ribbed. It is covered with epidermis under which are several rows of mesophyll tissue. The central part is filled with colorless parenchyma cells, with vascular bundles among them. There is a group of cells with thickened walls around every bundle. Parenchyma cells slim by the ripening stage of fruit and all the central part fills with slimy substance.

*Ungernia* development. We could not investigate plant development from seed to an adult individual. *Ungernia* development during a year has features peculiar to all bulbous plants. Leaves appear above the ground in February, with first warm spring days. They vegetate

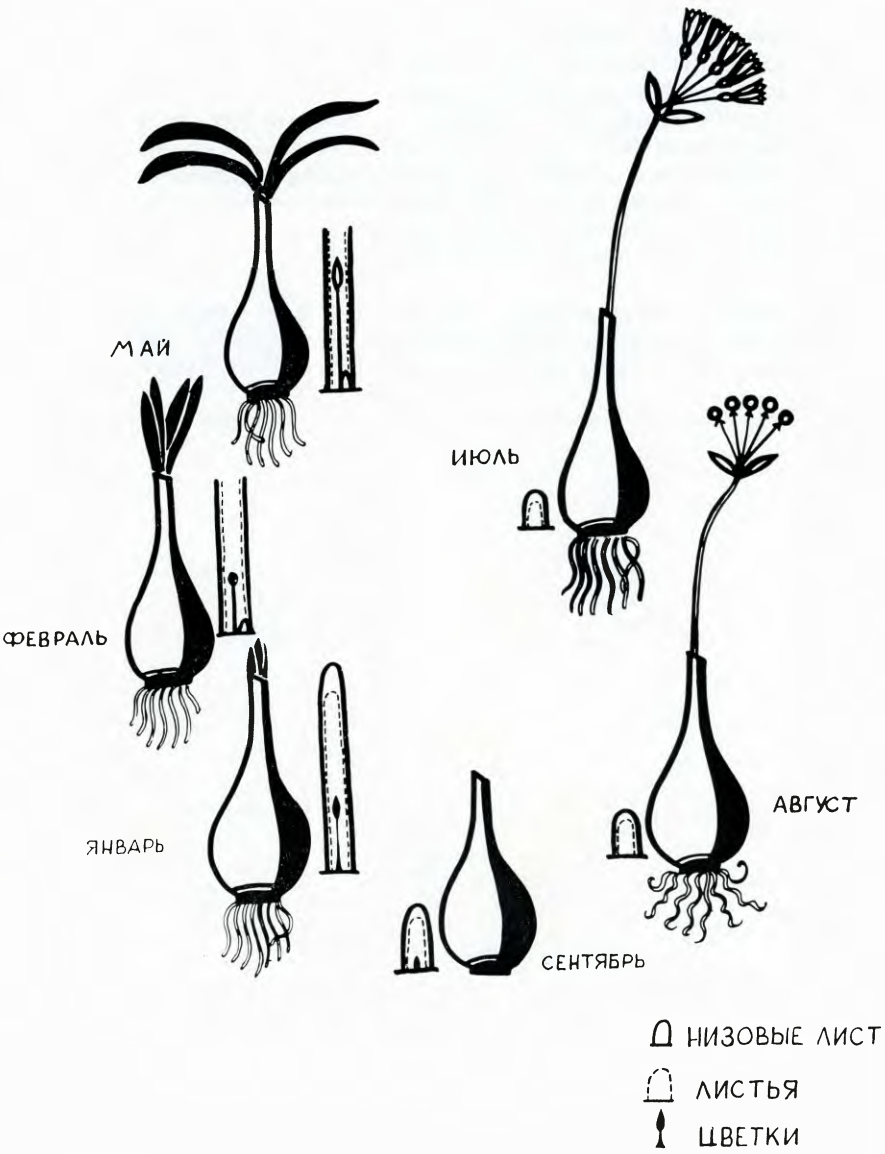


Fig. 38. **Ungernia trisphaera**, annual cycle of development: beginning at the bottom, proceeding clock-wise, September, January, February, May, July and August (months indicated in Russian).

