PLANT LIFE

AMARYLLIS
YEAR BOOK

1971

Crinum bulbispermum (Burm.)
Milne-Redhead & Schweickerdt
from the Transvaal, S. Africa

THE AMERICAN PLANT LIFE SOCIETY

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

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

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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

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EDITED BY
HAMILTON P. TRAUB
HAROLD N. MOLDENKE

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The cover design by Prof. Penrith B. Goff is based on a photograph of **Crinum bulbispermum** (Burm.) Milne-Redhead & Schweickerdt. See note in text for further details.

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PLANT LIFE, VOLUME 27, NOS. 2—4, INCL., 1971
GENERAL EDITION

ILLUSTRATIONS

CORRIGENDA

PLANT LIFE Vol. 24. 1968

Page 146, bottom of page—"Postscript—": under "Subsection I" change "Neapolitana" to "Moliana", and under "Subsection II", change "Moliana" to "Xanthoprasa".

Page 151, 3rd paragraph, 3rd line, change "(2n=24)" to "(2n=48)".

Page 152, 5th line from bottom, change "2n=24 (tetraploid)" to "2n=48 (octoploid)".

[See also PLANT LIFE Vol. 25. 1969, pages v—vi.]

CORRIGENDA

Traub, Hamilton P., Lineagics. 1964

Page 14, bottom of paragraph, 2nd line, and 5th line, change "Mauterpuis" to "Maupertuis".
Page 18. 2nd line, change "332" to "322".
12th and 16th lines, change "Mauterpuis" to "Maupertuis".
Page 19, under "1865", 1st line, change "ingetitance" to "inheritance".
Page 22, under "1963",—(d), change "Maryr" to "Mayr".
Page 26, 12th line, change "cretaceins" to "cetaceans".
Page 27, Table 1, at end of 2nd line delete "the".
Table 1, II, 5th line, change "cretaceans" to "cetaceans".
Page 33, 6th line from top, change "1662" to "1622".
Page 34, 10th line from bottom, change "1660" to "1690".
Page 35, center page, change "Mauterpuis" to "Maupertuis".
Page 36, 3rd and 7th lines from bottom, change "Mauterpuis" to "Maupertuis".
Page 37, 10th line from top, and 7th line from bottom, change "Mauterpuis" to "Maupertuis".
Heading "(B)", change "ANDANSONIAN" to "ADANSONIAN".
Page 46, 2nd and 12 lines, change "Mauterpuis" to "Maupertuis".
6th line from bottom, change "Russell" to "Russel".
Page 48, under "(3) Linordination" change "Wilheim" to "Wilhelm".
Page 50, Table 10, 4th line, change "Thompson" to "Thomson".
Page 53, 3rd. paragraph, 9th line, after "acceptible" add "group".
Page 58, 1st line, change "Mauterpuis" to "Maupertuis".
Page 61, from bottom, end of 17th line, and beginning of 16th line, change "function" to "functions".
Page 62, Fig. 2, 3rd and 4th lines, change "meterology" to "meteorology"; and change "mathematices" to "mathematics".
Page 64, 13th line, change "basic" to "basis"; 17th line, change "fall" to "falls".
Page 69, 14th line, from bottom, change "lin(age)" to "lin(eage)".
Page 92, 5th line from bottom, change "venleestenii" to "vanleestenii".
Page 96, 3rd line from bottom, change "includs" to "includes".
Page 97, 4th line from bottom, after "closely" add "to".
Page 99, Table 15, align "5a" with "(b) impediolinon"; and change the second "5a" to "5b" and align with "(c) desinolinon".
Page 100, 3rd line, change "symparty" to "sympatry"; and middle of page, under "Procaryotae", 2nd line, after "due" add "to".
Page 102, 2nd line from bottom, change "12" to "13".
Page 103, 1st paragraph, 11th line, change "inclusive" to "inconclusive".
Page 107, 1st paragraph, 7th line, change "are" to "is".
Page 108, last paragraph, 2nd line, after "often" add "of".
Page 112, 1st line, change "Methanabacae" to "Methanobacae"; and under "(C)", 2nd Paragraph, after 5th line, insert missing line, "autotrophs, known as obligate autotrophs, obtain their nutrition".
Page 115, 2nd paragraph, 12th line, change "1848" to "1948".
Page 117, below Table 21, 2nd line, change "Spirochetebacae" to "Spirochetobacae"; and in the following paragraph, 6th line, after "from" insert "the".
Page 121, 5th line from bottom, after "with" insert "the".
Page 123, 5th line, after "pointed" insert "out", and in 4th paragraph, center, 6th line after "(1957, 1962)" add "(b)".
Page 126, under "THE HIERARCHIC TAXA", end of first line change "were" to "was"; and 11th line from bottom, insert comma "," between "order" and "class".
Page 127, 2nd line from top, delete "that"; and 21st line from top, change "of" to "or".

PLANT LIFE, VOL. 27, NO. 1, January, 1971

AMARYLLIS
YEAR BOOK
1971

Year Book of
The American Amaryllis Society
38th Issue

GENERAL AMARYLLID EDITION

EDITED BY
HAMILTON P. TRAUB
HAROLD N. MOLDENKE

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

THE AMERICAN PLANT LIFE SOCIETY

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

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[THE AMERICAN AMARYLLIS SOCIETY—continued on page 153.]

PREFACE

Again, we are indebted to Prof. Penrith B. Goff of Wayne State University, Detroit, Michigan, for a beautiful cover design based on *Crinum bulbispermum*. The reader is referred to a short note in the text about this interesting and valuable plant.

The 38th edition of the AMARYLLIS YEAR BOOK is dedicated to Dr. Carlos Gomez Ruppel, who received the WILLIAM HERBERT MEDAL for 1971 in recognition of his outstanding amaryllid explorations in Argentina, Brasil and Chile over a period of years. He is an eminent scientist and the best of ambassadors of good will for Latin America since he has generously shared his plant treasures with enthusiasts in the United States and other parts of the world.

In this issue, Dr. Ruppel gives us a charming autobiography, and an article about two of his amaryllid collecting trips into Chile.

Mr. Leon Boshoff-Mostert contributes an interesting South African Letter.

Dr. Martin Cardenas writes about Bolivian amaryllids, and names a new *Amaryllis* species in honor of the late Ira S. Nelson; Dr. Whitaker reports on a collecting trip for *Amaryllis* in the Bolivian Yungas.

Mr. Doran gives us the first picture of the hard, round seeds of *Amaryllis reticulata* which so baffled the late, great William Herbert, who dreamed about them in print before he had seen the ripe seeds, thus creating much confusion among those who follow nomenclature as an end in itself.

Prof. Ravenna contributes the fourth in his series on the Amaryllids of South America; and also reports on new Latin American amaryllids.

The members will be particularly interested in the reports on Amaryllis chromosomes and the anthocyanin pigments of the Amaryllis flower, by a group of researchers at Louisiana State University, Baton Rouge. It is hoped that these researches will be continued since such information is very much needed.

Prof. Adee writes about an Ecuadorean amaryllid, and the year round of Amaryllid blooms in limited greenhouse space in the North.

Dara Emery reports on a long-lived Amaryllis hybrid; and Messers. Mertzweiller and Buchmann write about their Amaryllis breeding programs. Mr. Fesmire considers the growing interest in smaller hybrid Amaryllis. Mr. Bleakley informs us about Amaryllis in Australia.

Mrs. David E. Wilson, the daughter of Mrs. Morris Clint, writes about an amaryllid collecting trip into Mexico, thus following in her mother's footsteps.

Mr. Williams reports on the amaryllids he has received from the collections of Dr. Ruppel in South America; Mr. Buck summarizes the 1970 Daylily season; Mr. Hugh Bush and Mr. Tisch write about their experiences with amaryllids.

Mrs. Pahls reports on the charming *Eurycles amboinensis;* and Mr. Buck gives details for storing *Clivia* seeds.

Mrs. Pickard reports on the American Amaryllis Society's study course for the Amaryllis Judge's Certificate.

There are reports on the 1970 Amaryllis shows, and various other interesting contributions as shown in the Table of Contents.

Contributors to the 1972 issue of the AMARYLLIS YEAR BOOK are requested to send in their articles by August 1, 1971, 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, 1970
2678 Prestwick Court,
La Jolla, California 92037

Hamilton P. Traub
Harold N. Moldenke

PLANT LIFE LIBRARY—continued from page 140.

SUCCULENTS AND CACTUS, by the Sunset Editors and Jack Kramer. Lane Books, Menlo Park, Calif. 94025. 1970. Pp. 80. Illus. Paper covers. $1.95. This charming, profusely illustrated treatise on succulents and cactus will be welcomed by the gardening public. After an introduction to the nature of these amazing plants, the sections are devoted to starting a collection; caring for succulents and cactus; indoor culture; landscaping ideas; propagating techniques; problems encountered; specialties, and an index. Very highly recommended to the gardening public.

IN PRAISE OF ROSES, by Harry Wheatcroft. Henry Regnery Co., 114 W. Illinois St., Chicago, Ill. 60610. 1970. Pp. 192. Illus. $12.50. This charming book is like a breath of fresh air and a ray of sunshine. The 160 color prints, and 77 black and white illustrations are worth more than the price of the book. The author brings a half century of experience with roses and acquaintances with rose breeders to bear in discussing the greatest roses in his life, how new roses are bred, heredity, sports, scented roses, climbers and ramblers, blue roses, red and yellow roses, the American rose industry, etc. An important feature of the book is the section devoted to Harry Wheatcroft rose selections covering 58 pages—hybrid teas, floribundas, climbers, shrubs and miniatures. Indices of varieties (clones), and names and places, complete the volume. Very highly recommended to all gardeners.

BOUQUETS THAT LAST, by Emily Brown Hearthside Press, 381 Park Av. S., New York, N. Y. 10016. 1970. Pp. 176.+32 color plates. $10.00. This very attractive book represents a comprehensive guide to the making of long lasting arrangements, including the collection, cutting, conditioning, drying and preserving the floral and vegetative parts of garden, wayside, seashore and mountain plants. The outstanding features of the book are the 32 color plates presenting 73 compositions, in full color, and the long descriptive list of plants suitable for making bouquets that last. Highly recommended to flower arranger, home decorator and artist.

PLANT PATENTS; WITH COMMON NAMES, 2208 THROUGH 2855. 1963—1968. Publ. by the American Association of Nurserymen, 835 Southern Bldg., Washington, D. C. 20005. 1969. Pp. 23. $1.00. The subject matter is arranged under three parts: I. Numerical listings; II. Alphabetical listings, and III. Alphabetical listings of names and addresses of originators or discoverers and assignees. All plant patents through 1159 have expired as of December 1969, and become public property. The present Directory superseded the 1963 through 1967 supplements to the Directory. Annual supplements will be discontinued. Hereafter supplements will be published every 5 years.

RECENT ADVANCES IN PHYTOCHEMISTRY, VOL. 3, edited by Cornelius Steelink and V. C. Runeckles. Appleton-Century-Crofts, 440 Park Av. S., New York, N. Y. 10016. 1970. Pp. 268. Illus. $14.50. This is the third annual volume prepared under the auspeces of the Phytochemical Society of North America, and presents papers by outstanding authorities under the general theme, "Phytochemistry and the Plant Environment". The first three chapters are concerned with the chemical responses of plants to elements of their chemical and physical environments. The interactions between higher plants and other organisms are taken up in most of the remaining chapters. This timely book is very highly recommended to all interested in phytochemistry, and biology.

DEDICATED TO
CARLOS A. GOMEZ RUPPEL

EVOLUTIONARY BIOLOGY, edited by T. Dobzhansky, M. K. Hecht and W. C. Steere. Under this title a hard cover book is published annually devoted to critical reviews, commentaries, and original papers on all aspects of evolutionary biology.

VOLUME 3. Appleton-Century-Crofts, 440 Park Av. S., New York, N. Y. 10016. 1970. Pp. 309. Illus. $18.00. The papers in this volume are concerned with cancer cells as temperature sensative mutants; origin of mammals; comparative ecogenetics of two **Avena** species in Central California; evolution of social bees; sexual selection in **Drosophila;** defenses against visually hunting predators; and evolution in parthenogenetic **Curculionidae.**

VOLUME 4. Appleton-Century-Crofts, 440 Park Av. S., New York, N. Y. 10016. 1970. Pp. 312. Illus. $16.00. The papers in ths volume are concerned with diverse approaches to systematics; the meaning of adaptation and its relation to natural selection; the usefulness of amino acid and nucleotide sequences in evolutionary studies: on the evolution of substrate control in differentiation; natural regulation of plant species diversity; lichen symbiosis; **Drosophila** viruses and their role as evolutionary factors; evolutionary interactions between species of North American salamanders in the genus **Plethodon;** and evolution of human threat display organs.

Each of these two volumes is provided with an author and subject index. The two volumes are highly recommended to all interested in biology.

PLANT LIFE LIBRARY—continued on page 140.

HERBERT MEDALIST—CARLOS A. GOMEZ RUPPEL

CARLOS A. GOMEZ RUPPEL

An Autobiography

I am the son of Carlos Gomez and Emilia Elvira Ruppel, and was born on July 7, 1909 in San Juan City, Capital of the Province of San Juan, Argentina.

Being very fond of Nature since my earliest recollections, I take a very keen interest in all its forms. From my early childhood I made long and patient observations of Nature's simplest manifestations. At first the larger specimens of our Fauna did not attract my attention very much, at least not to the point that small birds, doves, amphibians, and reptiles in general did. Grass snakes soon became the target of my hobby. I was lucky, however, in having then lived in an area lacking poisonous snakes or vipers.

But, possibly due to my knack of catching and observing Arthropoda (as a child I, of course, called them "bichos", that is to say "bugs"), they were rather victimized by me. "Wars" between ants of different species or tribes provided my infantile spirit untold hours of exciting observations, and how fascinating it was to spend the time watching fights between red wasps (genus *Pompillus)* and spiders which, many a time, were considerably larger than their tormentors. The wasp's agility and astuteness infallibly accounted for its victories. Just one sting was quite sufficient: in only a few seconds the poor spider, under the effects of the poison, started to tremble and very soon became completely paralyzed. The wasp would then start to drag its heavy load to its quite often distant underground cave, where the archnidian's body juices would serve as nourishment to the larvae of the *Pompillus.*

Is it strange then that with these inclinations and with the partnership of a girl cousin of my own age, we should undertake building up a "natural history museum"? At first it was merely limited to Zoology. We used to stuff birds and "prepare" snakes and lizards in ethylic alcohol, and so on. But, what became our outstanding feature was our collection of insects, a task placed in my charge. My age at the time was around 7 or 8 years old, my hobby lasting until I was 10—in San Juan—when Father, an officer of the National Mortgage Bank's branch, was transferred to the Mendoza City branch; bringing with it a better position. Consequently, I had to give up my share in the "museum" though not entirely, for my entomological cases came along with me.

Shortly after our arrival in Mendoza City, I discovered the "Juan C. Moyano" Natural History Museum, with its splendid collections where I spent many a joyful hour in deep contemplation. Therefore it is not strange to say that as soon as I got the chance I introduced myself to the famous Dr. Charles S. Reed, its scientific director; a most charming gentleman. When informed of my fondness of Nature

he invited me to collaborate with him in the entomological department. I forthwith accepted with alacrity and devotionally worked for many years with Dr. Reed, acquiring ability, dexterity, knowledge, and a very practical experience under his expert guidance and kind tutorship.

During their course in Zoology at the National College (high school) students had to present an entomological box as part of their duties. But, how was one to get insects in Winter? (classes here start around the end of fall). A neighbouring student, aware of my activities, begged my collaboration. I helped him with pleasure and prepared a small case for him, which well fulfilled his needs but, oh my stars! how soon I found myself involved with several students who came with the same requirements. Later on more and more turned up, ad infinitum.

Father's financial help was limited to my bare essentials. So after cudgelling my brains for a more affluent state of affairs it became obvious that the sale of well prepared and classified insects could be a good source of income. By charging 3 pesos (about u$s 2.30 at the then rate of exchange) for a case of about 30 specimens, I soon sold out my entire collection. I can recall earning 50 pesos (around u$s 38.50) a very large sum for me at the time, as with that money it was possible for me to go to Buenos Aires and spend my three-month's holiday at my grandmother's who was living in Nuñez, a few blocks away from the River Plate.

At the time—I was not quite 12 years old—there were floodable areas at the riverside, where the most extraordinary Flora and Fauna (as I thought) thrived. This zone has lately been retrieved from the river and a huge football stadium has been built on it.

I was an awfully happy boy spending my vacations there and my collection of insects soon exceeded my needs and made available a surplus for new sales to defray the expenses for further travels.

And so several years went by during which time I finished my secondary studies and had to make up my mind about the University career I should take up. As there were not many careers to choose from at the time, my parents recommended my taking up Medicine, possibly due to my inclinations.

So I enrolled at the La Plata Faculty of Medical Sciences where—in my second year—I obtained the job of paid helper in the Biological Chair, a post I was able to hold till the end of my studies and which greatly helped to solve my need for living expenses.

While a graduate student I specialized in allergy, attracted by its persevering correlation with plants, and my need for a doctorate thesis, which in February 1942, "Contaje de Polenes Anemófilos en La Plata" (Pollen Count in La Plata) won my professors' praise.

Having set up my practice in Mendoza, I soon joined the medical corps of the "Allergy Center." There I led a very fortunate time, as within a few years I became—through a competitive contest among other doctors—the Center's head, a post equivalent to that of a Chief of "Mixed Services", the highest post attainable in this country's

medical roster; one which is not easily obtained as postulating doctors must first request their retirement.

Always inclined to teaching, but lacking the specific teacher's degree, and having practiced many sports, I took up coaching, either successively or simultaneously, in such fields as swimming, mountaineering, skiing, skating, gymnastic exercises on the larger apparatus, etc.

I could have aspired to a Chair in the Faculty of Medical Sciences but I felt better fitted—and prefer—Chairs in secondary Schools where the youth give one a better chance to make a good job for their total formation.

Having obtained the chance of becoming Deputy Professor in the two-hour-a-week Chair of Hygiene, in 1951, I joined the staff of teachers and henceforth my onward path grew smoother and smoother. By the end of that same year I had gotten a sixteen-hour-a-week job, Shortly after this number of weekly hours of teaching I was lecturing 36 hours a week in three shifts. Quite understandably I found myself in a condition of incompatibility and had, either to resign to 12 hours of teaching or else resign my chieftainship in the Allergy Center. Though it may well seem inconceivable, the latter resignation was my choice and henceforth I no longer practiced as a doctor; becoming, exclusively, a professor in botany, zoology, anatomy and hygiene.

Under this stress I got a cerebral thrombosis in 1965 which, greatly to my annoyance, compelled me to ask for retirement; a request that was granted in 1968.