Symbols at the base right, top downwards, basal leaves, leaves and scape (indicated in Russian).

only for 4 months and die off at the end of May. At this time an intensive underground development of the inflorescence takes place and flower primordia begin to grow, which were initiated in the previous year. In July they are fully formed and start to blossom at the end of July to the beginning of August. A renewal bud for next year's primordia appears at the base of the scape. It consists of leaf primordia at the beginning and primordia for flower bearing organs or inflorescence added later. During spring leaf development is greater than the development of reproductive organs; that is why there is some months break between the growth of the leaves and the appearance of the flowers. (Fig. 38).

Geography and taxonomy. As we mentioned above, species area of the genus *Ungernia* is Middle Asia and its borderlands (Afghanistan and Iran). All of them are in the mountains. *U. trisphaera* grows in

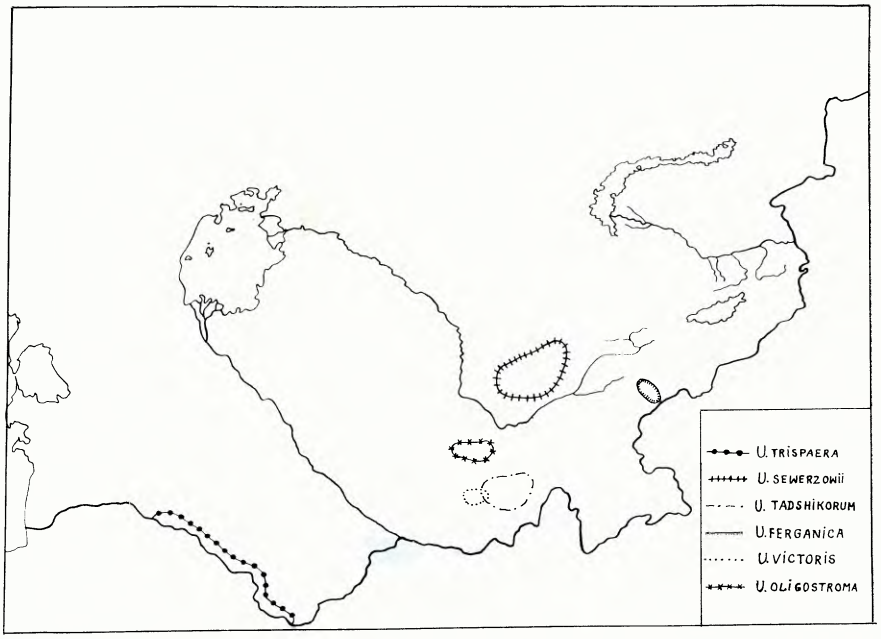


Fig. 39. Map showing the distribution of *Ungernia* species in the U. S. S. R.

mountains of Turkmenistan (northern slopes of Kopet-Dag) but possibly the main part of its area is within Iran, because it was described from Meshkhed and mentioned in flora of Afghanistan (Kitamura, 1960). *U. sewerzowii* and *U. ferganica* are found in the Tien Shan mountains; *U. tadshikorum, U. victoris* and *U. oligostroma,* in the Pamir

—Alaj (Fig. 39). Different species grow at different altitudes and on different soils within the boundaries of indicated mountains.

## UNGERNIA BGE.

1875, Bull. Soc. Nat. Mosc. 49, 2:273; Traub & Moldenke, 1949. The Genus *Ungernia,* In Amaryllidaceae: Tribe Amarylleae. pp. 158—164.

Perianth funnel-shaped almost regular, slightly crooked tube. Stamens in two rows, inner stamens longer. Filaments thin, inserted in the tube lower than the throat: anthers oblong, versatile. Ovary deeply three-furrowed with numerous ovules; style filiform, stigma capitate. Capsule angular at the loculars; seeds black, compressed.

Bulb big, with a long neck. Leaves bluish lorate developing before blooming. Scape a few to many-fld umbel, surrounded with bracts, the outer biggest one envelopes the inflorescence. Typus generis: *U. trisphaera* Bge. 6 species in the genus, growing in the mountains of Asia.