During the 1950's—I cannot recollect the date exactly—I started corresponding with Mrs. Marjorie S. Anthes of Encinitas, California, U.S.A., and which happy event largely influenced my future activities. This friendship yielded me a pleasant alliance.

In one of her letters, Mrs. Anthes said that "it seems incredible that your countrymen have not paid any attention whatever to the numerous species of Amaryllids which there grow so abundantly. The United States does not have them, but we heartily desire having them."

As may be inferred from the aforesaid, I took up collecting every interesting plant I came across during my excursions. A few Amaryllids were nursed at home and, with a few more that I hunted, a parcel of them was sent to Mrs. Anthes. Thanks to this friendship I made a few other contacts and these, in turn, brought me many others.

Several years went by and interest in wild plants began to increase as well as the number of correspondents all over the world. The zones of my raids increased exceeding the boundaries of my country. I got collections in Paraguay and Brazil where every single trip offered me remarkable new discoveries.

Groups of interested parties were formed in the U. S., groups that helped to finance these trips, for—as stated above—I am not a man of means. To all of those who have partaken in one way or another I here wish to express my sincere gratefulness, particularly so to those from California who were so enthusiastic with the material from my collections.

The West-central Argentine zone is relatively rich in species of the genus *Rhodophiala* and a few *Zephyranthes.* But, informed that the northern Argentine zone and the bounding ones contained a larger representation with many species of the genera *Amaryllis, Habranthus. Hieronymiella* (see Fig. 2), *Alstroemeria,* etc., I aimed my search in this direction, and was agreeably rewarded for my pains with interesting discoveries.

Fig. 2. **Hieronymiella aurea** Rav., showing bulbs collected by Dr. Ruppel and Sr. Y. Yanello at Zim-Zim, Salta, Argentina. Sr. Yanello appears in the picture. Photo by Dr. Ruppel.

My enthusiasm for the subtropical zones made me overlook Chile, situated practically "next door", so to speak, to my province. This neglect was a serious mistake. About three years ago I went into central Chile for the first time and was really astounded at the abundance of species of the family *Amaryllidaceae.* Since then I have undertaken about ten excursions into this country so well favored with Nature's gifts.

There the Rhodophialas and Alstroemerias amaze one due to their variety as well as on account of their abundance. During spring one finds the fields bountifully draped with such flowers as *Alstroemeria, Rhodophiala, Leucocoryne, Placea* species, etc., etc. to the extent that one has to tread on them as if one were walking on lawns if one wishes to make headway! As soon as the rains are over, though, these veritable gardens become transformed into real deserts until the following spring.

At present, thank God, my health has been fairly restored. However, as I am no longer a young man I am distressed to think that not

many years remain for me to comply, in full measure as is my wish, with my friends' requirements, nor shall I be able to give full swing to my enthusiasm. Let us trust in the Lord's wisdom Who knows what is best for us.

Casilla 370,
Mendoza, Argentina,
June 1970

1970 HERBERT MEDAL PRESENTATION TO DR. THADDEUS MONROE HOWARD, JR.

Mrs. Robert E. Herold, *San Antonio, Texas*

The WILLIAM HERBERT MEDAL for 1970 was presented to Dr. Thaddeus Monroe Howard, Jr., for his outstanding contributions

Fig. 3. Mrs. A. C. Pickard is shown presenting the 1970 HERBERT MEDAL to Dr. Thad M. Howard in award ceremonies held at the Witte Memorial Museum, San Antonio, Texas on April 13, 1970. Photo by Mrs. Robert E. Herold.

to the amaryllids, notably adding to the knowledge available on *Alliums, Bessera, Sprekelia* and other genera.

The award was given at the Amaryllis Judging School held by The Shasta Garden Club of San Antonio, Texas, Mrs. Edward T. Story, presiding, on April 13, 1970 at the Witte Memorial Museum. Mrs. A. C. Pickard, Official Amaryllis Judging Instructor from Houston, Texas read the citation and on behalf of The American Amaryllis Society presented the medal to Dr. Howard (Fig. 3).

Among those present were students of the school, members of the San Antonio Amaryllis Judges Council and invited guests.

The reader is referred to the 1970 issue of PLANT LIFE for the autobiography of Dr. Howard.

EDITOR'S MAIL BAG

Mr. J. F. Parsons, FRHS, 55 Roxburgh Road, Nuneaton, Warwickshire, England, an "enthusiastic amaryllisarian would like to get in touch with amaryllisarians in the United States, Australia and South Africa, to exchange information and bulbs."

Mrs. Betty C. Zorbach, under date of August 11, 1970, writes,—"I am sorry to inform you of the sudden death of Dr. William W. Zorbach late in June. As you know, he was an avid grower of Amaryllis and other amaryllids and this was one of his joys of life. We had planted many of our bulbs here at Houghton, Michigan, and many have bloomed after being wintered over in the University greenhouse."

Dr. Zorbach and his wife Betty authored the article, "Sucrose as the sole constituent of the Honey of *Crinum asiaticum*" in the 1968 PLANT LIFE. He wrote reports on his amaryllid activities in several issues of PLANT LIFE. He was born June 15, 1916 and died June 28, 1970, at Houghton Technological University, where he was Professor of Chemistry. Dr. Zorbach's many friends will miss him very much.

Mrs. David E. Wilson [Marcia Clint Wilson] writes under date of August 13, 1970, "We had a marvelous vacation trip into Mexico with mother (Mrs. Morris Clint) and she was an excellent instructor with all procedures in caring for plant material collected. She makes plant inspection as easy as possible for the U. S. Department of Agriculture and has always had a pleasant relationship over the years. When my husband picked up our bulbs the day after our return, the head of the local branch of the Department asked my husband: "Does Mrs. Clint have these bulbs grown for her in Mexico?" "No" replied my husband, "I was the chauffeur and I can assure you we dug each one!" See article in present issue.

Mrs. Wilson contributed the cover featuring *Zephyranthes clintiae* for the 1957 HERBERTIA which is dedicated to her mother, Mrs. Morris Clint.

Under date of September 3, 1970, Mr. Richard J. Sudd, 2568 Comstock Circle, Belmont, Calif. 94002, writes,—"My family and I have moved to California [from Des Plaines, Ill.] last year and are

EDITOR'S MAIL BAG—continued on page 128.

1. REGIONAL ACTIVITY AND EXHIBITIONS

THE 1970 AMARYLLIS SHOWS

The 1970 Amaryllis shows began with the Greater New Orleans Official All-Horticulture Show, and the Corpus Christi Official Amaryllis Show, on the same dates, April 11 and 12. Then followed the Official Greater Houston Amaryllis Club Show, on April 12. The Houston Official Amaryllis Show was held on April 19. The Greater Gulf (Mobile) Amaryllis Show, and the Southern California Official Amaryllis Show were held on the same dates, April 25 and 26. The Show season closed with the Hattiesburg Official Amaryllis Show, on May 9.

Mr. Fred J. Buchmann writes under date of October 15, 1970, that no Amaryllis show was held at Baton Rouge in 1970, but that an Official Show is being planned for 1971 in conjunction with the Men's Garden Club Spring Show.

It should be noted that at the Official Southern California Amaryllis Show "people still liked large bloom" since they finally chose 'Goliath' as number one flower on the second and last day of the show. However, at the end of the first day, the outstanding new species, *Amaryllis papilio,* the Butterfly Amaryllis, reigned as first bloom.

It would be worth while to obtain show visitor's participation to vote for first, second and third blooms at all of the Amaryllis shows beginning in 1971. It would be interesting to compare the first, second and third choices for each of the regional shows. Those in charge of the 1971 shows should plan accordingly.

1970 GREATER NEW ORLEANS OFFICIAL ALL-HORTICULTURE AMARYLLIS SHOW

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

The Men's Amaryllis Club of New Orleans sponsored their eleventh annual all-horticulture Amaryllis show over the week-end of April 11 and 12, 1970. For the second year in a row the Show was held at the Lakeside Shopping Center Mall. Over one thousand flower lovers viewed the Show, and many took the time to express their satisfaction with the staging as well as the quality of the horticulture to the members of the Show committee. Again this year (as in past years) one of the highlights of the Show was the competition table of single Amaryllis florets. Each year more and more Show visitors are attracted by the uniqueness of this display.

Over two hundred and fifty entries were made with almost one hundred and fifty being pot plants. Milo Virgin, Al Diermayer, and Walter Latapie won top honors in the Show. Mr. Virgin won the Walter Latapie Award with a massive 'Golden Triumphator', and a

sweepstakes award for the most blue ribbons in the registered and named hybrid sections. Mr. Diermayer won the Southern Seed and Popcorn Co. Award for the best specimen in the breeder's section, the T. A. C. Construction Co. Award for the best unnamed and unregistered hybrid (a charming greenish white miniature), and a special trophy for the best single floret ('Bianca'). Mr. Latapie won the sweepstakes ribbon for the most blue ribbons in the unregistered and unnamed hybrid sections, and the President's Trophy for the most blue ribbons overall. Mr. W. J. Perrin won the James Mahan Award (the award of merit runner-up trophy) for an outstanding 'Apple Blossom'. He also received the Ludwig Challenge Cup for this flower. The 1970 Show Chairman was Mr. Vincent Peuler. Mr. Al Diermayer was Co-Chairman.

CORPUS CHRISTI OFFICIAL AMARYLLIS SHOW 1970

Mrs. Carl C. Henny, *P. O. Box 3054, Corpus Christi, Texas 78404*

We are glad to report that we received 93 entries for our annual Coastal Bend Amaryllis Society Exhibit this year. Our Exhibit was held in conjunction with the "Festival of Flowers" held by the Corpus Christi Council of Garden Clubs on April 11th and 12th, 1970.

Fig. 4. Mrs. Levi Materne, winner of the Ludwig Challenge Cup at the 1970 Official Coastal Bend Amaryllis Society Show, Corpus Christi, Texas, April 11, 1970.

Among the Pot-Grown Registered and named Amaryllis were 'Ludwig's Daintiness', 'Ludwig's Striped', 'Siren', 'Apple Blossom', Ludwig's Ace', and 'Flora Queen'. Entries in the Registered and Named Leopoldii Cut Scape Section were 'La Forest Morton', 'Spring Dream', 'Franklin Roosevelt', 'Apple Blossom', 'Picotee Petticoat', 'Candy Cane', 'Royal Dutch', 'Happy Memory', 'Fiesta' and 'Picotee Dutch Doll'.

The Ludwig Challenge Trophy was awarded to Mrs. Levi Materne [Fig. 4] for her entry of the greatest number of "blue ribbon" winners in the Ludwig Registered and Named Amaryllis Section.

A "Special Trophy" to a non-member was awarded to Mr. J. B. Parr, for his entry of 'Mother Queen Superior', which scored 92 points.

A "Special Trophy"—to a Club Member—was awarded to Mrs. Carl Henny for receiving the greatest number of blue ribbons in the "Breeder's Class".

An "Achievement Trophy"—Club Member: was awarded to both Mrs. Robert B. Arnold and Mrs. R. A. Hornberger for entries in the Registered and Named Leopoldii Amaryllis classes, which were blue ribbon winners.

An "Award of Merit" was given by the Council of Garden Clubs—to Mrs. Robert B. Arnold, for her entry of 'La Forest Morton', which scored 96 points.

"Awards of Merit" were given by the American Amaryllis Society, affiliated with the American Plant Life Society,—to Mrs. Robert B. Arnold for her entry of 'La Forest Morton', scoring 96 points; and to Mrs. Herman Galloway for her entry of 'Picotee Petticoat', which scored 95 points.

Twenty blue ribbons, 15 red ribbons, 9 yellow ribbons, and 2 white ribbons were awarded by judges for entries in the exhibit. Judges for the exhibit were Mrs. Frank Hopwood, Mrs. Larry Miller, and Mrs. R. H. Parkinson, National Accredited Amaryllis Judges from San Antonio, Texas.

THE GREATER HOUSTON AMARYLLIS CLUB 1970 OFFICIAL SHOW

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

Due to an unusually cool Spring, with most of March nights quite cold, Greater Houston Amaryllis Club members reported their amaryllis did not develop sufficiently for our scheduled show date of April 12th. Therefore, we joined the Men's Garden Club Show, which was held April 26th in the Houston Garden Center. Both shows were outstanding and were viewed by an overflow crowd since those who came to visit either one of the shows were in for a double treat.

Some of the Men's Garden Club members are also amaryllis growers and they had an attractive display with many blue ribbons attesting to their ability. The highest score in their amaryllis division went to a pink seedling, a little lighter in color than 'Fairyland' but with more compact form, which was a hybrid produced by Mr. Kermit L. Warnasch, Houston, Texas.

Due to limited space, the Greater Houston Amaryllis Club omitted their usual impressive staging, and Arrangements Chairman Mrs. G. D. Everett used a few colorful arrangements of amaryllis to high light the room.

Needless to say, the center of attention was the trophy table which held the outstanding specimens in the show, with winners as follows:

Highest award—silver tray—to Mrs. Sally Fox for 'Glorious Victory', a beautiful salmon amaryllis.

Ludwig Challenge Cup to Mrs. P. A. Froebel for 'Trixie', a large cherry red blossom.

The above two winners also received Awards of Merit from the American Amaryllis Society.

Mrs. Chas. H. Pease won a silver covered dish for the best miniature 'Black Magic' which was one of her hybrids. She received a Preliminary Commendation Award.

Mr. Kermit L. Warnasch won a silver tray for best seedling, along with a Preliminary Commendation Award. He also won the Sweepstakes Award.

Mrs. A. C. Grebe received a silver dish for an outstanding American Hybrid of unusual rose coloring.

All classes were judged by official amaryllis judges selected by the Chairman, Mrs. C. L. Mercer.

There was not sufficient room for an Educational Exhibit; however, those visiting the show who showed a bit of interest were encouraged to try their hand at growing these imposingly beautiful blossoms by the hostesses who enthusiastically explained that it actually takes very little effort to get such grand dividends.

Mrs. W. S. Wheeler acted as Show Chairman, assisted by Mrs. Sally Fox. Both felt the seedling division was one of the most popular spots in the room as the visitors viewed the new and quite outstanding blossoms which were produced by novice hybridizers.

Mrs. John H. Ellett is President of the Greater Houston Amaryllis Club and complimented the Show Chairman and her various committees for goal fulfilled—"promoting interest in growing amaryllis".

1970 OFFICIAL HOUSTON AMARYLLIS SHOW

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

The annual Amaryllis Show of the Houston Amaryllis Society held its official Spring show on April 19, 1970 at the Garden Center.

As usual we had anticipated exceptional bloom this season, how-

ever, the combination of extended cool nights and cloudy days had a serious effect on length of scape and quality of bloom.

While waiting for the garden bulbs to bloom, we were enjoying beautiful pot grown Amaryllis that were potted the first of the year; but one is never satisfied to stage a show with only those grown under controlled conditions however perfect they are.

It has been our philosophy to encourage the growing of Amaryllis in the garden. We have found this to be rewarding as each year the increasing interest among garden Amaryllidiarians that visit the show indicate they are adding more and more to their collections.

We have become a tradition for the garden minded in this region and elsewhere.

The classification of entries included the named and unnamed species from Division 1 through Division 8 with the exception of Divi-

Fig. 5. Houston Official 1970 Amaryllis Show, artistic section: Left, exhibit by Mrs. Arnold Kitzmiller; and Right, exhibit by Mrs. R. S. Culpepper, President of the Houston Amaryllis Society.

sion 2, long trumpet. Division 9, unclassified Dutch unnamed and non-registered clones created added interest to the show.

The Educational section, showing the various methods of propagation encourages the new grower to try his luck at hybridizing.

For many years members of the society have been growing Amaryllis from seed and these plants coming into maturity are bringing new colors and forms into cultivation adding worthy meritorious introductions.

American Amaryllis Society award winners were:

'Apple Blossom' (cut specimen) Lud. R. #422-D. 5A—highest A.M. Mrs. L. E. Morgan.

'White Christmas' (cut specimen) V.M. R. #534-D. 5A—Mrs. Arnold Kitzmiller.

'Trixie' (potted plant) Lud. R. #706-D. 5A—Mrs. A. C. Pickard.

'Takarasuka' (cut specimen) Lud. R. #881-D. 5A—Mrs. A. C. Pickard.

'Pamela' (Miniature) (potted plant) Lud. R. #559-D. 8—Mrs. Ward H. Blair.

Breeders Class—preliminary commendation, Dutch Seedling—Mrs. A. L. Hammond.

Collection of five (5)—'Apple Blossom' Lud. R. #422-D. 5A—Mrs. A. C. Pickard.

Sweepstakes Winner—Mrs. A. C. Pickard.

An added feature was the impressive Amaryllis arrangements by members of the Amaryllis Society (Fig. 5). The focal point of interest was the display of the award plants and silver trophies awarded to the winners.

The visitors, both local and out of town expressed their pleasure for another educational presentation. The Amaryllis Handbook (Guide to Culture) written and published by Mrs. A. C. Pickard (founder of the organization) was much in demand as it was displayed in the Educational Section.

GREATER GULF AMARYLLIS SHOW, 1970

W. A. McCollum, *President, Amaryllis Society of Mobile,*
57 Hillsdale Lane, Mobile, Alabama 36608

The Greater Gulf Amaryllis Show was held on April 25 and 26. The entries totaled 217, and the Show was a decided success. Approximately 5,000 persons visited the Bel-Air Mall where the Show was held. The theme of the show was "Deep South Beauty".

SOUTHERN CALIFORNIA OFFICIAL AMARYLLIS SHOW 1970

I. K. Rosoff, *Show Chairman,*
5617 Natick Avenue, Van Nuys, California

W. Quinn Buck, *Show Co-Chairman,*
26 E. Camino Real, Arcadia, California

The Sixth Official Amaryllis Show of the Southern California Hemerocallis and Amaryllis Society was held at the Los Angeles State and County Arboretum, 301 N. Baldwin Avenue, Arcadia, California, on Saturday and Sunday, April 25, and April 26, 1970, entitled "A Carnival of Color", the theme of the show. To emphasize the theme, Joe Werling designed and printed the show schedule cover in blue and orange on chartreuse colored paper. The show emphasis was "GARDEN GROWING OF AMARYLLIS" and the displays pointed up the fact that these spectacular plants exist in various colors, sizes and shapes.

In the spring the most common ones seen are the *Amaryllis johnsonii* variants, with only a few white bi-colors on display. Oddly, the gardeners growing large displays of various Amaryllis in their yard gardens are for the most part born in Europe and emigrated to this country in their mature years. They are acquainted with the greenhouse grown flowers and are trying to raise the European bulbs in their outdoor gardens, but with not too much success. After seeing the displays of the various hybridizers (Plant Life, 1969, page 29), their interest was renewed and they are in the market for the local bulbs. To these gardeners the fall amaryllid, the pink colored *Brunsvigia*, is still thought to be a lily! More amaryllid public relations are needed.