Key to the species of the genus *Ungernia* Bge.

1. Scape of 20 cm or higher ..... 2
— Scape up to 20 cm high ..... 4
2. Bulbs of 5-7 cm in diam.; 4-6 leaves, segments without stripes, brick-red ..... 2. *U. sewerzowii* (Rgl) B. Fedtsch.
— Bulb of 7-12 cm in diam.; 8-15 leaves; segments with stripe ..... 3
3. Segments pink with wide brown stripes on both sides ..... 1. *U. trisphaera* Bge.
— Segments yellowish or pinkish, wide purple stripe on the inner side ..... 5. *U. tadshikorum* Vved. ex Artjush.
4. Inflorescence with 5-15 flowers; segments light-ochra with purple tips ..... 4. *U. ferganica* Vved. ex Artjush.
— Inflorescence with 4-7 flowers ..... 5
5. Segments yellowy with pinkish-purple stripe on the inner side ..... 6. *U. victoris* Vved. ex Artjush.
— Segments yellowy-pinkish with thin brown stripes on both sides ..... 3. *U. oligostroma* M. Popov et Vved.

### 1. *U. trisphaera* Bge. (See Fig. 33.)

1875, Bull. Soc. Nat. Mosc. 49, 2:273; Boiss. 1884, Fl. Or. 5:146; Pax und Hoffm. 1930, Engl.-Prantl. Natürl, Pflanzf., ed 2,15a:406; B. Fedtsch. 1932, Fl. Turkm., 2:317; Vved., 1935, Fl. USSR, 4:482.

Bulb ovate, 7-12 cm in diam.; leaves about 15, linear, grey=blue, 25-40 cm long and 3-5 cm wide. Scape rounded, 10-25 cm high, umbellate inflorescence with 10-20 flowers at the end; 6 segments concrescing in tube 1 cm long. Perianth pinkish, wide brown strips on both sides of segments, which 2.0-3 cm long and 0.5-0.8 cm wide. Stamens in two circles; filaments of outward circle 2.0 cm long, inner circle 2.5 cm long concrescing to the tube of perianth for a distance of 0.5 cm from its base. Style about 3 cm high with a clavate stigma. Capsula about

2 cm in diameter. Blossoms in July. 2n=22 (Zakharieva and Makushenko, 1969).

On fixed sands and on outcrops of bedrocks.

Distribution in the USSR: Mountain Turkmenistan (Sari-Jazi; Kushka, Pul-e-khatum, Serakhs, Kaakhka, Jablonovskoje).

Described from Meshkhed. The type is in Leningrad (Fig. 33).

2. *U. sewerzowii* (Rgl.) B. Fedtsch. (See Fig. 33.)

1915, Veg. Turkestan: 256; Vvedensky, 1935, Fl. USSR, 4:485; Vvedensky, 1941, Fl. Uzbek., 1:498; Nikitina, 1951, Fl. Kirgiz. SSR, 3:120; Pavlov, 1958, Fl. Kazakhst., 2:231; *Lycoris sewerzowii* Rgl. 1868, Soc. Nat. Mosc. 41, 1:435.

Bulb oblongo=ovate, 5-7 cm in diam.; leaves 4-6, linear, grey=blue about 20 cm long and 1.5-2 cm wide. Scape rounded (15) 20-40 cm high with an umbellate inflorescence of (5) 7-12 flowers. Segments brick-red, without strips 2.5-3.0 cm long and 0.4-0.6 cm wide. Perianth tube 0.9 cm long. Stamens in two circles: filaments of outward circle 1.7 cm long, of inner one 2 cm long, concrescing to the perianth tube for a distance of 0.7 cm from its base. Style 3 cm high with a clavate stigma; capsule 2-2.5 cm in diam. Blossoms in July-August. 2n=22 (Zakharjeva and Makushenko, 1969).

On the slopes of stone and rock debris at the steppe zone of mountains.

Distribution in the USSR: Tian Shan: south-west spurs of Tallasky-Alatau, Chatkalsky range.

Described from Chirchik. The type in Leningrad.

3. *U. oligostroma* M. Pop. et Vved.