This year we had a few weeks of unusual warm weather a month or so prior to the show, and then it turned cool, forcing the greenhouse potted bulbs to mature earlier. Most of the exhibits were garden grown with enough greenhouse or sheltered potted plants to make a fine competitive exhibition.

THE AWARDS AND WINNERS ARE AS FOLLOWS: SWEEPSTAKES—Cecil Houdyshel Memorial Trophy,—S. S. Harshbarger; SWEEPSTAKES RUNNERUP—So. Calif. H & A Soc. Trophy,—Leonard Doran; BEST REGISTERED LUDWIG VARIETY—Ludwig Challenge Cup,—Tom Humphreys, La Jolla, with 'Goliath'; BEST REGISTERED LARGE FLOWERED HYBRID (other than Ludwig) —So. Calif. H & A Trophy,—S. S. Harshbarger, with 'Hellas'; BEST MINIATURE—Mrs. Gladys Williams Award,—I. K. Rosoff; BEST MINIATURE RUNNERUP—So. Calif. H & A Soc. Award,—I. K. Rosoff; BEST SEEDLING—Show Chairman's Award,—S. S. Harshbarger, a white with ruffled petals; BEST SEEDLING RUNNERUP—So. Calif. H & A Soc. Award,—W. Quinn Buck, #50 Seedling (an unusual mauve pink color); BEST FLOWER IN SHOW—Judges Award, —W. Quinn Buck, Seedling; POPULARITY POLL WINNER—President's Award,—Tom Humphreys, La Jolla, with 'Goliath'; AMERICAN AMARYLLIS SOC. AWARD OF MERIT—S. S. Harshbarger, with 'Hellas'; and Dr. Kelly Spearman, with 'Brilliant Star'.

AMERICAN AMARYLLIS SOC. PRELIMINARY COMMENDATION: W. Quinn Buck—#50 Seedling; Ed Pencall—Rose Seedling; and S. S. Harshbarger—White Seedling.

SPECIAL AWARD: A Rosette to Mrs. Gladys Williams—a new species, rare and beautiful, *Amaryllis papilio* (See 1970 Plant Life, page 83, Fig. 21). Compare with Mrs. Williams' entry.

SPECIAL AWARD: A Rosette to Mr. Leonard Doran—*Amaryllis pardina* Hybrid—a double raised from his own seed, beautiful spotted and yet different.

AWARDS TO: Mr. Bruce Claflin of Upland; Mr. E. A. Angell of Loma Linda; Mrs. Marie Turner of Temple City; and The Chadwicks of Redondo Beach, all growers and hybridizers of Amaryllis, who supplied the show with hundreds of blooms that made the exhibit hall a mass of color and beauty.

Letters of appreciation to Mr. G. Keep of Sepulveda, a commercial grower of Amaryllis, and J. S. Vosberg of Sunland, a grower and sales-

Fig. 6. Exhibits at the Southern California Official Amaryllis Show, 1970. **Upper left,** Floral arrangement; **upper right,** exhibit of yellow Clivias; **lower left,** part of exhibit of potted hybrid Amaryllis; and **lower right,** exhibit of **Amaryllis papilio.**

man of plants and bulbs for many years.

A SPECIAL AWARD: A Rosette for the exhibit, and a plaque for the research being made to find better methods of clonal increases, to associates Roger Boddaert, Irving Cantor and Robert Epstein, on a group of outstanding yellow *Clivia* cultivars: *C. citrina* and *C. kewenses,* an English hybrid. Clivias in the southland are quite common, but all are of a pale orange yellow to reddish orange. This exhibit was a show stopper (See Fig. 6).

In the past, our floral arrangements were made and exhibited by florists. This year our members' wives were asked to try their skill in this art. No individual awards were to be given, and no name cards shown. Only home grown flowers and Amaryllis were to be used, and all receptacles individually improvised, such as coffee cans, jars, bowls, boxes, etc. The results were so unusual even the men stopped to look and admire. See Fig. 6. Mrs. Gladys Williams, Marie Creach, Ruth Fesmire, Dorothy Rose and Marian Harshbarger entered one or more exhibits. A special award ribbon was given, but no one knows what happened to the award when the show closed.

In the 1969 show Ed Pencall exhibited his flowering seedlings in large containers and made an eye-catching exhibit. This year his exhibit was a wooden box almost 3 feet in all dimensions, containing 25 scapes having 69 blooms of white seedlings. This exhibit was placed just inside the hall, and more pictures were taken of this exhibit than any other in the show. A Rosette was given for this outstanding specimen.

Again, Amaryllids were shown with more members bringing in their specimens. Mr. F. T. Ching, Director of the Arboretum, contributed a number of *Crinum* Species that were in bloom; Mrs. C. H. Welborn, *Crinum* 'Ellen Bousanquet'; J. S. Vosberg, *C. 'powelli album';* I. K. Rosoff, *C. kirkii* and 'Cecil Houdyshel'; Joe Werling, *Sprekelia;* Marie Creach, *Cyrtanthus;* and a large collection of *Haemanthus,* none however, in bloom. Mr. W. H. Gilliam of Oxnard, a large pot of *H. katherinae;* and I. K. Rosoff, ten species, no two having the same leaf formation. No awards given.

A card gave the date, time and place of our Fall meeting that is devoted to Amaryllids in blossom then, re-blooming *Amaryllis, Lycoris, Nerines, Crinum, Haemanthus, Brunsvigia, Vallota purpurea,* and various *Zephyranthes.*

The Arboretum turnstile count Saturday and Sunday was 11,000. Of this number, 3000 visited our show and cast over 800 votes for the best flower in the show. Only a few votes separated the four top runners, and they were (listed alphabetically) as follows:

Mr. Doran's Pardina Hybrid; Mr. Harshbarger's white seedling; Mr. Humphrey's 'Goliath'; and Mrs. Williams' *Amaryllis papilio* (a large, a medium and two small blooms).

Saturday's count showed *Amaryllis papilio* ahead by 39 votes, and the second choice also a small one (See Fig. 6). Sunday's votes changed everything. 'Goliath' first, followed by the next larger bloom. The

number of votes separating top and bottom was 51. People still like large blooms.

The certified judges were: Mrs. Kenneth Anderson, Mrs. Eva Turnquist, Mrs. Gladys Williams, Mr. Quinn Buck, Mr. Roger Fesmire, and Mr. Jack McCaskill. Clerks, Charles Hardman and Joe Werling.

Credits are due to Jack McCaskill, Photographer; Joe Werling, Printing, Show Cards and Signs, and V. Romito, Photo Engraving Negatives and Prints.

HATTIESBURG OFFICIAL AMARYLLIS SHOW 1970

Mrs. Sam Forbert, *1910 Evergreen Lane, Hattiesburg, Miss. 39401*

The Hattiesburg Amaryllis Society held its annual spring show at the Garden Center, May 9, 1970. The theme of the show was "Around the World with Flowers". Much interest was shown in both the horticulture and artistic design divisions.

Sweepstakes award, a silver tray, donated by the Amaryllis Society, Inc. of Alabama, was won by Mrs. Ruth Bethea. An award of merit, a silver tray donated by Mrs. R. A. Fowler, was won by Mrs. O. F. Coursey of Moss, Miss., for the clone 'Apple Blossom.'

Other winners were Mrs. H. W. McGee and Mrs. Johnnie Jackson, who won silver trays donated by Kling Florist and Fisher Florist, for the best in the cut Reginae type and Leopoldii type Amaryllis. Mrs. Ruth Bethea won the silver award donated by the Hattiesburg Amaryllis Society.

In the art Exhibit, Mrs. Debbie Bright won the Davis and Parker Paint Store award. Tri-color, silver tray, donated by Southland Florist for best design in a designated class was won by Mrs. J. O. Mayo for "Changing of the Guard." Mrs. U. J. Lucas won the creativity award for a design titled, "Paris Sidewalk Cafe."

The horticulture judges, all from Mobile, Alabama, were Wilmer H. Smith, Mr. and Mrs. Jeff A. Brown, Mr. and Mrs. Dewey Hardy, and Mrs. A. B. Palmer. Artistic design judges were from Laurel, Miss.—Mesdames John E. May, Virgil Kirkland, and Otto M. Wansley, Sr. Prior to judging, the judges were entertained in the home of Mrs. D. R. Cole and later the judges were guests at a luncheon at a local restaurant.

THE AMERICAN AMARYLLIS SOCIETY STUDY COURSE FOR THE AMARYLLIS JUDGE'S CERTIFICATE

Mrs. A. C. Pickard

Amaryllidaceae (Am-ah-ril-i-day see-ee), the Amaryllis family, is a large group of widely distributed perennial herbs growing from bulbs, or rhizomes.

An Amaryllis is a member of one genus usually bearing from two to several lily like florets on a single leafless scape. The blos-

soms are of various sizes, from miniatures to giant sized blossoms. The varying forms of the flower ranging from the long trumpet, like the Easter Lily, to the open faced Dutch hybrids. There are double forms and irregular orchid shapes. The colors range from pure white, pink, red, scarlet, salmon, pastel tints, blends and stripes.

The word "Amaryllis" is the classical name given the plant by Linnaeus, the great Swedish botanist. The word is derived from the Greek word "Amarysso", meaning "to sparkle" and refers to the surface texture of the blossom.

The name, "Belladonna", is the Italian for "beautiful lady". The master plant recorder and botanist Linnaeus finally adopted the name Belladonna in combination with his new generic name, Amaryllis. For more than 250 years various forms of Amaryllis Belladonna have been in cultivation and crossed with other species and this has opened up a great field for the plantsman. The common form of *Amaryllis belladonna* is grown in Florida, known as Florida red, is botanically referred to as *A. belladonna* var. *major*.

The American Amaryllis Society has classified *cultivated* Amaryllis in nine Divisions on the basis of the chief characteristics of each group. Further sub-divisions may be made within each of the nine divisions. Each division contains many varieties. This form of classification is necessary, as the foundation for exhibition schedules and as the basis for Amaryllis breeders. Familiarity with the flower and its parts is necessary to intelligent evaluation.

In order to simplify the classification, the nine divisions of cultivated Amaryllis have been arranged in numerical order with a brief description of the distinguishing characters of each.

Division 1. (D-1) Includes all the cultivated wild Amaryllis species, sub-species, varieties and forms. The majority of species are native to Bolivia, Brazil and Peru. Example: *A. striata* var. *fulgida*.

Division 2. Long-Trumpet (D-2). The whole flower is very long and trumpet shaped, similar to the Easter Lily. The pedicels are relatively long and the flowers are distinctly drooping. The tepaltube is very long, 4½ to 5½ inches. Example: *A. elegans* var. *ambigua*, —color of flowers white striped with pink lines.

Division 3. Belladonna type hybrids. (D-3) The flowers are much shorter than in Division 2 and gracefully drooping. The pedicels are long and the tepaltube less than 4 inches in length. They show the influence of species with the informal flower structure of *Amaryllis belladonna, Amaryllis vittata* and others. Example: (a) *A. johnsonii* (b) 'Christmas Joy'.

Division 4. Reginae type hybrids (D-4). The pedicels are shorter than in Division 2 and 3. The tepaltube less than 2 inches in length. The flowers are slightly drooping, horizontal or slightly upright and are moderately open faced. When viewed sideways, the flower length exceeds 4 inches. The tips are rounded or slightly pointed. There are two sub-divisions in Reginae. D-4A—markedly imbricated type. The tepalsegs overlap ¾ or more of their length. Tips of segs are rounded

or slightly pointed. Example: 'Friendship'. (V.M) D-4B.—This is the less imbricated type. The tepalsegs overlap less than ¾ of their length. The segs are sometimes reflexed. The tips are rounded or pointed. Example: 'Picotee' (Ludwig).

Division 5. Leopoldii type hybrids (D-5). The flowers are similar to those of Division 4 except the flowers are wide open flat form. When viewed sideways, the length must not exceed 4 inches. There are two sub-divisions in this division. D-5A.—The tepalsegs are imbricated almost their entire length. The tips are rounded. Example: 'Boquet' (Ludwig) D-5B.—The flowers are similar to D-5A except the segs are less imbricated. The tips are rounded or slightly pointed. Example: 'La Forest Morton' (Ludwig).

Division 6. Orchid flowering type. (D-6) The tepalsegs are not arranged according to the usual flower pattern. They are variously shaped, twisted or extremely reflexed, similar to *Sprekelia* (the Aztec Lily). Example: 'Cannae Butterfly.'

Division 7. Double hybrids (D-7). This division includes the semi-double and fully double forms of hybrids under culture. The flowers have two, three or more rows of segs, each seg narrowing and shortening toward the center of the flowers. There may be petaloid "ears" in the center. Example: 'Helen Hull.'

Division 8. Miniature type hybrids (D-8). Distinctly dwarf statured types, including various flower forms. The flowers harmonize with the smaller scape diameter and height. Example: Gracillis hybrids; ('Fire-Fly').

Division 9. Unclassified hybrids. (D-9) Meritorious hybrids that cannot be placed with certainty into any preceding Division.

The flower form and structure make up the chief difference between Reginae hybrid (D-4) and Leopoldii hybrid (D-5). The Reginae flower moderately open faced but not flat. The Leopoldii flower is a wide open flat form.

Familiarity with the Divisions of cultivated Amaryllis is necessary to intelligent evaluation.

A mature plant produces inflorescences and fruit.

A *clone* is the original and offspring reproduced by asexual methods (vegetative method of reproduction). An *unnamed seedling* refers to the seedling grown from a particular seed before there is any increase by vegetative means. *Unnamed clone* refers to the unnamed seedling plus any of its increase by vegetative means. After the unnamed clone receives a name and is registered, it is referred to as a *named clone,* such as 'Apple Blossom', 'Boquet', etc.

Besides the essential reproductive organs, there are several accessory parts:

Inflorescence is the flower bearing stem or stalk consisting of the scape, spathe valves, pedicels and the blossoms. It is the flower cluster.

A *scape* is a leafless stem that rises from the bulb (without foliage) which supports the bloom.

An *umbel* is a flower cluster of two or more flowers that rises from the same point on top of the scape.

A *pedicel* is a stem of one flower in a cluster. (The support or arm of the flower.)

Spathe-valves are leaf like bracts enveloping the immature flower buds and protect them from injury before they open.

Tepalsegs are the six parted portions of the blossom. The three posterior tepalsegs are setepalsegs (abbreviated to setsegs). These are usually broader than the three inner tepalsegs.

Petepalsegs are the anterior tepalsegs and are called petsegs for short.

Note.—Observe the difference in size of the tepalsegs as they make up the characteristic form of the flower.

Tepaloids are characteristic of some Amaryllis hybrids. Sometimes the tepalsegs are variously lobed or twisted near the center. They vary in width, shape and length. They are sometimes referred to as "ears".

Nectaries are glands for the production of nectar and fragrance, attracting insects and birds that transfer the pollen from the anthers to the stigma of the blossom.

The flower organs of reproduction are formed partly inside the perigone. The *stamens* are the male reproductive organs. These are composed of very small stems called *filaments,* which are topped by two lobed *anthers.* When mature, the lobes split lengthwise and expose the *pollen* grains necessary for pollination of the blossom.

The *pistil* is the female reproductive organ. It consists of the *ovary, style* and *stigma.* The stigma is the capitate or three-lobed structure that receives the pollen.

An Amaryllis hybrid is a plant resulting from a cross between parents unlike one another in one or more heritable characteristics.

Conformity to Division standards is of first importance in the placement of entries in Amaryllis shows. Amaryllis can be judged for flower structure and flowering habit by Division standards only.

Group entries in various colors, shapes and sizes make the show more interesting. There may be a collection, minimum of 5 scapes all same variety; or 5 different types; or mixed colors.

Specialization is excellent for Flower Shows. Some think it is more spectacular and more exotic to feature Amaryllis only at an Amaryllis Show, while other Shows sometimes show the *Clivia, Crinum, Eucharis, Nerine, Narcissus,* etc. These other Amaryllids may be included to give variety and information about the 85 genera and 1000 species in the large *Amaryllidaceae* family. To the general public, these just named are other kinds of flowers, because in shape, size, etc. there is no resemblance to *Amaryllis.* With the exception of *Narcissus,* no detailed classification of the flower types of the other Amaryllids is available.

Anthers may be removed without penalty (if permission is granted by the show committee) in order to prevent pollen dusting over the segs, or for other prevailing reasons.

Amaryllis scapes grow tall and it is often necessary to stake them. If the stakes or ties are not conspicuous then no deduction in points is made.

Character scored:	Method of Rating	Possible score single specimen	single scape	potted plants 2 or more scapes
1. Perfection of flower shape	Rating is to be strictly within the division standard on the basis of beauty of form	15	15	15
2. Conformity to flower color standard	No flower of inferior color is to be considered. Whenever possible rating is to be on the basis of a verifiable color standard (chart) in order to avoid errors due to difference in individual color perception	45	45	35
3. Flower size	Since flower size is dependent on the flower division, the sizes recognized in the particular division concerned should govern	15	15	15
4. Length and character of scape	The length of the scape should be considered in relation to the size of the florets	5	5	5
5. Number of florets per scape and number of expanded flowers (number of florets per scape includes unexpanded and expanded flowers)	Only 3 or more flowers per scape are eligible. For two **expanded** flowers per scape, allow 3 points; for 3 allow 5; for four or more, allow 6 points. In miniature 2 or more flowered scapes are eligible; allow 4 points for two expanded flowers, 6 points for three or more	6	6	6
6. Number of scapes per plant	This category applies only to potted plant exhibits. Allow 8 points for one scape; 9 points for two scapes; 10 points for three or more scapes	—	—	10
7. Fragrance	Allow 2 points for fragrance, not too faint or too strong; deduct 2 points if fragrance is lacking	2	2	2
8. Foliage *	This category applies only to potted plant exhibits; for foliage absence deduct 2 points; for foliage not much developed, allow 1 point; for well developed foliage allow 2 points	—	2	2
9. Condition of exhibit	Exhibits in prime condition are to receive the full allowable points; those failing to come up to standard are to be penalized accordingly	12	10	10
	Total possible score	100	100	100

* Leaf growth that comes along with the flower scape is very desirable but some varieties do not produce foliage until the flowers have appeared. Leaf growth is quite frequently the result of temperature control. The foliage usually appears before the blossom scapes in yard grown **Amaryllis.**

OFFICIAL AMERICAN AMARYLLIS SOCIETY SHOW RULES

The official awards of the American Amaryllis Society may be presented at any Amaryllis Show or Amaryllis division of a general flower show which complies with the rules of the Society.

(1) All flowers exhibited are to be expanded in half or more direct light to show the typical flower color of the florets. Judging in all

cases is on the basis of open blossoms and number of blossoms per scape. *Never* on the basis of the total number of blossoms of the potted plant.

(2) All exhibits must have been grown by the exhibitor. All plants in his possession less than one year should be classified and judged separately. All greenhouse grown plants should be classified and judged separately from yard grown plants.

(3) The Award of Merit is offered to the named and registered exhibit rating 95 or more. Second and third prizes may be offered in each division.

(4) In order to have only flowers in their prime condition, it is permissible to remove any scapes with fading flowers.

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

In listing *named* clones, it is important to inclose the names in single quotation marks, thus: 'La Forest Morton', 'Maria Goretti', etc. Do not underline, or put in all capitals.

The Amaryllis Judges Training Course concerns the Amaryllis plant, the wild and cultivated Amaryllis, the Divisions of cultivated Amaryllis, and the judging of Amaryllis specimens and potted plants at Amaryllis Shows.

The Amaryllis Judges Certificate indicates the applicant is qualified to judge in the Horticulture division of Amaryllis, as of the date issued.

AMARYLLIS JUDGES' CERTIFICATES

Since the last report in the 1969 Amaryllis Year Book (page 32), the following numbered Amaryllis Judge's Certificates have been issued by the American Amaryllis Society:

No. 179. Mrs. James Edward Hamner, III, 2922 Mayfair Drive, San Antonio, Texas 78217. Horticulture only.

No. 180. Mrs. R. D. Bragg (Jewell), 1627 Mardell, San Antonio, Texas 78201. Horticulture only.

No. 181. Mrs. Henry W. Gomez, 2907 Chisholm Dr., San Antonio, Texas 78217. Horticulture only.

No. 182. Mrs. Kathleen Hart Wyner, 311 W. Hollywood, San Antonio, Texas 78212. Horticulture only.

No. 183. Mrs. Gilbert H. Yarbrough, 442 E. Gerald Av., San Antonio, Texas 78214. Horticulture only.

No. 184. Mrs. G. Browning Smith, Rt. 3, Harlingen, Texas 78550. Horticulture only.

No. 185. Mrs. Paul J. Opper, 237 E. Summit, San Antonio, Texas 78212. Horticulture only.

No. 186. Mrs. Harley E. Crouch, Box 1408, San Antonio, Texas 78586. Horticulture only.

No. 187. Mrs. Robert B. Arnold, P. O. Box 245, Ingleside, Texas 78362. Horticulture only.

No. 188. Mrs. D. A. Ingalls, 515 Nardac Place, San Antonio, Texas 78218. Horticulture only.

No. 189. Mrs. David P. Martin, 105 Cas Hills, San Antonio, Texas 78213. Horticulture only.

No. 190. Mrs. Emma Mae Allen, 210 Alpine St., Chickasaw, Ala. 36611. Horticulture only.

No. 191. Mr. W. A. McCollum, 57 Hillside Lane, Mobile, Ala. 36608. Horticulture only.

No. 192. Miss Mildred Laughlim, 701 Dauphin Island Parkway, Mobile, Ala. 36606. Horticulture only.

No. 193. Mr. John R. Clark, 4456 Bush Lane, Mobile, Ala. 36619. Horticulture only.

No. 194. Mrs. Mittie Young, 303 Hillside Drive, Chickasaw, Ala. 36611. Horticulture only.

No. 195. Mrs. Wm. P. Cazalas, 160 Randolph St., Mobile, Ala. 36609. Horticulture only.

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

TRAUB—NEW AMARYLLIS SPECIES—continued from page 47.

cm. wide, acute-apiculate; 2 side setsegs elliptic, 6.4 cm. long, 2.9 cm. wide, acute-apiculate; 2 side petsegs elliptic, 6.6 cm. long, 2.5 cm. wide, bluntly sub-apiculate; bottom petseg, linear, 6.2 cm. long, 1.3 cm. wide, bluntly sub-apiculate. *Stamens* fasciculate-declinate-markedly ascending; anthers at anthesis 5 mm. long, pollen yellow. *Style* declinate, markedly recurved; stigma capitate, obscurely 3-lobed. *Capsule* very deeply lobed, lobes extending downward markedly; seeds D-shaped, flat, black, winged.

Range.—Known only from the nomenifer locality, midway between Corioco and Caranavari, La Paz Province, Bolivia.

Notes.—The flowers were long lasting, over two weeks; two flowers opened at a time in succession. One very small bulb produced a 1-flowered scape, but the flowers were almost as large as in the 4-flowered scape.

2. LINEAGICS

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

COLLECTING TRIPS INTO CHILE, 1968 & 1969

Carlos Gomez Ruppel

In the following commentary I shall refer to two trips, both of them undertaken between September 20 and October 15 though without fixing any further dates but stating only the localities visited.

The trip from Mendoza to Santiago lasts 45 minutes by air, whereas it takes 13 hours to do the same by train. In spite of the discomfort, I had always gone there by train as from the windows of the railroad car I could better contemplate the vegetation, thus getting a better idea of the plants I might find later on when carrying out my excursions to those places which appeared to be interesting.

My goal was Quilpué City, only a few kilometers from Valparaiso, Chile, where I made friends with Professor Otto Zöllner, a courteous botanist to whom I am indebted for determining some of the species collected.

In a gently sloping "campo" (i.e. a very large field) right at the south of this progressive city, I found—notwithstanding a terrible drought affecting nearly all the country—several bulbous or rhizomatous plants in full anthesis: *Calydorea speciosa* Herb., *Iridaceae* with white flowers, 5 centimeters in diameter, with dark spots in their middle; white flowered *Leucocoryne*, some of which have an agreeable smell and are, therefore, "harvested" in baskets and sold in the flower markets, mostly in Santiago, Chile; two small plants rather like *Rhodophiala,* due to their bulbs and leaves; two blue flowered *Liliaceae,* very ornamental and long lasting after cutting: *Pasithea coerulea* (R. et P.) D. Don (see color plate in "Flores Silvestres de Chile" by C. Muñoz Pizarro, page 146) and a *Conathera* sp., possibly *biflora,* flowering quite well in pots and easily cultivated; Two *Lobelia* spp. and a white *Oenothera, Lavausia mitica,* and so on.

I recommend visiting this easily reached "campo" (which is so near Quilpué) during the normal rainy season, towards the end of September for it must then be a veritable paradise with its abundance of flowers.

AN EXCURSION TO QUINTEROS. Coastwards, to the east of Quilpué, Professor Zöllner and I arrived at Valparaiso. Thence northwards along a magnificent road, passing through Viña del Mar—a sumptuous seaside resort—and Concón until we got to the Quinteros zone. A few kilometers to the north of this city, among some pasture lands I observed a large bed of red flowers in the distance, which, on getting nearer, turned out to be *Phycella bicolor* (R. & P.) Herb., a magnificent species which so far I had only encountered in pictures and which I had been hunting anxiously. We herborized, took several snapshots and took up a few bulbs (Fig. 9).

This species grows in high, well-drained lands, therefore in rich, black soil, sand and gravel, receiving fitting rains during the months of July through September, and finally flowering around the end of the latter month. By November everything becomes dry till the following season. It flowers upright, with its long narrow leaves among the

Fig. 7. Sketch showing Dr. Ruppel's collecting trips in Central Chile during 1968 and 1969. Cross-hatched lines indicate in general the places explored.

high grass which shade its roots keeping them cool, though the flowers themselves flourish in full sunlight.

Later on, crossing the road to the left, towards the sea, we walked up to some sand dunes, about 500 meters away where a varied vegetation thrived. This consisted in *Puya chilensis* with its greenish yellow inflorescence; *Alstroemeria* spp. with thin leaves and long stems; *Rhodophiala* spp., ferns and *Nothoscordum* sp. in the shady places.

Fig. 8. **Leucocoryne violascens** R. A. Phil. Collected by Dr. Ruppel at Llay-Llay, near Quilpué, Chile.

EXCURSION TO PANGUE, in the province of Santiago, between Casa Blanca and Curacaví. A few hills rise up in this zone and, at the time, were barren due to the aforementioned drought. A stream runs at the base of the hills. At the edges of this stream there was a fair

Fig. 9. **Phycella bicolor** (Ruiz. & Pav.) Herb. Collected by Dr. Ruppel at Quinteros, Chile. Photo by Dr. Ruppel.

vegetation among which I found, after a slight search, an *Alstroemeria* sp. with bright leaves having pubescent edges, relatively large, which I shall call Alst. sp. No. 10 "Pangue". I then walked up to the hills and found *Tropaeolum tricolor* (See Muñoz Pizarro's book page 122), which, with climbing branches and bushes, make up a pageant of color and beauty. I have not seen it cultivated, so that I dare say this is not easy. But it certainly should be worth while trying to domesticate it.

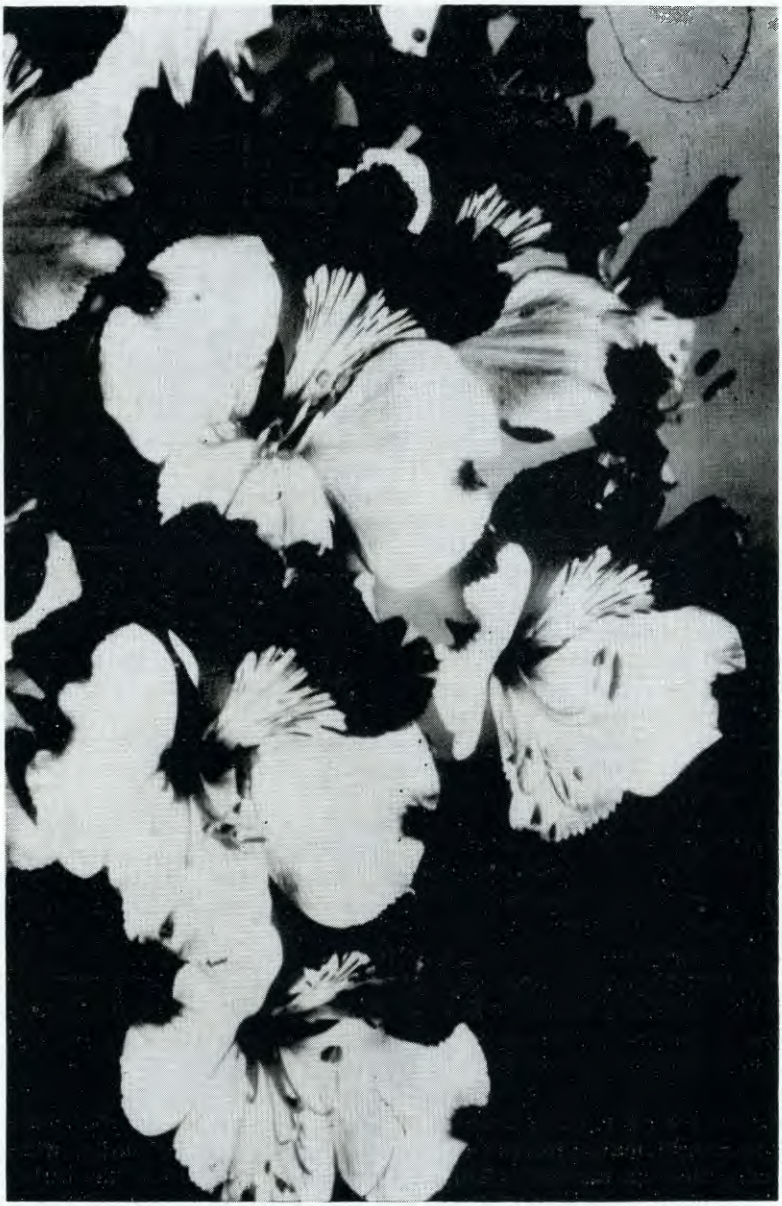

Fig. 10. **Alstroemeria** sp. collected by Dr. Ruppel at Zapallar, Chile. See map, Fig. 7. Flower scape enormous; flowers lilac-salmon. Photo by Dr. Ruppel.

EXCURSION TO CUESTA PELVIL. I left Quilpué and steered towards Santiago. It was painful to see the effects of the drought; wherever one looked one could see acre upon acre of dead cultivated plants, especially fruit trees and olive groves.

In spite of the poor prospects I planned a sally to the so called Cuesta Pelvil, a few kilometers to the south of Santiago, near a settlement called Peña Flor. There is a bus that takes one as far as Peña Flor, but to get to Cuesta Pelvil one has to hire a taxi-cab, and there are five kilometers to go. I hired one, whose driver, however, refused going uphill with the excuse that it would ruin his engine. So, from the foot of the hill I had to walk uphill a couple of kilometers, where—in spite of the drought—I began seeing plants that interested me: an *Alstroemeria* sp., of large wide leaves with scapes peeping out, some of them two centimeters wide. Possibly they were a species I had seen years before in bloom, and whose shaft was 1.50 meters high. Due to this I called it *A.* "gigantea." I recall that its flowers were white, yellow spotted and about ten centimeters in diameter.

The plants were small and backward through lack of rainwater, but I found a dry shaft of the previous year in fairly good state, about eighty centimeters high with 7-forked branches (pedicels), each one with two remains of a receptacle. Therefore fourteen-flowered.

And then, wherever the eye could reach: *Alstroemeria decumbens* with their characteristic stems and narrow leaves, and another species which grows flat on the ground looking like a kind of lawn grass, which I shall call *Alst. cespitosa.* The latter is easy to pull up but not so the former, whose bulbous roots penetrated the soil (a rocky one) from twelve to sixteen inches. Finally, and in one sole group, several bulbs with leaves so characteristic of *Phycella bicolor* (R. & P.) Herb. (Syn.- *Phycella ignea* Lindl.) See color plate in Muñoz Pizarro's aforementioned book, page 82. See present Fig. 9.

This species turned out to be what I suspected, for it flowered in cultivation in 1969. All of these plants live at the foot of shady hillsides or in their semi-shade in black, rich, loose sandy soil among crumbled rocks, making it difficult, sometimes, to dig them up. The return trip to Peña Flor on foot took me about four hours, but being a downhill journey it was far less arduous.

EXCURSION TO CANON DEL RIO MAIPO (MAIPO River Canyon). The bus took me only as far as Puente Alto, situated about twenty kilometers to the south of Santiago. From there I travelled in another one which went along a fine road bordering the Maipo River upstream, and getting a lovely view of the nearby hillsides with their vegetation. One can choose any of the great number of places whose good prospects can be glimpsed from the bus and begin one's gathering after walking no more than 50 to 200 meters.

Alongside the road there are several settlements, but so tiny that they are not shown on the general maps. I got off the bus near Guayacan, which is one of these hamlets, and walked downhill part of the way, searching the hillsides.

Fig. 11. **Placea arzae** R. A. Phil. Collected by Dr. Ruppel at Runque, Chile.

I soon saw an abundance of *Alstroemeria* spp.; one of the species I shall call Als. "Guayacan 1-68", which is, apparently late flowering as there was, at the time, nothing but foliate branches, with wider leaves but shorter than the species I shall speak of later on. They are fashioned into tighter rosettes and their scapes, dry since the previous year, were about seventy centimeters long.

Description of the dry scape of an Alstroemeria "Guayacan 1-68": Peduncles with an abundance of linear leaves twelve centimeters long and (?) centimeters in diameter; 70 centimeters high and 1.5 in diameter at its lower third.

Umbel: I counted 27 inflorescences measuring 25 centimeters diameter and 12 centimeters high. How beautiful it must have been "in flesh" and in full anthesis!

I insist that the data here given are approximate, as they were taken from material that had become dry and spoilt through exposure. Of this species I managed to get a few rhizomes in good condition.

Another *Alstroemeria* sp. found in a reduced area but with characteristics which differ from the former, I shall call: "Alst. Guayacan 2-68". It has narrower but longer leaves, with a less tight rosette and of a lighter green than the former, growing among shrubby thickets (underbrush). Therefore, the getting of any plant was quite unachievable. Dry shaft: 1.50 meters high, bearing straight pedicels.

In the sandy places of this area numerous Amaryllid spp. *(Rhodophiala* spp.?) also grew.

EXCURSION TO RUNQUE. This place is situated at the highest point of the road from Santiago to Quillota. *Rhodophiala* spp. and *Phycella bicolor* flower on its lower hills during September through October. The beautiful *Tropaeolum azureum* Miers (see color plate, page 124, M. Pizarro's book) with a beautiful fernlike foliage with deep spherical corms; and, finally, *Placea arzae* Phil. (Fig. 11) with conspicuous paraperigone, striped purple, yellow cream segments (see M. Pizarro's color plate, page 126).

I must own that notwithstanding the dreadful drought afflicting Chile, both my luck and enthusiasm helped me greatly.

Acknowledgement. The author of this paper is very grateful to Prof. Arthur Penny for his help in translating many passages.

BOLIVIAN AMARYLLIDS, 1970

MARTIN CARDENAS, *P. O. Box 538, Cochabamba, Bolivia*

1. **Amaryllis nelsonii** Cardenas, **sp. nov.** (Fig. 12).

This showy *Amaryllis* reminds one at a glance of *A. yungacensis* Cárd. & Nelson, but differs by its green yellowish bright scarlet tipped tepals. This new species, is named after the late courageous botanical explorer and talented *Amaryllis* scholar, Prof. Ira S. Nelson, who in his 1958 trip to Bolivia, wanted anxiously to enter Caupolican Province

previously explored botanically only by Mr. R. S. Williams of the New York Botanical Garden.