1937, Veget. Preserve of Guralash and Zaamin forest tracts, 2nd edition: 6; *U. minor* Vved., 1935, Fl. USSR, 4:484; Vvedensky, 1941, Fl. Uzbekist. 1:498; Vvedensky, 1936, Fl. Tajik. SSR, 2:364.

Bulb ovate, 2-4 cm in diam. Leaves 3-5, linear, grey-blue. Scape 5-10 cm high with an umbellate inflorescence of 4-5 flowers. Segments yellow=pink with thin brown stripe on both sides, 2-3.2 cm long and 0.3-0.6 cm wide; perianth tube 1 cm long. Stamens in two circles: filaments of the outward circle 2 cm long, of the inner one 2.5 cm long, concrescing to the perianth tube for a distance of 0.6 cm from its base. Style 3 cm high. Capsule 2-2.5 cm in diam. Blossoms in July-August. 2n=22 (Zakharjeva and Makushenko, 1969).

Rocky slopes, at a height above sea level of 1700-2300 m.

Distribution in the USSR: the Pamirs-Alaj (Turkestansky range) Kogan-Tau, northern slope of ravine Bjuragan-Sai.

Described from Zaamina. The type in Tashkent.

4. *U. ferganica* Vved. ex Artjushenko

1970, Amaryllid. of the USSR; Vvedensky, 1935, Fl. USSR, 4:484,

descr. ross,; Nikitina, 1951, Fl. Kirgiz. SSR, 3:120.

Blub oblongo=ovate, 4-7 cm in diameter. Leaves about 10, linear, grey=blue. Scape flattened out, 10-20 cm high with a inflorescence of 5-15 flowers at the end. Segments light ochra with purple tips on the inner side, 2-4.3 cm long and 0.3-0.5 cm wide, perianth tube 1 cm long. Stamens in two circles: filaments of the outward circle 2 cm long, of the inner one 2.5 cm long, concrescing to the perianth tube for a distance of 0.7 cm from its base. Style up 4 cm high. Capsule 3-3.5 cm in diam. Blossoms in July-August. 2n=22 (Zakharjeva and Makushenko, 1969).

On the rocky slopes of the steppe zone of mountains.

Distribution in the USSR: Tian-Shan; Fergansky range.

Described from Kugart. The type in Tashkent.

5. *U. tadshikorum* Vved. ex Artjushenko

1970. Amaryllidaceae of the USSR; Vvedensky, 1935, Fl. USSR, 4:483, descr. ross.; Grigoriev, 1935, Opredel. vegetab. suburbs of Stalinabad: 90; Vvedensky, 1963, Fl. Tadgikist. 2:362.

Bulb oblong, ovate, 7-10 cm in diam.; leaves 8-15, linear, bluish, 25-30 cm long and 2.5-4 cm wide. Scape flattened out. (15) 25-30 cm high, with an umbellate inflorescence of 7-17 flowers. Segments of perianth yellowy or pinkish, wide purple strip on the inner side, 2.5-3.2 cm long and 0.5-0.7 cm wide, perianth tube 0.7 cm long. Stamens in two circles: filaments of the outward circle 2 cm long, of the inner one 2.5 cm long concresting to the perianth tube for a distance of 0.5 cm from its base. Style 3 cm high with a club-shaped stigma. Capsule 2-2.5 cm in diam. Blossoms in July-August. 2n=22 (Zakharjeva and Makushenko, 1969).

On the clayey slopes of the steppe zone of mountains.

Distribution in the USSR: Pamiro=Alai; Sanglok, Huli=zandan, Tevil=Daga; Hodga=Mastak.

Described from the m. Sanglok. The type in Tashkent.

6. *U. victoris* Vved. ex Artjushenko

1970, Amaryllidaceae of the USSR; Vvedensky 1935, Fl. USSR 4:483 descr. ross.; Vvedensky, 1941, Fl. Uzbek. 1:496; Vvedensky, 1963, Fl. Tadgik. SSR., 2:364.