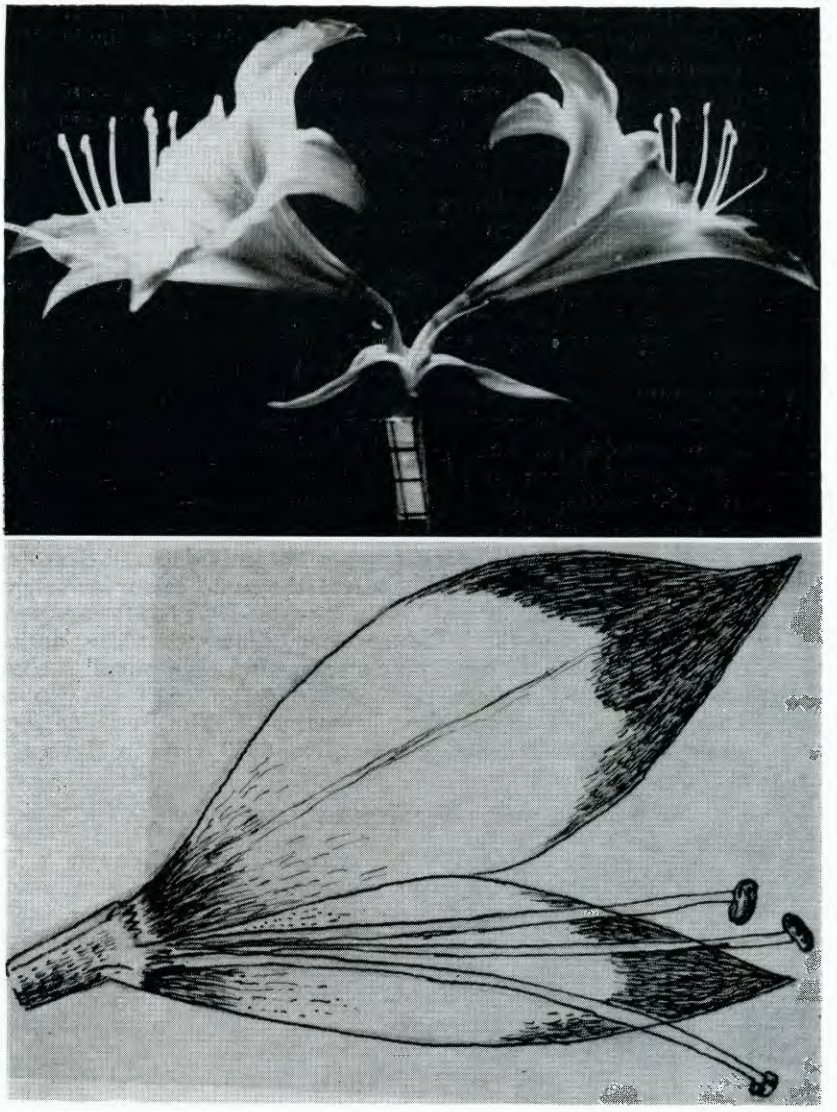

Fig. 12. **Amaryllis nelsonii** Cardenas. **Upper,** side view of umbel. **Lower,** partial long section of flower. Photo and drawing by Dr. Martin Cardenas.

Bulbo globoso, 5 cm long., 6 cm crasso. Pseudocollo 7 cm long., 3.5

cm crasso. Folis loratis 30 cm long., 3.5-4 cm latis. Scapo 20-25 cm long., 2 cm a basim crasso parce aplanatis, atro viride. Umbella 3 flora. Bracteis spathaceis lanceolatis 7 cm long. albidis, viride nervatis. Pedicellis 3 cm long. 7 mm crassis atro viridis. Floribus regularibus 12 cm long., 11 cm latis. Ovario 15 mm long. triquetrus atro viride. Tubo brevis 7-8 mm long. atro viride nitente. Setepalsegmentis late lanceolatis 10-11 cm long. 4 cm latis, extus diluto flavo viridiscentis a basim atro viridis nitentis, apice coccineus, intus a basim purpureo inspersus. Petepalsegmentis: lateralis 9 x 3.5 cm deflexis, inferioribus rectus 7 cm long, 2 cm latis, setepalsegmentis aequale coloribus. Paraperigonio temperato viridis, villosus. Staminibus 10-11 cm long. albidis. Stylo 9 cm long. non stamina superans, albidis, apice purpureis. Stigma capitata, trilobata, purpurea.

Patria: Bolivia, Provincia Caupolican, Departamento La Paz vicinis Fluvis Tumo, 750 m.

Bulb globose 5 cm long, 6 cm thick. Neck 7 cm long, 3.5 cm thick. Leaves lorate 30 cm long, 3.5-4 cm wide. Scape 20-25 cm long, 2 cm wide at base, somewhat flattened, dark green. Umbel 3 flowered. Spathe bracts lanceolate 7 cm long whitish, green nerved. Pedicels 3 cm long, 7 mm thick, dark green. Flowers regular 12 cm long, 11 cm wide. Ovary 15 mm long, dark green triquetous. Tube very short 7-8 mm long dark green shining. Setepalsegments lanceolate 10-11 cm long, 4 cm wide, whitish yellow greenish, dark green at base, scarlet red at the tips, purple flushed inside base. Petepalsegments: laterals deflexed 9 x 3 cm. lower straight 7 cm long 2 cm wide, all of the same colour as setepalsegments. Interior of the flower finely purple dotted. Paraperigone light green villous. Stamens 10-11 cm long, filaments white, anthers yellow. Style 9 cm long not longer than stamens, whitish, purplish above. Stigma capitate purplish, trilobate.

Bolivia, Province of Caupolican, Department of La Paz, Rio Tumo basin, 750 m. September 1969, E. Meneses, No. 6320, type in Herbarium Cardenasianum.

II. THE GENUS **PYROLIRION** IN BOLIVIA

Dr. H. P. Traub, in his The "Genera of Amaryllidaceae", The Amer. Plant Life Soc., 1963, gives a generic diagnosis and admits tentatively 10 species native to Perú and Bolivia. R. Foster in his "Catalogue of the Ferns and Flowering Plants of Bolivia," Gray Herb., 1958, includes for this country the two species: *Pyrolirion boliviense* (Baker) Sealy and *P. xiphopetalum* (Baker) Sealy. We have seen at the New York Botanical Garden Herbarium, the type specimen of *Zephyranthes xiphopetala* Baker, which reminded us of a very curious plant growing on the dry clayey slopes surrounding the City of La Paz. This plant attracts the attention of everyone by its solitary bright yellow flowers emerging from a slender scape which comes up from a whitish bulb not showing apparently any leaf at any time of the year. Baker's original description in Plants Collected in Bolivia by Miguel Bang, Henry H. Rusby, Memoirs, Torr. Bot. Club, 1895, does not give

any description of the leaves, nor the fruits and seeds, since the type specimen does not bear such parts. According to the original diagnosis, the locality given by Bang was Vic. Cochabamba 1891 (No. 890). We do not know if in the recent years this taxon has been collected again and illustrated afterwards since La Paz, where it really occurs, was visited after Bang, by many botanists. Bang used to collect many specimens without labeling them at once. He ordinarily added the collection numbers and locality names later on. Thus, most of his locality references are too vague, confused or entirely wrong as in the case of this amaryllid.

Fig. 13. **Pyrolirion xiphopetalum** (Baker) Sealy. Potted plants in flower at Cochabamba. Photo by Dr. Martin Cardenas.

Many years ago Dr. Belisario Diaz Romero, published in Boletin de Estadística y Estudios Geográficos, La Paz, the name *Balliviana uniflora* for the actual *Pyrolirion xiphopetalum* (Baker) Sealy. This name was naturally a nomen nudum.

Pyrolirion xiphopetalum (Bak.) Sealy (Figs. 13 & 14)

During the last year, we obtained several plants of *Pyriolirion xiphopetalum* and from them we draw the following description:

Bulbs whitish, tunicate 3-4 cm long. Scape solid, 10-20 cm long glaucous bearing only one sessile flower. Spathe bracts very light brown to whitish 2.5-4 cm long, acute. Flowers 5-7 cm long. Ovary obconic about 2 cm long, dark green shining. Tepaltube 4 mm long. Outer tepals 4-4.5 cm long, lanceolate 7 mm wide, bright yellow, greenish below, outside, bright yellow inside. Inner tepals lanceolate slightly narrower, bright yellow. Stamens adnate to the base of petals, 3 short and 3 longer. Filaments 9-12 mm long, light yellow. Anthers 4 mm long, deep yellow. Style 2 cm long, light yellow. Stigma trifid with expanded tipped lobes 1 cm long, yellow greenish. Fruit capsule about 1.5 cm long, 1.2 cm thick, trilocular. Seeds circular to luniform, black, about 7 mm long, slightly undulate at its surface and white membranous winged.

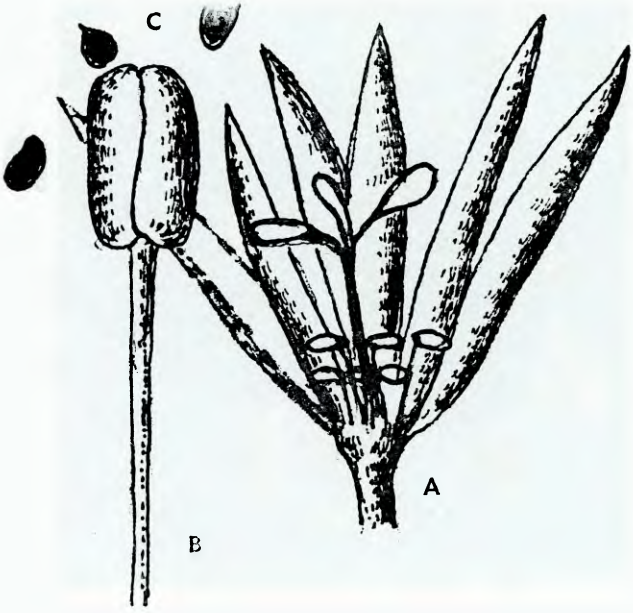

Fig. 14. **Pyrolirion xiphopetalum** (Baker) Sealy. **A.** Dissected flower **B.** Fruit. **C.** Seeds. All X 1.00

We do not know whether this pretty Amaryllid is now in cultivation. We never have seen it with leaves and do not know its native name in the Aymara language.

III. THE GENUS **CASTELLANOA** IN BOLIVIA

In the "GENERA OF AMARYLLIDACEAE" by Hamilton P. Traub, The American Plant Life Society, 1963, appears the Genus *Castellanoa* with the type species *C. marginata* (R. E. Fries) Traub. This plant was discovered by the Swedish botanist, R. E. Fries, at the "Puna" of Northern Argentina and diagnosed as *Hippeastrum marginata* in Act. Soc. Upsal. Ser. 4, 1(1), 161, 1905. Under our present knowledge of the Family *Amaryllidaceae,* obviously, this plant is not an *Amaryllis* (Syn.—*Hippeastrum*), because of its solid scape and the stamen characters. Traub states that the fruit and seeds of this taxon are unknown.

On the other hand, recently, Ing. A. T. Hunziker, in KURTZIANA, Tomo 5, 1969, Cordoba, Argentina, says that since the original description of *Hippeastrum marginata* R. E. Fries, nothing has been added about the taxonomic position of such a rare species, nor have original errors been corrected. However, Hunziker believes that the Genus *Castellanoa* appears to be a synonym of *Hieronymiella* because of its heteromorphic stamens which should be attached at their base.

Fig. 15. Castellanoa marginata (R. E. Fries) Traub. Side view of umbel. Photo by Dr. Martin Cardenas.

Both authors believe that the taxonomic definition of this monotypic genus, must be studied on the basis of new material.

We saw this plant for the first time above Quechisla, Province of Nor Chichas, Department of Potosí, Bolivia, at the end of 1931. We sent an herbarium specimen of it to the late Dr. Cristobal Hicken in

Buenos Aires. He identified our material as *Hippeastrum marginata* R. E. Fries. Many years later in March 1949, we obtained bulbs of a similar plant without flowers, from near Cuchu Ingenio, 40 Km, N. E. Potosi. These came in flower, but we did not pay much attention to it until we had in hand the "GENERA OF AMARYLLIDACEAE" by H. P. Traub. Then we obtained new bulbs from the same locality and grew them. We had for study material of plants with leaves, flowers, fruits and seeds. On the basis of this study, we believe that *Castellanoa* Traub, is a good genus and we describe the especies *C. marginata* (R. E. Fries) Traub, as follows:

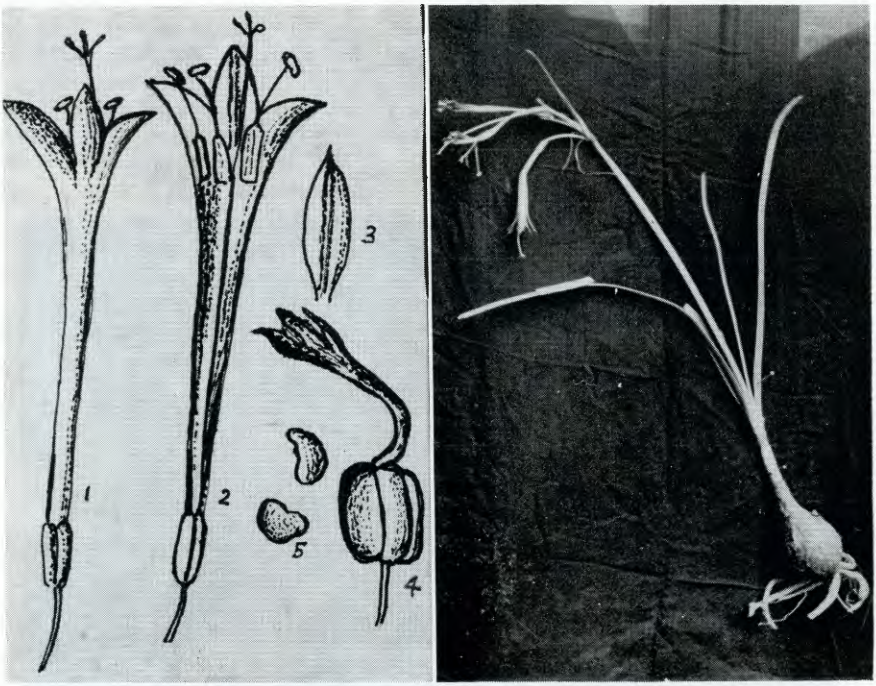

Fig. 16. **Castellanoa marginata** (R. E. Fries) Traub. **Left,** (1) side view of flower. (2) long section of flower. (3) tepalseg. (4) capsule. (5) seeds. **Right,** entire plant. Drawing and photo by Dr. Martin Cardenas.

Castellanoa marginata (R. E. Fries) Traub (Figs. 15 & 16)

Quechisla, 3,400 m and Cuchu Ingenio, 3,500 m.

Bulb ovoid 6-8 cm long, 4-5 cm in diameter. Neck 7 cm long or longer. Leaves sheathed 20-25 cm long, 7-10 mm wide, glaucous with hyaline and minutely toothed edges. Scape 23-25 cm long, solid, flattened about 8 mm wide at its base, glaucous green. Spathe 8 cm long, dark purple. Umbel 6-8 flowered. Pedicels 3.5-4 cm long,

brownish green, darker at the base of flowers. Flowers, slightly and laterally pendulous. Ovary 12 mm long, trigonous, 4 mm broad. Tepaltube 5 cm long, 3 mm thick above ovary. Limb of flowers 2.5-3 cm. Perigone orange-yellowish at base, bright red above. Tepals lanceolate 2.5 cm long, 6 mm wide with a yellow middle strip inside. Stamens of two sizes, 3 short (about 15 mm long) and 3 long (about 18 mm), inserted in the tepaltube and flattened at base. The free section of filaments are more than twice the length of the expanded portion. Interior of the tepaltube, yellow. Style 8 cm long, light green to yellowish, longer than stamens. Stigma trifid light green with the lobes lacinulate. Capsules ellipsoid 2 cm long, 15 mm in diameter, trilocular with a persistent dry flower. Each locule containing 2 vertical piles of seeds. Seeds flat, lunate, 8-10 mm long, blackish slightly undulate at its margins.

The vernacular Amerindian name of this plant at Quechisla is "Pharantuya". We do not know whether this is a Quechua or Aymara word. However, there is another Amerindian name similar in its termination, "Chacaltuya" assigned to *Chlidanthus fragrans.*

NEW AMARYLLIS SPECIES

Hamilton P. Traub

1. **AMARYLLIS DORANIAE** TRAUB, **SP. NOV.**

On one of his plant exploration trips to South America, in 1965, Mr. J. L. Doran discovered an *Amaryllis* L. species on an island in the estuary of the Rio Orinoco, Venezuela, at an elevation of approx. 100 ft. (30 m.). The outstanding feature of this species, belonging to the subgenus *Macropodastrum* Bak., is the clear rose color of the flowers. This is Doran collection No. 22 (see PLANT LIFE 26: 49. 1970). It is appropriate that this species be named for Mr. Doran's mother.

Amaryllis doraniae Traub, **sp. nov.**

Holotype: Specimen Doran, s. n.; Traub No. 1103 (TRA), grown from bulbs collected by Mr. J. L. Doran in Sept. 1965 on an island in the estuary of the Rio Orinoco, Venezuela; specimen flowered in the greenhouse for Mr. Doran at Burbank, Calif. May 19, 1970.

Bulbo rotundo 4 cm. diametro, collo 1.5 cm. longo; foliis sub anthesi vix evolutis, post anthesin plene evolutis; scapo 35.5 cm. longo; spatha 2-valvata; umbella (2—vel 3)—4-flora, floribus buccinatis, 12 cm. longis, 9.5 cm. per transversum faciem diametris inodoratis; tubo tepalorum 5 cm. longo viridi; segmentis tepalorum 8.1—8.8 cm. longis 2—2.9 cm. latis, parte inferiori 1/3 viridi, parte superiori 2/3 carmineo-roseo; pedicellis sub anthesi 3.2 cm. longis; staminibus quam segmentis tepalorum brevioribus; stylo segmenta tepalorum subaequanti vel paulo superanti; stigmate breviter trifido, lobis 1.5 mm. longis.

Bulb round, 4 cm. long, 4 cm. in diam., neck 1.5 cm. long, 2 cm. in diam. *Leaves* starting at flowering time (mid-May, Burbank, Calif.), fully developed after flowering. *Scape* hollow, glaucescent, light green, slightly flattened, 35.5 cm. long, 1.6 x 1.1 cm. at the base, 1.0 x 0.7 cm. at the apex. *Spathe-valves* 2, upright at first, reflexed at the middle at anthesis, yellowish-green, lanceolate, apex rounded, 5.7—6 cm. long, changing to dry brown; bracteoles short, very narrow. *Umbel* (2—3)—4-flowered; flowers 12 cm. long, at first held horizontally, later declined; long trumpet-shaped, 9.5 cm. across face; segs slightly reflexed toward the apex; tepaltube green, outside lower 1/3 of tepalsegs green, upper carmine rose (HCC 621/1), lighter carmine rose above, tipped light carmine rose to whitish, throat greenish-whitish, filaments and style white lower half, carmine rose above, *scentless. Pedicels* at anthesis 3.2 cm. long, green. *Ovary* oblong, 1.2 cm. long, 8 mm. in diam., green. *Tepaltube* trigonous, 5 cm. long, 7 mm. in diam. at the base, 1.3 cm. in diam. at the apex. *Tepalsegs* ruffled on the margins in upper reflexed part; top setseg 8.7 cm. long, 3.4 cm. wide, lanceolate, rounded-apiculate, 2 side setsegs 8.8 cm. long, 2.9 cm. wide, lanceolate, rounded apiculate, 2 side petsegs 8.1 cm. long, 2.8 cm. wide, lanceolate, bluntly acute, bottom petseg, 8.2 cm. long, 2 cm. wide, lanceolate, bluntly acute. Stamens fasciculate, slightly declinate, very slightly ascending, shorter than the tepalsegs; anthers cream-colored before anthesis, shrinking to 5 mm. long at anthesis, pollen yellow. *Style* straight to very slightly descending, sub-equaling or slightly overtopping the tepalsegs, stigma shortly trifid, lobes 1.5 mm. long.

Range.—Known only from the nomenifer locality, an island in the estuary of the Rio Orinoco, Venezuela, alt. prox. 100 ft. (30 m.).

Postscript.—Mr. Doran reports that he "found *Amaryllis doraniae* on Isla Redondo(?), in the area between Caña Macareo and Caña Mariusa in the Orinoco Delta; exactly where I do not really know because this area is one of those wet horrors with no landmarks [see the estuary of the Rio Orinoco in a good atlas]. It all looks alike. Only one clump was found. It would be reasonable to believe more could be found up-stream, no telling how far, possibly several hundred miles. We were probably 50—60 miles east of Pedernales near latitude 10° N." (Note.—the term "caña" here refers to "one of many streams of water in a delta.")

II. **AMARYLLIS BLOSSFELDIAE** TRAUB & DORAN, **SP. NOV.**

This charming new species of *Amaryllis* L. was collected originally by Mrs. Anita Blossfeld (Mrs. Harry Blossfeld) (see PLANT LIFE 22: 13. 1966) on the sand dunes near the Ocean beach at Praia do Sape, District of Maranduba, in the municipality of Ubatuba. Mr. Harry Blossfeld, who is cultivating a lot of 20 of these plants notes that the blooming season is as a rule a month or two later than that of *Amaryllis striata* var. *crocata,* and that the flowers have a more brilliant and intense cinnabar orange color (nasturtium red); as a rule the plants

have longer flower scapes, and when the buds open, the spathe-valves have wilted; the pedicel length at anthesis is 7 cm. long as contrasted with 1.2—2.5 cm. long in *A. striata* var. *crocata.*

Collections of this species were also made by Mr. Blossfeld from the region of Mogi das Cruzes, 50 Kilometers east of São Paulo, on the railway to Rio de Janeiro, alt. 2500 ft. This area has a climate moister than São Paulo (City), with a decided rainy season, and a dry cold winter from April to August. It grows in an area that gets 80 inches of rain per year (2101 mm. by Government record); practically a tropical climate. In this region it rains during the dry season although much less than in the rainy season when the rains are daily and heavy, and the temperature is relatively high.

Mr. J. L. Doran has also collected this species south of Ubatuba along the Ocean beach (see Doran No. 32, PLANT LIFE 26: 50. 1970) at Coraguatatuba, in sand in swamps, alt. 100 ft. (30 m.), and the type description is based on the plants from this locality that flowered for Mr. Doran in the greenhouse at Burbank, Calif. in May 1970. For the chromosome count of this species by Love, et al., see article elsewhere in this issue.

It is fitting that this beautiful species be named in honor of Mrs. Harry Blossfeld who first collected this fine plant.

This species differs from *Amaryllis striata* var. *crocata* in the features indicated by Mr. Blossfeld as reported above, and other particulars such as the extremely long leaves, usually larger number of flowers per umbel, and so on, as indicated in the detailed description below.

Amaryllis blossfeldiae Traub and Doran, **sp. nov.**

Holotype: Doran s. n.; Traub No. 1004 (TRA), May 19, 1970. grown from bulb collected by J. L. Doran at Coraguatatuba, Brasil, October 1966; and flowered by Mr. Doran in the greenhouse at Burbank, Calif.

Bulbo rhizomatoso 8.5 cm. longo, 8.8 cm. diametro, collo 1.8 cm. longo; foliis usque ad 8 linearibus longissimis 73—78 cm. longis, supra mediam 2.5 cm. latis; scapo 33.5 cm. longo, quam affine A. striata var. crocata 1—2 menses postea florente; umbella plerumque 4- vel 5-flora, floribus pallide tropaeolo-rubris; pedicellis 3.7—5 cm. longis, post anthesin elongatis; tubo tepalorum 5 cm. longo; stylo quam staminibus longioribus; stigmate trifido, lobis 3 mm. longis.

Bulb 8.5 cm. long, 8.8. cm. in diam., neck 1.8 cm. long, 3.5 cm. in diam.; bulb coats light brown; rhizomatous. *Leaves* 3—5, linear, very long, 73—78 cm. long, 2.5 cm. wide at the base, 3.7—4 cm. wide above the middle, narrowing gradually to the bluntly acute apex, deep green, furrowed; old leaves declining at the time the 5 new leaves are sprouting (mid-May 1970. at Burbank, Calif.). *Scape* hollow, roundish, very slightly flattened in lower half, bright green, glaucous, 33.5 cm. long. *Spathe-valves* 2, long-lanceolate, bluntly acute, green at anthesis; bracteoles smaller, up to 6 cm. long, green. *Umbel* (3—)—4—5-flowered;

flowers similar to *A. striata* in shape but slightly smaller and slightly more irregular, 2 side setsegs slightly wavy; tepalsegs light nasturtium red, greenish or yellowish star in throat. *Pedicels* 3.7—4.4—5.0 cm. long, bright green, elongating greatly after anthesis. *Ovary* oblong, 1.7 cm. long, 7 mm. in diam. *Tepaltube* 5 cm. long, 5 mm. in diam. at the base, 8 mm. in diam. at the apex. *Tepalsegs:* top setseg spatulate, 8 cm. long, 2.8 cm. wide, apiculate; 2 side setsegs very slightly irregular, spatulate, 7.8 cm. long, 2.7 cm. wide, apiculate; 2 side petsegs very slightly irregular, 7.7 cm. long, 2.1 cm. wide, apex blunt; bottom petseg lanceolate, 7.4 cm. long, 1.2 cm. wide, apex blunt. *Stamens* declinate-ascending white in lower ½, pinkish above, anthers 5 mm. long at anthesis, pollen ash-gray. *Style* overtopping the stamens, white in lower ½, pinkish above; stigma trifid, lobes 3 mm. long, white on top.

Range.—The species has been collected on the sand dunes near the Ocean Beach at Praia do Sape, District of Maranduba, in the municipality of Ubatuba; and south of Ubatuba along the Ocean Beach at Coraguatatuba, and in the region of Mogi das Cruzes, 50 km. east of São Paulo, on the railway to Rio de Janiero, alt. 2500 ft.

III. **Amaryllis belladonna** L. ssp. **quentiniana** Traub & Whitaker, **ssp. nov.**

While on a plant exploration trip in Bolivia in early 1970, Dr. Thomas W. Whitaker and Dr. Quentin Stephen-Hassard collected a number of *Amaryllis* species. Dr. Stephen-Hassard located a dwarf *Amaryllis belladonna* subspecies about midway between Corioco and Caranavari in La Paz Province. The plant was growing on the face of a cliff above the road, and was very difficult to collect since the bulbs were buried deeply in the rock crevices, to a depth of 6—8 inches. A hand pick was necessary to dig them. They were scattered widely in deep shade. Apparently there was no vegetative multiplication, and it appears that the subspecies has to be propagated by means of seeds.

Bulbs of this collection were received by the writer, and flowered on July 4, 1970 at La Jolla, Calif. It was identified by the writer as a subspecies of *Amaryllis belladonna* L., and it was immediately apparent that this beautiful dwarf was an excellent addition to the germ plasm available for the breeder of short-statured hybrids. A small quantity of seeds was obtained in 1970 which was distributed. In another season it is hoped that more seeds will be available.

Since this beautiful dwarf was discovered and collected by Dr. Quentin Stephen-Hassard, who had gone to considerable effort to pry it loose from the rocky crevices, it is named in his honor.

Amaryllis belladonna L. ssp. **quentiniana** Traub & Whitaker, **ssp. nov.**

Holotype: Traub No. 1005 (TRA), grown from a bulb collected 3-8-70 by Drs. Whitaker and Stephen-Hassard, about midway between Corioco and Caranavari, La Paz Province, Bolivia. It bloomed July 4, 1970 at La Jolla, Calif.

Planta subparva; bulbo parvo 4 cm. longo, 3.5 cm. diametro, collo 1 cm. longo; foliis 4 viridibus ligulatis 12 cm. longis 2 cm. latis; scapo

9 cm. longo; spatha 2-valvata; umbella (1)—4-flora, floribus cinnabarinis, his A. belladonnae L. similibus sed parvioribus; pedicellis 2.3—2.7 cm. longis; tubo tepalorum 2.8 cm. longo; paraperigonio setis minutis albidisque intus basi segmentorum tepalorum composito; staminibus quam stylo brevioribus; stigmate capitato obscure 3-lobato.

Bulb small, up to 4 cm. long, 3.5 cm. in diam., neck 1 cm. long, 1.4 cm. in diam.; bulb coats medium brown. *Leaves* 4, strap-shaped, 12 cm. long, 2 cm. wide, green. *Scape* 9 cm. long, 9 x 12 mm. in diam. at the base, 6 x 8 mm. in diam. at the apex, hollow, somewhat compressed, green, glaucescent. *Spathe-valves* 2, lanceolate, 4.2 cm. long, acute, brown, dry at anthesis. *Umbel* (1—) 4-flowered; flowers vermilion (HCC 18/2), throat greenish-yellowish, whitish in upper part, markedly declined, and wide open as in *Amaryllis belladonna* L., but much smaller, and blooming at a different season. *Pedicels* 2.3—2.7 cm. long at anthesis, green. *Ovary* trigonous, 8 mm. long, 5 mm. in diam., green. *Tepaltube* 2.8 cm. long, 4 mm. in diam. at the base, 10 mm. in diam. at the apex. *Paraperigone* of minute whitish bristles at the base inside of tepalsegs, and throat. *Tepalsegs:* top setseg broadly elliptic, 6.3 cm. long, 3.3

TRAUB—NEW AMARYLLIS SPECIES—continued on page 28.

COLLECTING AMARYLLIS IN THE BOLIVIAN YUNGAS

THOMAS W. WHITAKER

During March 1970, Dr. Q. M. Stephen-Hassard, a retired dentist of La Jolla, California, and I collected Amaryllis in Bolivia. We spent about one week in the Yungas east and slightly north of La Paz and about 4 days in the area around Cochabamba. We made 8 collections in the course of our trip. (See summary, Table 1.) The account that follows is an attempt to place on record the precise site of the collections, the tentative identification of each collection, a description of the habitat and any peculiarities of the plants noticed at the time of collection. The map (Fig. 17) indicates the route of our journey.

The Yungas east and north of La Paz lie at an altitude of 2000-9000 ft., and are essentially a series of deep canyons, slashed in the flanks of the Andes, as water from the towering eastern Cordillera rushes toward the Amazon Basin. The scenery is stunningly spectacular. The canyon walls are steep and for the most part densely forested. There are innumerable waterfalls that cascade down the steep canyon walls to the streams below. To a native of the arid Southwestern United States the scenery has an "out of this world" appearance, and is almost indescribable in grandeur.

Two collections were made in the vicinity of Cochabamba, Bolivia. Cochabamba lies at an altitude of about 8000 ft. It has a pleasant climate, and is the center of a potentially rich agricultural area. While in Cochabamba we were the guests of Prof. Martin Cardenas, and he directed our collecting activities.

Table 1. Summary—**Amaryllis** species collected in La Paz and Cochabamba Provinces, Bolivia, in February and March 1970.

Collection number *	Collection date	
1	3- 6-70	**Amaryllis escobar-uriae.** 8 km. downstream from Unduavi, La Paz, Bolivia.
2	3- 6-70	**Amaryllis yungaensis.** Rio Solcame, La Paz, Bolivia.
3	3- 7-70	**Amaryllis escobaruriae.** Left side of river at Puente Villa, La Paz, Bolivia.
4	3- 7-70	**Amaryllis pardina.** Right side of river at Puente Villa, La Paz, Bolivia.
5	3- 8-70	**Amaryllis belladonna** ssp. **quentinana.** About one-half distance between Coroico and Caranavi, La Paz, Bolivia.
8	3- 9-70	**Amaryllis escobar-uriae.** 3 km. from Sacramento on road between Undavi and Coroico, La Paz, Bolivia.
13	3-13-70	**Amaryllis cybister.** On dry stony hillside near Rio Chapare, on road between Cochabamba and Punata, Cochabamba, Bolivia.
14	3-14-70	**Amaryllis mollevillquensis.** Collected originally by Dr. Cardenas in village of Mollevillque, Cochabamba, Bolivia.

* U. S. Plant Introduction (PI) numbers will be given after the species have been verified and/or identified.

COLLECTION 1—MARCH 6, 1970

Tentative identification—Amaryllis escobar-uriae (according to Dr. Martin Cardenas).

Location—about 8 km. downstream from Undavi, La Paz, Bolivia (El Chaco—Cardenas). On the opposite side of the canyon, facing a tremendous waterfall.

Habitat—growing mostly in unshaded areas, in rich fertile black soil in crevices on the face of steep cliff.

Plant description—long strap shaped leaves; bulbs ½-2″ in diameter, growing in clumps; apparently reproducing vegetatively and by seed. One plant had inflorescence almost ready to open.

COLLECTION 2—MARCH 6, 1970

Tentative identification—Amaryllis yungaensis Card.

Location—on Rio Solocame, where road crosses river on way to Irupana.

Habitat—above river, in dark, rich soil of rock crevices, in deep shade, with many other plants (begonias, bromeliads, fuschias, etc.) on a steep jungle hillside. Plants difficult to collect, almost inaccessible, in widely scattered individual clumps.

Plant description—long strap-shaped leaves; bulbs ¼ to 2″ in diameter. Apparently reproducing both vegetatively and by seed.

COLLECTION 3—MARCH 7, 1970

Tentative identification—Amaryllis pardina (Hook. f.) Lem.

Location—at Puente Villa where road crosses the river by bridge. No. 3 bulbs on left side of river driving toward Caranavi.

Habitat—on face of steep cliff, growing in dark, rich soil in shaded crevices with begonia and many other plants; damp, heavy shade.

Plant description—medium width and length strap-shaped leaves; bulbs ½ to 2″ in diameter; plants scattered and comparatively rare.

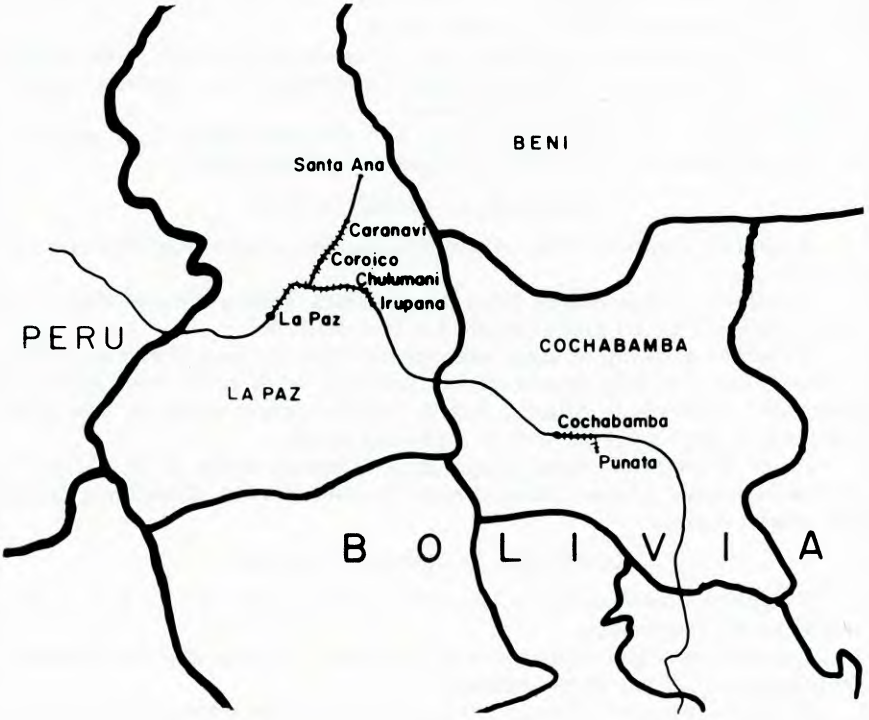

Fig. 17. Map of a small portion of Bolivia showing parts of the provinces of La Paz, Cochabamba and Beni. The cross-hatched lines show the route followed by the Whitaker—Stephen-Hassard party to collect Amaryllis; March 1970.

COLLECTION 4—MARCH 7, 1970

Final identification—Amaryllis escobaruriae Card.

Location—at Puente Villa where road crosses the river. No. 4 bulbs on right side of river driving towards Caranavi.

Habitat—growing on face of cliff, but not in densely shaded areas.

Plant description—medium length and width strap-shaped leaves;

bulbs ½-2″ in diameter. Many plants—easily collected; may be different species from that on left side of the river.

COLLECTION 5—MARCH 8, 1970

Identification—Amaryllis belladonna L. ssp. *quentiniana* Traub and Whitaker. See preceding article.

Location—about one-half distance between Coroico and Caranavi, La Paz, Bolivia.

Habitat—growing on face of cliff above road; very difficult to collect; bulbs buried deeply in crevices, 6 to 8″, a hand pick necessary to dig them; scattered widely in deep shade.

Plant description—medium size, strap-shaped leaves; bulb small, ½ to 1″ in diameter; bulbs grow singly; apparently no vegetative multiplication; must be propagated by seeds.

The plants were first located by Dr. Stephen-Hassard as members of the party searched the cliffs and jungle for *Amaryllis.*

COLLECTION 8—MARCH 9, 1970

Tentative identification—Amaryllis escobar-uriae (from Martin Cardenas).

Location—3 kilometers from Sacramento (down Chuspi-Pata) on road between Undavi and Coroico, La Paz, Bolivia.

Habitat—growing in large scattered clumps on face of vertical cliffs, in deep shade, mostly drenched continuously with mist from adjacent waterfall. Difficult to collect; finally reached large clump in flower by climbing on the top of the cab of a passing truck.

Plant description—long strap-shaped leaves; bulbs 2 to 3″ in diameter; elongate shaped bulb; plants in flower very attractive; white and scarlet corolla.

COLLECTION 13—MARCH 13, 1970

Tentative identification—Amaryllis sybister (Herb.) T. & U. (confirmed by M. Cardenas).

Location—on Rio Chapare, road between Cochabamba and Punata, Cochabamba, Bolivia (type locality).

Habitat—growing above river in extremely dry environment, buried 6 to 8″ in soil, no shade, with other xerophytic plants such as cactus.

Plant description—medium length strap-shaped leaves; bulbs 4 to 5″ in diameter, 6-8″ in length; grows in small colony of approximately 25 plants; evidently propagated vegetatively. We searched the area thoroughly but found *only* this single colony.

COLLECTION 14—MARCH 14, 1970

Tentative identification—Amaryllis mollevillquensis Card. (confirmed by Martin Cardenas).

Location—collected originally by M. Cardenas in the village of Mollevillque, Cochabamba, Bolivia.

Habitat—unknown; growing in pot in patio of Dr. Jose Marquez.