Bulb ovate, 4-7 cm in diam. Leaves 4-7, linear, grey-blue 20-25 cm long and 2.3 cm wide. Scape flattened out, 10-20 cm high with an umbellate inflorescence of (2) 4-7 flowers. Segments yellowy with pinkish-purple strip on the inner side, 2-4.2 cm long and 0.3-0.6 cm wide; perianth tube 1-1.2 cm long. Stamens in two circles: filaments of the outward circle 2 cm long, of the inner one 2.5 cm long, concresting to the perianth tube for a distance of 1-1.2 cm from its base. Style 3-4 cm high. Blossoms in August.

On the rocky slopes at a height of 2000-2500 m.

Distribution in the USSR: Pamiro-Alay (m. Tsulbair, the valley of

the r. Hanaka-su, southern slopes of the range Dapbase-Kon).

Described from Sika. The type in Tashkent.

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## **Kaempferia** cv. 'Pobeda' (Korsakoff, 1969)

Flower white, with yellow blotch at the base of lip, the yellow of the blotch margined on both sides with faint lavender bars.

Always interested in hybridizing everything at hand, I was rewarded with a new white color variety. On Aug. 15, 1965, with the wife's nimble fingers, **Kaempferia decora** and **K. kirkii** var. **elatior** were crossed reciprocally. Seed was obtained both ways. A few seedlings of both crosses survived up to the present. On July 6, 1968, the first seedling flowered, sending up an upright spike as **K. decora** does, with eight florets of the same size as decora's, but white in color. **K. decora** has bright yellow flowers and **K. kirkii** var. **elatior** has lavender flowers with yellow center. All seedlings are indistinguishable from the parents in growth habit, except that the flowers are white.—**Alek Korsakoff**

# PLANT LIFE LIBRARY

HALDANE AND MODERN BIOLOGY, edited by K. R. Dronamraju. The Johns Hopkins Press, Baltimore. 1968. 333 pp. $10.95. As a memorial and contribution to an understanding of the late J. B. S. Haldane, this book has a list of distinguished contributors, but on the whole is disappointing. Truly one of the intellectual giants of the first six decades of the twentieth century, Haldane deserves a better fate. Several of the papers could just as well have been published in conventional journals since they contribute little to an understanding of Haldane, or his contributions to biological thought. Even further afield is an article in the Appendix by Mourant, which is essentially an unabashed plug for the International Biological Programme (IPB).

In the realm of biological thought Haldane was truly a "Man for All Seasons." There was little on the frontiers of biology that did not arouse his interest and most of these interests resulted in publications of substantial merit. In this connection it should be remembered that at the apogee of his career, Haldane had plenty of competition. It was not easy to find your way into the biological limelight in company with such brilliant scientists as Morgan, Sturtevant, Muller, Fisher, Wright, Darlington, Beadle, and several others.

As a student and disciple of Sir Frederick Gowland Hopkins, Haldane was one of the first to insist that gene action must be interpreted in terms of biochemical reactions. Caspari in a chapter on Haldane's contribution to biochemical genetics, states that, "Haldane's most important contribution to the development of biochemical genetics, however, was his early appreciation of the need to describe the nature of the gene, and gene action in biochemical terms."

Although Haldane's ideas on the nature and origins of life are adequately discussed by Pirie, and to a lesser extent by Oparin, it comes as a surprise to note the omission of Haldane's contributions to evolutionary thought. His book, "'The Causes of Evolution," published in 1932 is a classic in this field, and contributed much to the outstanding research that followed in developing our understanding of the processes of organic evolution. Such productive scholars as Dobzhansky, Stebbins, Mayr, or Simpson are among those well qualified to assess Haldane's work in this area. Their names, however, do not appear among the list of contributors.

A considerable segment of Haldane's life is almost completely ignored or overlooked. Here I refer to his Marxian political philosophy that seemed so attractive to him shortly after the conclusion of World War II. How he was able to rationalize Marxism with the false dogmas of Lysenkoism would have been of much consequence to an understanding of Haldane. The Editor apparently could not persuade anyone to tackle this job, or perhaps he preferred to let sleeping dogs lie.