Plant description—short, rather wide, strap-shaped leaves; scape arises from naked bulb; scape about 1′ in length; beautiful dainty, cardinal flower; specimen given to me by Dr. Marquez, inflorescence about ready to open.

ECUADORIAN AMARYLLID BLOOMS IN ILLINOIS

William R. Adee, *961 Sunset Ave., Waukegan, Illinois 60085*

A package of native amaryllids arrived on May 9, 1969 from Dr. Elizabeth Naundorff of Quito, Ecuador. Included were *Bomarea, Callipsyche,* and *Stenomesson aurantiacum.* The latter two species have similar bulbs and were mixed together. One group of bulbs sent up scapes almost immediately upon being potted in a 12″ pan in garden soil. The flowers opened on June 23. They were tubular coral colored with apple green segments, long lasting. Pods were set from self pollinations. Leaves followed the flowers. They were petiolated, about 9 inches long of a shiny green.

I assume from Dr. Naundorff's comments that they must have a dormant period in their native land. Mine have remained evergreen in the greenhouse, but those I sent to one friend in Burbank, Calif. went dormant after forming one leaf. Dr. Naundorff stated "You know *Callipsyche* and *Stenomesson* are like *Colchicum;* first one leaf, then leaf gone, develops a flower."

These bulbs are being grown in Texas, Minnesota, and other places in California.

The *Bomarea* has not bloomed, but prospers in the greenhouse. It has climbed from the bench to the roof. It grows in an 8 inch pot in "Baccto Potting Soil", kept constantly moist.

The fourth amaryllid in the package is probably an escape *Agapanthus* from a ranch. It is starting to grow after six months of inactivity.

VACATIONING IN MEXICO WITH A BULB COLLECTOR

Mrs. David E. Wilson, *2719 Palm Circle West, Galveston, Texas 77550*

Early in 1970, my husband and I decided our three children were old enough to travel for a few days in the interior of Mexico. With a growing interest in the rain lily tribe, I particularly wanted my mother, Mrs. Morris Clint of Brownsville, Texas, to act as a guide and instructor over a route that would be both interesting and probably fruitful for collecting. The heaviest blooming season for these bulbs is usually April-June, but because of earlier commitments, we planned our trip for the first week in July. The rainy season is usually un-

predictable. Some of the essential supplies on our list were: comfortable clothing, distilled water, cameras, trowels, rock hammer, small shovel, clean paper sacks of assorted sizes, rubber bands, scissors and a day book for notes. Besides the usual border crossing papers, we had to apply to the U. S. Department of Agriculture for a plant collecting permit.

Our first stop from Brownsville was Cuidad Mante. While there we enjoyed the tropical plants, birds and butterflies, and purchased excellent sweet bread, rolls, avocados and mangoes to supplement lunches. From Mante we connected with Highway 80 at Antiguo Morelos for San Luis Potosi, noting speedometer reading in day book. The first *Zephyranthes* we found (and the only one in bloom on the trip) was a pale yellow 29 miles west of Antiguo Morelos in a valley just east of El Naranjo. Most of these were growing in a bar pit filled with water, but we managed to locate others without getting wet. For the next ten miles we traveled through the wet part of the mountain, with its tall oak trees, orchids, Bromeliads and other tropical growth. When we stopped for lunch, Mother found *Zephyranthes* growing across the road on the mountain ledge. She had promised *Zephyranthes* in leaf in these "Z. clintiae mountains" and she knew what she was talking about. We stopped several more times on the dry side of this mountain range and once more on a steep limestone hill just a few miles east of Huisache, each stop yielding one or more species or variation of species in leaf.

We decided to spend two nights in San Luis Potosi in order to make a morning trip on Highway 80 on the way to Guadalajara in search of the original collecting place of *Habranthus concolor,* rediscovered in 1954 by my parents and Mr. Fred Jones of Corpus Christi (Herbertia, 1955). As we made our approach to the first mountain right outside of town, a truck with liquified petroleum gas tried to pass our car and a truck with a large bus coming down the mountain in his path. My husband, a novice in mountain driving, quickly pulled to a spot on a small hill to let the trucks resolve their problem. We collected a narrow-leafed *Zephyranthes* at this location, immediately dubbed "Pollo Hill." This short mountain stretch is pretty rugged and made worse on our drive with road repair and loose gravel. Once we reached the plateau, we found several *Zephyranthes* and *Habranthus concolor* in leaf at different locations between 19 and 23 miles from the traffic circle in San Luis Potosi. The *Habranthus* were quite small from lack of rainfall. Some of these desert soils puzzled me. They could be brick hard on the surface, but somewhat moist and loamy sand several inches below. Rocks make digging difficult.

My next lesson in collecting bulbs in Mexico began our second afternoon in San Luis Potosi. While my husband entertained the children at the swimming pool, Mother and I began to prepare our collection to be passed by the U. S. Department of Agriculture. Using scissors, we carefully cut roots and leaves from each bulb and removed old and loose scales. Each group of bulbs was then carefully washed to remove

any trace of soil and placed on newspaper to dry overnight (with collection number for identification). The next morning it was a simple matter to mark clean paper sacks with collection number, number of bulbs, and refer to notebook for locality and family identification.

We left the city on Highway 86 to Valles. About 10.8 miles from the traffic circle in San Luis Potosi we stopped at another Clint collecting spot for *Habranthus concolor*. Here the bulbs were not only plentiful, but in full summer growth and easy to dig. We had missed their bloom by several weeks, for the last seed capsules were ripening. On the way back to the car we dug several bulbs of *Zephyranthes* in leaf. Leaving the plateau and entering the mountains, we were threatened by scattered thunderstorms, but managed to miss each shower. Rains must have started in mid-June over the territory we covered, for even the driest desert areas showed spots of green. We had planned a lunch and collecting stop at Valle de Fantasmas (approximately 30 miles from traffic circle), which is a place that should please anyone for scenic beauty. Green forests are broken by cleared spots of green carpet and red soil. Across the Valley can be seen the reason for its name: huge outcroppings of light grey stone, elongated and weathered like statues. We dug *Habranthus* growing deep under large rocks and roots, usually in the shade. A *Zephyranthes* in leaf was found in the more open sunny spots.

As we continued to climb in the mountains, we were treated to the sight of a majestic Mexican eagle gliding in the sky to our left. My husband muttered "what's he doing so high", but by this time he was almost used to mountain driving. When we entered the drier part of the mountains, Mother put out a call for the next pull-out place. This happened to be fenced, but we managed to find a few bulbs near the road. From here (52.1 miles from S.L.P.) to Valles was new collecting territory for Mother, but this didn't seem to handicap her. As soon as she began to see outcroppings of limestone, she again put out the "call." After we dug what *Zephyranthes* we wanted, she explained that some of the prettiest Mexican rain lilies seek out soils with limestone or volcanic rock, or both. These bulbs were not deep, but we had to use a rock pick to get them. Our last collection (114 miles from S.L.P.) was found in the wet mountains. The upper part of the mountain was fenced, but we dug a few *Zephyranthes* from under rocks and between crevices. Our last stop for the day, where the soil was red clay and rocky, was a dud. Not a rain lily in sight, even though the territory looked perfect and the fields were covered with *Nothoscordum* in bloom. I was about to tease Mother about her "miss" when my husband pointed to a sign on a nearby building—"Flor de Mayo—one of the names used in Mexico for Rain Lily! Perhaps we will find them here next time.

[See also page 12, Editor's Mail Bag.]

SEEDS OF **AMARYLLIS RETICULATA** L'HERIT.

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

In 1969, *Amaryllis reticulata* L'Hérit. (see Fig. 18) capsules matured in my greenhouse. The individual seeds were attached to the inside of the capsule by fine hair-like strands (placentae) and no amount of agitation dislodged them. Seeds left in the capsule for two weeks dehisced, but the outer seed coats did not wrinkle. The seeds are round or roundish, hard, shining, black, 8x9mm. in diam.

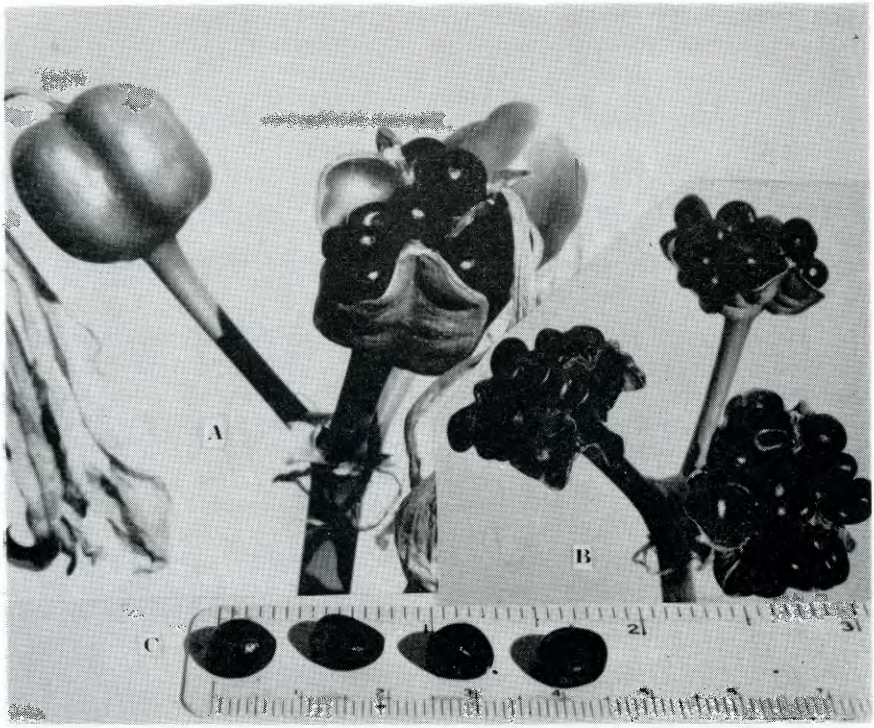

Fig. 18. **Amaryllis reticulata** L'Hérit. Capsule and seeds. A. Unopened capsule, and capsule just opening. B. the same 10 days later. C. Black, roundish, hard seeds. Photo by J. L. Doran.

Seeds planted as soon as the capsule opened germinated promptly when planted. Seeds allowed to remain in the capsule for some time required from two months to about a year to germinate.

The plant, Doran-24, which produced the seeds was collected in Brasil, at Relito ci de Vordas, Km. 150, near creek, alt. 4,000 ft.

CHROMOSOMES OF **ALLIUM EUROTOPHILUM** WIGGINS (CONTINUED)

LEE W. LENZ, *Rancho Santa Ana Botanic Garden, Claremont, California 91711*

In the 1969 PLANT LIFE, the Chromosome number, 2n=14, for *Allium eurotophilum* Wiggins, was reported (PLANT LIFE Vol. 26: 68—69, 1970). However, the reproduction of the photoprint of the chromosomes was lost in transit to the engraver, and the intended Fig. 17 for the 1969 issue could not be included. It is reproduced here in the 1970 edition as Fig. 19.

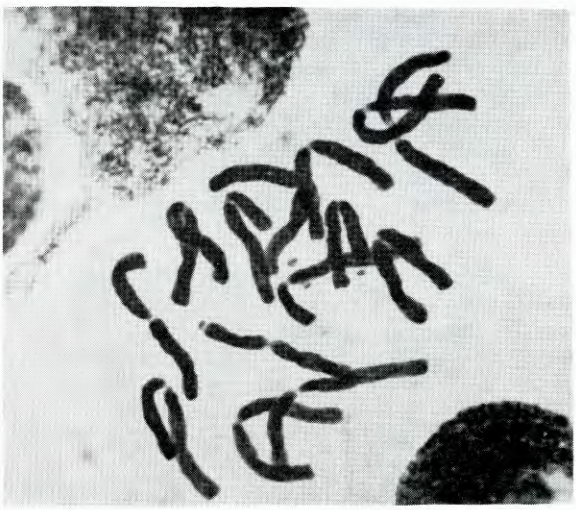

Fig 19. **Allium eurotophilum** Wiggins. Root-tip (2n) chromosomes. See text, PLANT LIFE 26: 68-69. 1969.

THE DR. RUPPEL AMARYLLID COLLECTIONS

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

Amaryllis angustifolia, the aquatic species, bloomed again in 1970, right on schedule. Last winter (1969) I allowed the pot to dry out when the foliage started to yellow. The plant remained dormant and leafless all winter until water was applied in late January. Leaf sheaths of about 6 inches in length came up and the leaves appeared between them. A bud soon became apparent but as the leaves continued to grow, the bud decayed. In February another bud started up and this one finally produced an umbel of six flowers. Several pollens were tried with negative results; however, one bloom did set seed from its

own pollen. The seed were sent to Dr. Ruppel as he had lost all his bulbs and would not at present be able to collect any more of them. When this species first bloomed in 1969 it proved to be different from the dried specimen which had led to its discovery. That one still remains to be rediscovered.

While reading Alice M. Coat's interesting book, "The Plant Hunters," I became amused when she posed the question if the plant explorer, in the classical sense, had ceased to exist due to civilized man having become resident in all parts of the globe. My mind pictured Dr. C. Gomez Ruppel's description of his finding a species of *Amaryllidaceae* which he labeled *Rhodophiala* "Estanislao del Campo". "On the way from Embarcacion, Salta to Formosa, capital of the same province, a 36 hour trip, the train stopped in E. del Campo. Looking at the field from my cabin. I saw myriads of amaryllid leaves, just growing at the sidewalk! At once, I jumped out of the train, with my small spade and dug up as many bulbs as I could, before the train started moving." Bulbs of this collection bloomed in 4 inch pots in Fort Worth the following spring. I called the flower *"Habranthus brachyandrus,"* due to the pale orchid petals and the deep purple throat. This must be a dwarf variety of that species.

Among the *Amaryllis* L., species Dr. Ruppel has sent to the U.S. are the following:

A. aglaiae—collected at Tafi del Valle, Tucuman, Argentina.

A. "red cochuna"—a red form of A. aglaiae collected near the Cochuna River, Tucuman, Argentina.

A. petiolata—collected at Santo Tome, Corrientes, Argentina.

A. "aulica Reitz"—seed of species collected by Dr. Raulino Reitz of Brazil.

A. "belladonna var. minor"—from cultivation in Formosa, Argentina.

A. "elegans, var. albostriata"—collected at Pozo del Tigre and at Palo Santo, Formosa, Argentina.

A. flammigera—collected in Tucuman, Argentina.

A. moreliana—seed of collected bulbs.

A. vittata—seed collected from cultivation in Sao Leopold, Brazil.

A. vittata var. *tweediana*—seed of bulbs collected in Bolivia.

A. "brown"—seed of *A. papilio* (See PL 1970, Page 82).

A. "curitiva"—collected in state of Parana, South Brazil.

A. "orange Reitz"—stoloniferous species from Santa Catarina, Brazil. Collected by Dr. Reitz.

A. "satipo"—miniature species.

A. "yanellosianum"—collected at "Old Tucuman Road", Salta, Argentina.

A. "Chamical"—The Hill—collected near Chamical, a small town 35 kms. from Salta City, Argentina.

Many bulbs of various Amaryllids have been collected by this avid modern-day plant collector and living specimens of many of them have

been sent to areas of the United States to give us the pleasure of seeing the beauty of his native flora. Species of *Rhodophiala, Habranthus, Zephyranthes, Hymenocallis, Crinum, Eustephia, Hieronymiella, Phycella,* and others have been included in his shipments. Dr. Ruppel is a true horticulturist whose great joy is to share his plants with others.

The Amaryllis Society could have made no better choice for the award of the 1971 Herbert Medal. I am very pleased at his selection.

NOTE ON **CRINUM BULBISPERMUM** (BURM.) MILNE-REDHEAD & SCHWEICKERDT

HAMILTON P. TRAUB

Crinum bulbispermum (Burm.) Milne-Redhead & Schweickerdt (the subject of our cover) is a very variable species ranging from the Cape to the Transvaal in South Africa; all, as contrasted with other *Crinum* species, are relatively frost hardy, but those from the Transvaal are the hardiest of all. From the writer's observation, those from the Cape are as a rule not very deeply seated in the ground and the bulb scales remain fibrous, but those from the Transvaal are quite deeply situated in the soil and are subject to the formation of secondary cartilaginous thickening of the bulb scales as in some species of *Brunsvigia.* The forms cultivated at my home show this great variation. In the southern forms, the flower color ranges from white, pink, to medium red, and those from the Transvaal vary in color from pinkish, medium red, to very deep purplish red.

In all cases the plant can withstand considerable cold as indicated. Although the top portions may be destroyed, the underground parts are uninjured, and the plant soon recovers. In contrast, *Crinum gouwsii* (see PLATE LIFE Vol. 10: 38—41, Plate 8. 1954) is easily affected by cold and it is frozen to the ground when *Crinum bulbispermum* is not harmed.

The cover by Prof. Goff pictures a plant native to the Transvaal. It shows the usual vigorous growth. It is a seedling (from the stock sent to the writer by Mr. Leon Boshoff-Mostert several years ago) grown by Dr. Thomas W. Whitaker.

AMARYLLID NOTES, 1971

HAMILTON P. TRAUB

Stenomesson herbertianum (Spreng.) Traub, *comb. nov.* Syn.—*Stenomesson flavum* Herb., App. Bot. Reg. 40. 1821, non *Pancratium flavum* R. & P. Fl. Peruv. 3: 54, 284. 1794, Herb. Amaryll. 198, pl. 28, f. 1. 1837; *Pancratium herbertianum* Spreng. Syst. Veg. IV. Cur. Post. 132. 1828; *Stenomesson latifolium* Herb. Bot. Mag. pl. 3803. 1841; *Chrysiphiala flava* (Herb.) Ker-Gawl., in Bot. Reg. pl. 778.; *Pancratium*

curvidentatum Steud. Nom. II. 2: 250. 1840-41; *Stenomesson vitellinum* Lindl. in Bot. Reg. pl. 2. 1843.

Stenomesson flavum (R. & P.) Traub, *comb. nov.* Syn.—*Pancratium flavum* R. & P., Fl. Peruv. 3: 54, 284. 1794; *Pancratium croceum* Savign., in Lam. Encyc. 4: 725. 1795 (err. typ. 735); DC. in Red. Lil. 4: pl. 187. 1807; *Stenomesson croceum* (Savign.) Herb., Amaryll. 119, pl. 28, f. 4. 1837; *Stenomesson ruizianum* Kunth, Enum. Pl. 642. 1843; *Neaera crocea* (Savign.) Salisb., in Gen Pl. 109. 1866.

Subg. *Plagiolirion* (Bak.) Traub, *comb. nov.*, Genus *Urceolina* Reichb. (Amaryllidac.). Syn.—Genus *Plagiolirion* Bak., Gard. Chron. 38 (1883) ii.