Naomi Mitchison, Haldane's sister, has provided an interesting sequence of reminiscences that covers the period from Haldane's boyhood up through World War I. It is one of a series of short essays in the Appendices and has the title "Beginnings." It makes pleasant reading, and suggests some of the events that may have shaped the mature individual.

It is distressing to record that the book has no complete Bibliography of Haldane's scientific publications, although Professor Sewell Wright has listed about 80 of Haldane's papers, mostly concerned with some aspect of genetics. The usefulness of the book will be handicapped by lack of a good index. In spite of its several faults, this book will be an important resource for anyone interested in Haldane, a brilliant, clever, many sided, stimulating, and absorbingly interesting human being.—**Thomas W. Whitaker**

TROPICAL CROPS. DICOTYLEDONS 1 [Vol. 1] and DICOTYLEDONS 2 [VOL. 2], by J. W. Purseglove. John Wiley and Sons, Inc., New York. 1968. 719 pp. Illus. $8.50 per volume. Modern texts on tropical agriculture

are scarce, or nearly nonexistent; hence an authoritative book on tropical crops has a ready made niche to fill. Prof. J. W. Purseglove, Professor of Botany and Plant Pathology, University of the West Indies, Trinidad, is as well equipped by training and experience as any living person to author a text on tropical crops. For thirty years he has traveled, worked and taught in the tropics of Africa, the Far East and the New World. Moreover, these two volumes on Tropical Dicotyledons, comprising a total of 719 pages, are based primarily upon actual studies of the extensive living collections maintained by the University of the West Indies at St. Augustine, Trinidad. Incidentally, the line drawings for which there are a set for nearly every crop, are excellent. It is evident they were based upon fresh material.

The book is arranged by plant families listed in alphabetical order, as are the genera within each family. These two volumes are loaded with useful information. Under each species there are such subheadings as: uses, origin and distribution, ecology, structure, pollination, chemical composition, propagation, husbandry, major pests and diseases, improvements, production, and a few references. As an added bonus the chromosome number of each species is given where known.

A useful and handy innovation is the Appendix at the end of Volume 2. The Appendix gives the scientific name, family, common name, use, origin and the page reference for each crop. There is also an Index of 28 pages which includes the common names of the plants referred to in the text, and the common and scientific names of the major diseases and pests. There is a list of about 72 General References. The Appendix, Index and list of General References occupy the terminal 54 pages of Volume 2. This arrangement appears to be a device originated by the publisher to trap the prospective customer into purchasing both Volume 1 and Volume 2. They are, however, worth the price ($8.50 each) for anyone with even a mild interest in tropical agriculture. For agronomists, botanists, and those who need a good reference work on tropical crops, these two Volumes will be indispensable. We shall await with great interest Prof. Purseglove's treatment of the Tropical Monocotyledons used as crop plants.—**Thomas W. Whitaker**

PLANTS: ADAPTATION THROUGH EVOLUTION, by Joan Eiger Gottleib. Reinhold Book Corp., New York. 1968. pp. 114. $2.25. The author of this book, Dr. Joan Eiger Gottleib, is a firm believer in the proposition that a working knowledge of plant biology is a minimum requirement for any serious science student. Furthermore, she insists that an account of the plant kingdom is an essential part of any good biology text. This little paperback volume of 114 pages was designed to cope specifically with these problems. The book is one in a series of Reinhold's, "Selected Topics in Modern Biology," on the general subject of the diversity of life, edited by Peter Gray.

Dr. Gottleib has simplified her task by shunting all plants below the mosses into the "Protista." Besides its convenience there are some good biological arguments for this controversial division. It will, however, be difficult to convince some mycologists and algologists they have spent their careers working with organisms other than plants.

In the preface, Dr. Gottleib promises to bring maximum readability to the story of the plant kingdom. Surely an unbiased critic would agree that she has fulfilled her pledge. Even the conventional life cycle diagrams come alive under her treatment. She is particularly skillful at articulating the descriptive material of plant science into meaningful patterns. Several of her analogies are apt and clever, for example: Bryophyta—"Amphibia of the Plant Kingdom" and Pteridophyta—"Botanical Snakes."

**PLANT LIFE LIBRARY**—continued on page 4.

# 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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[A Committee of the American Plant Life Society]

**[AMERICAN AMARYLLIS SOCIETY, continued from page 2.]**

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**1. AMARYLLIDACEAE: TRIBE AMARYLLEAE,** by Traub & Moldenke (including the genera Amaryllis, Lycoris, Worsleya, Lepidopharynx, Placea, Griffinia, and Ungernia; Manila covers; 194 pages, incl. 18 illustrations. $5.00 postpaid.

This is required reading for every amaryllid enthusiast.

**2. DESCRIPTIVE CATALOG OF HEMEROCALLIS CLONES, 1893—1948,** by Norton, Stuntz, and Ballard. A total of 2695 Hemerocallis clones are included and also an interesting foreword, and explanatory section about naming daylilies. Manila

covers; 100 pages (1—X; 1—90), includes a portrait of George Yeld. $5.00 postpaid.

**3. THE GENERA OF AMARYLLIDACEAE,** by Hamilton P. Traub. Includes a general introduction, a key to the subfamilies, infrafamilies, tribes, subtribes and genera of the Amaryllidaceae, and descriptions of all the genera. Every member of the Society should have this book for constant reference. Manila covers; publ. 1963; 85 pages. $5.00 postpaid.

**4. LINEAGICS,** by Hamilton P. Traub. This is the first outline text for the undergraduate student on the grouping of organisms into lineages. The text is divided into four parts: (a) the history of lineagics and lineagics as an integrated science; (b) basic lineagics, principles and procedures; (c) applied lineagics, principles and procedures; and (d) research methods in lineagics. Recommended for the student in biology. Publ. 1964. Manila covers, 163 pages, incl. 8 illus. $5.00 postpaid.

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(**A**) **HERBERTIA, or AMARYLLIS YEAR BOOK** [**First series,** 1934 to 1948, incl.], devoted exclusively to the amaryllids (Amaryllidaceae), and the workers concerned in their advancement. A complete set of these volumes is indispensable to all who are interested in the amaryllids. Libraries should note that this may be the last opportunity for complete sets.

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**ILLUSTRATIONS**—continued from page iii.



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**REGISTRATION OF CLONES**—continued from page 72.

ZEPHYRANTHES CLONE

**Registered by Alek Korsakoff, Jacksonville, Florida.**

'Nicetria' (Korsakoff, 1969) Bulb oval, about 3 cm. long, 2 cm. in diam., neck 1.5 cm. long; tunics dark brown. Leaves 52-57 cm. long, 1.1 cm. wide; spinach green. Scape 14 cm. long. Spathe 3 cm. long, united below to 1.3 cm. Pedicel 1.5 cm. long. Ovary 5 mm. long, 3 mm. in diam. Perigone colored Amaranth Rose (530/2 HCC), 6 cm. across; tepaltube 1.5 cm. long, green; tepalsegs with margins undulated, 5 cm. long; setsegs 2.5 cm. wide, petsegs 1.8 cm. wide, both rounded at the apex.

The cross, **Zephyranthes** [(**Z. atamasco** ♀ x **Z.** sp. K484 ♂) ♀ **x Z. grandiflora** ♂] was made Mar. 27, 1966; first seedlings bloomed Apr. 12, 1968. Holonomenifer; Korsakoff G76B, 4-3-69; No. 1002 (TRA), grown by Alek Korsakoff, Jacksonville, Fla.

**PLANT LIFE LIBRARY**—continued on page 172.

STREET TREES IN EGYPT, by M. Nabil El Hadidi and Loutfy Boulos. Herbarium, Botany Dept., Faculty of Science, Cairo University, Giza, U. A. R. 1968. Foreword, Introduction by Vivi Taeckholm. 4 figures, 52 plates and Index. This book on the cultivated trees of Egypt fills a definite need. Each plate illustrating a tree is accompanied by the Latin and common names of the subject, and a detailed description in English. This book will help the tourist, native layman, and also the Egyptian student of botany and agriculture, to identify the cultivated trees of Egypt. Highly recommended.