Subg. *Mathieua* (Klotsch) Traub, *comb. nov.*, Genus *Urceolina* Reichb. (Amaryllidac.). Syn.—Genus *Mathieua* Klotzsch, in Otto & Dietr. Allg. Gartenz. 21: 337-338. 1853.

Subg. *Calliphruria* (Herb.) Traub, *comb. nov.*, Genus *Urceolina* Reichb. (Amaryllidac.). Syn.—Genus *Calliphruria* Herb., Bot. Reg. Misc. No. 87. 1844.

Subg. *Eucharis* (Planchon et Linden) Traub, *subg. nov.*, Genus *Urceolina* Reichb. (Amaryllidac.) Syn.—Genus *Eucharis* Planchon et Linden, Cat. Hort. Ann. 8: 3. 1852; Flore des Serres 8: 107-108. 1853.

Urceolina edentata (C. H. Wright) Traub, *comb. nov.* Syn.—*Urceocharis edentata* C. H. Wright, Kew Bull. 24. 1910.

Urceolina x *clibranii* (T. M. Masters) Traub, comb. nov. Syn.—*Urceocharis* x *clibranii* M. T. Masters, Gard. Chron. ii (1892) 214, fig. 36.

Urceolina horsmannii (Baker) Traub, *comb. nov.* Syn.—*Plagiolirion horsmannii* Bak., Gard. Chron. ii (1883) 38.

Urceolina fosteri (Traub) Traub, *comb. nov.* Syn.—*Eucharis fosteri* Traub, Plant Life 7: 36. 1951.

Urceolina hartwegiana (Herb.) Traub, *comb. nov.* Syn.—*Calliphruria hartwegiana* Herb. Bot. Reg. Misc. No. 83. 1844.

Urceolina tenera (Bak.) Traub, *comb. nov.* Syn.—*Calliphruria tenera* Bak., Amaryll. 112. 1888.

Urceolina subedentata (Benth.) Traub, *comb. nov.* Syn.—*Eucharis subedentata* Benth, Gen. Pl. 3: 731. 1883.

Urceolina bouchei (Woodson & Allen) Traub, *comb. nov.* Syn.—*Eucharis bouchei* Woodson & Allen, Ann. Missouri Bot. Gard. 24: 181. 1937.

Urceolina lowii (Bak.) Traub, *comb. nov.* Syn.—*Eucharis lowii* Bak. Gard. Chron. 13(1): 538-539, Fig. 78. 1893.

Urceolina sanderi (Bak.) Traub, *comb. nov.* Syn.—*Eucharis sanderi* Bak., Bot. Mag. pl. 6676. 1883 (Mar. 1).

Urceolina sanderi ssp. *multiflora* (Bak.) Traub, *comb. nov.* Syn.—*Eucharis sanderi* var. *multiflora* Bak. Bot. Mag. pl. 6831-B. 1885.

Urceolina grandiflora (Planch. et Linden) Traub, *comb. nov.* Syn.—*Eucharis grandiflora* Planch. et Linden, Flore des Serres I. ix. 255. pl. 957. 1853-54.

Urceolina himeroessa (Sandwith ex Standley) Traub, *comb. nov.* Syn.—*Eucharis himeroessa* Sandwith, Herbertia 3: 74. 1936.

Urceolina lehmannii (E. Regel) Traub, *comb. nov.* Syn.—*Eucharis lehmannii* E. Regel, Gartenflora 38: 313-314, pl. 1300, f. 1 & 1b. 1889.

Urceolina mastersii (Bak.) Traub, *comb. nov.* Syn.—*Eucharis mastersii* Bak. Bot. Mag. pl. 6831-A. 1885.

Urceolina bakeriana (N. E. Brown) Traub, *comb. nov.* Syn.—*Eucharis bakeriana* N. E. Brown, in Gard. Chron. i (1890) 416, fig. 61.

Urceolina candida (Planchon et Linden) Traub, *comb. nov.* Syn.—*Eucharis candida* Planchon et Linden, Cat. Hort. Ann. 8: 3. 1852; et Flore des Serres 8: 107-108, pl. 188. 1853.

Urceolina butcheri (Traub) Traub, *comb. nov.* Syn.—*Eucharis butcheri* Traub, Plant Life 23: 60-69. 1967.

Urceolina bonplandii (Kunth) Traub, *comb. nov.* Syn.—*Hymenocallis bonplandii* Kunth, Enum. Pl. 5: 666. 1850.

Urceolina galanthoides (Klotzsch) Traub, *comb. nov.* Syn.—*Mathieua galanthoides* Klotzsch, in Otto & Dietr., Allg. Gartenz. 21: 337-338. 1853 (Oct. 22).

Urceolina castelnaeana (Baill.) Traub, *comb. nov.* Syn.—*Calliphruria castelnaeana* Baill., in Bull. Soc. Linn. Paris, 143: 1135. 1894 (Mar. 7).

Urceolina korsakoffii (Traub) Traub, *comb. nov.* Syn.—*Eucharis korsakoffii* Traub, Plant Life 23: 85—87. 1967.

Urceolina narcissiflora (Huber) Traub, *comb. nov.* Syn.—*Eucharis narcissiflora* Huber in Bol. Mus. Para. 4: 543. 1906.

Urceolina ulei (Kraenzlin) Traub, *comb. nov.* Syn.—*Eucharis ulei* Kraenzlin, in Engl., Bot. Jahrb. 50: Beibl. 111, pp. 4—5. 1913.

Rauhia Traub.—It is to be noted that the General Committee on botanical nomenclature (Taxon 19: 304. 1970) voted that *Rauhia* Traub (1957, *Amaryllidaceae*) and *Rauia* Nees et Martius (1823, *Rutaceae*) should not be treated as variants under Art. 75 of the Code.

REGISTRATION OF NEW AMARYLLID CLONES

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

Mr. James E. Mahan, *Registrar*

Mr. Charles Hardman, *Associate Registrar*

This department has been included since 1934 to provide a place for the registration of names of cultivated **Amaryllis** and other amaryllids on an International basis. The procedure is in harmony with the International Code of Botanical 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. Additional catalogs of cultivars have been published since 1949: **Catalog of Brunsvigia Cultivars, 1837-1959,** by Hamilton P. Traub and L. S. Hannibal, PLANT LIFE 16: 36-62. 1960; Adden-

dum, PLANT LIFE 17: 63-64. 1961; **Catalog of Hybrid Nerine Clones, 1882-1958,** by Emma D. Menninger, PLANT LIFE 16: 63-74. 1960; Addendum, PLANT LIFE 17: 61-62. 1961; **The Genus X Crinadonna,** by Hamilton P. Traub, PLANT LIFE 17: 65-74. 1961; **Catalog of Hybrid Amaryllis Cultivars,** 1799-1963, by Hamilton P. Traub, W. R. Ballard, La Forest Morton and E. Authement, PLANT LIFE. **Appendix** i-ii + 1-42. 1964. Other catalogs of cultivated amaryllids are scheduled for publication in future issues.

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

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

Correspondence regarding registration of all amaryllids such as **Amaryllis, Lycoris, Brunsvigia, Clivia, Crinum, Hymenocallis,** and so on should be addressed to 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, 1970

Registered by Sterling S. Harshbarger, 161 S. Virginia Av., Pasadena, Calif. 91107:

"Cousin Gladys" (Harshb., 1971), R; A-915; D-5b; U—4-fld; 22″ high; 6—6½″ diam.; pure white, creped, fringed segs with red ring deep in the apple green throat; deciduous; spring.

Registered by W. Quinn Buck, 26 E. Camino Real, Arcadia, Calif. 91006:

"Stephanie" (Buck, 1971), R; A-916; D-5a; 24″ high; U—4-fld; 8″ diam.; bright pink-scarlet self; very heavy substance; very flat, prominent ears.

Registered by Ed Pencall, 4227 N. Peck Rd., El Monte, Calif. 91732:

"Foxy Pink" (Pencall, 1971), R; A-917; D-5a; 20″ high; U—4-fld; 6″ diam.; medium silvery pink with white blaze on segs; very round.

"Binky Pink" (Pencall, 1971), R; A-918; D-5a; 24″ high; U—3-4-fld; 9″ diam.; rose pink; **award: P. C., 1970,** Off. Amaryllis Show, So. Calif., Hemerocallis & Amaryllis So., Apr. 26, 1970.

RAVENNA—NEW MILLA SPECIES—continued from page 90.

and no doubt exists in my mind about the distinctness of the present species.

A bulb of *Milla oaxacana* still survives in my collection of living plants. Since 1963, when it was planted, it flowered only once.

LITERATURE CITED

Baker, J. G. A revision of the genera and species of herbaceous capsular gamophyllous Liliaceae, Journ. Linn. Soc. Lond. 11: 378-387. 1871.

Moore, H. E. The genus *Milla* and its allies. Gent. Herb. 8: 262-294. 1953.

CONTRIBUTIONS TO SOUTH AMERICAN AMARYLLIDACEAE IV.

PEDRO FÉLIX RAVENNA
Melián 2240, Buenos Aires, Argentina

The present contributions are a continuation of the series which appeared in PLANT LIFE 1969. The studies presented concern the genera *Amaryllis, Zephyranthes, Chlidanthus, Castellanoa, Stenomesson Griffinia, Tristagma* and *Nothoscordum.* In addition to the Herbaria already enumerated, I have consulted material in the following: Herb. Gunckel, Herb. Looser (both from Chile), LP, SGO, and US. I wish to express my gratitude to the curators or owners, who so kindly made the specimens available to me.

I. STUDIES IN THE GENUS **AMARYLLIS**

My experience in examining different flower shapes in the genus, convinced me that several species might be grouped in *Series*, on phylogenetic grounds. These trends are observables within the various subgenera. Two natural groups are proposed here, in an attempt to fill this need.

Additionally, two undescribed species are included. The first, *A. iguazuana,* was found by Prof. G. Hatschbach in the State of Paraná (Brazil), and by me in the Iguazú National Park in Argentina. The second, *A. rubropicta* is also a native of the same Brazilian State.

STRIATAE Rav. **series nova** (Subgeneris **Lais**)

Perigonium horizontale vel declinatum saepe basin versus valde angustatum (ut in *A. belladonna),* rubrum, scarlatinum, aurantiacum vel luteolum. Tepala saepe undulata tertio inferiore stria media lutescente vel viridescente notata.

Perigone horizontal or declined, often rather narrowed toward the base (as in *A. belladonna),* red, scarlet, orange or yellowish. Tepals frequently undulate with a yellowish or greenish band in the lower third.

Type species: *Amaryllis striata* Lam.

Species hitherto recognized in the Series: *A. striata* Lam., *A. petiolata* Pax, *A. aglaiae* Cast.

AVIFLORAE Rav. **series nova** (Subgeneris **Omphalissa**)

Perigonium horizontale vel saepe oblique erecto-patente modice apertum, rubrum, aurantiacum, albo viridescente vel viride nerviis fusco-rubris vel fusco-aurantiacis saepe profuse notatum. Tepala exteriori-lateralia apicem versus arquata et convergentia sub interiori-inferius contigua.

Perigone horizontal or spreading upright, moderately open, red, orange, greenish-white or green, very often profusely nerved with red or dark orange. Outer pair of inner tepals curved, somewhat convergent toward the apex, contiguous below the lower inner tepal.

Fig. 20. Left, Amaryllis iguazuana Rav., plant as cultivated in Buenos Aires from bulbs collected in the Iguazu National Park, Argentina. **Right, Amaryllis vittata** L'Herit. ssp. **guarapuavae** Rav., in the wild state. Photos by Pedro F. Ravenna.

Type species: *Amaryllis aviflora* Rav.

Species hitherto recognized in the Series: *A. aviflora* Rav., *A. maracasa* Traub, *A. restingensis* Rav., *A. iguazuana* Rav., *A. rubropicta* Rav., *A. mandoni* (Bak.) Traub et Uphof.

Species of this group are all closely allied and differences are very difficult to detect in herbarium specimens. Important characters as flower color, plant size, and leaves texture, are often not apparent in them.

Amaryllis mandoni (Bak.) Traub et Uphof is transferred to subgenus *Omphalissa* on account of the markedly zygomorphic perigone, which agrees with this Series. The presence of a capitate-trilobed or trifid stigma, is less important than the shape of the perigone, as also occurs in subgenus *Macropodastrum*.

Amaryllis iguazuana Rav. **sp. nov.** (Figs. 20-A & 21)

Planta circ. 64 cm alta. Bulbus late ovatus in collo brevi usque 40 mm longo productus. Folia lorata canaliculata viridia valde pruinosa ad anthesin circ. quinque ad 12-33 cm longa circ. 24-33 mm lata ad apicem subacuta. Scapus usque 45 cm longus leviter compressus pruinosus purpurescens praeter apicem versus cinereo-viridis ad 11.5-12 mm latus ad basin 27-28 mm latus. Spatha usque 8 cm longa; valvae lanceolatae subaequales haud marcescentes pallide virides; bractea interior unica tenuiter filiformis albicans ad 5 cm longa. Pedicelli ad 40-41 mm longi. Inflorescentia biflora. Flores leviter erecto-patentes ad 9.5-10.7 cm longi circ. 10-11 cm in diametro horizontale et 8.8 cm in diametro verticale. Tepala oblanceolata usque 13 mm connata extus praeter margines viridia ad lateras et apicem rubro-venata, intus usque apicem stria media viride caeterum insigniter rubro striata et reticulata; exteriori-superius ad 10.5 cm longum circ. 34 mm latum (apiculus circ. 3 mm longus), exteriori-inferiora arquata sub interiori-inferius contigua valde flexuosa ad 98 mm longa circ. 28 mm lata, interiora-lateralia arquate-patentia ad 95-96 mm longa circ. 24 mm lata, interiori-inferius fasciculo staminum subtendente ad 91 mm longum circ. 15.4 mm latum. Filamenta stricte declinato-ascendentia tertio superiore rubicunda basin versus albicans, sepalina lateralia ad 55 mm longa, sepalinum superius circ. 58 mm longum, petalinum inferius usque 58-60 mm, petalina lateralia ad 77-79 mm longa. Antherae reniformes post dehiscentiam circ. 4.5-5 mm longae; pollen luteus. Stylus declinato-ascendens tertio superiore rubicundus usque 95 mm longus. Stigma trifidus; lobis albis erecto-patentes ad 4 mm longis.

Plant about 64 cm tall. Bulb widely ovoid ca. 6 cm in width; pseudoneck to 4-5 cm long. *Leaves* lorate, channelled, with somewhat revolute margins, green, rather pruinose, often five at anthesis, erect, to 12-33 cm long, 24-33 mm broad, later longer and somewhat recurved, almost pointed. *Scape* to 45 cm high, slightly compressed, markedly pruinose, upwards a grayish-green, purplish below, ca. 11.5-12 mm broad, 27-28 mm near the base. *Spathe* to 8 cm long; *valves* lanceolate.

subequal, not marcescent, a pale green; inner bract single, narrowly filiform, whitish, to 5 cm long. *Pedicels* ca. 40-41 mm long. Umbel two-flowered. Flowers spreading obliquely, to 9.5-10.7 cm long, 10-11 cm in its horizontal diameter, 8.8 cm in its vertical diam. *Tepals* oblanceolate, connate at the base for 13 mm, dorsally green excepting the margins and apex which are red-nervated; inner face with a red band throughout, profusely red-striated and reticulated; the upper outer to 10.5 cm long, 34 mm broad, its apiculum ca. 3 mm long; lower outer pair curved,

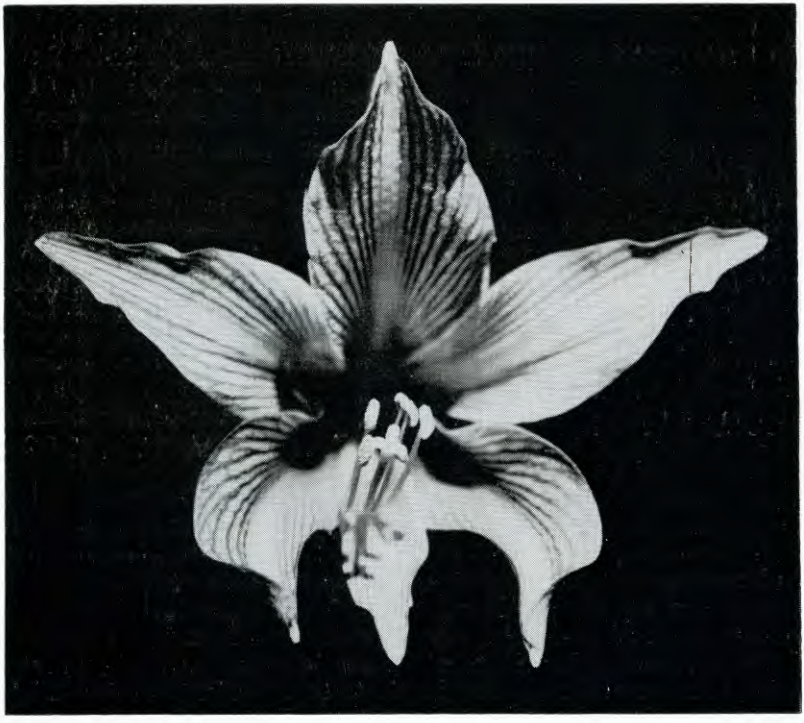

Fig. 21. **Amaryllis iguazuana** Rav., front view of flower. Photo by Pedro F. Ravenna.

contiguous below the lower inner, rather flexuose, to 9.8 cm long, 28 mm broad; lateral inner pair spreading to 9.5-9.6 mm long, 24 mm broad; lower inner subtending the stamen fascicle, to 9.1 cm long, 15.4 mm broad. *Filaments* closely declinate-ascending, reddish in the upper third, whitish below; upper episepal to 58 mm long, lateral episepal ca. 55 mm long, lower epipetal 55-60 mm long, lateral epipetal pair 77-79 mm long. *Anthers* after dehiscence reniform, ca. 4.5-5 mm long; pollen yellow. *Style* declined-ascending, reddish in the upper third, to 9.5 cm long. *Stigma* trifid, its lobes spreading upright, ca. 4 mm long.

Hab.—In clearing of woods, often near streams, at the Iguazú National Park, Argentina. Apparently, it also inhabits some places in the State of Paraná, in Brazil, but in lower drier woods.

Specimens: Culto in Bonaria ex bulbis prope rivulum Central in Parque Nac. Iguazú provincis Missionum Argentinae collectis; leg. Ravenna 1040, II-1970 (typus in Herb. Ravenna). Misiones, dept. of Iguazú, route 101, between Cataratas and Yacuí; leg. Perrone 8-X-1949 (BA 54162). Brazil, Paraná, mun. Guarapuava, Lagoa Sêca; leg. Hatschbach 19784, 21-IX-1968 (HH, Herb. Rav.) ?

This interesting species is closely related to *Amaryllis aviflora* Rav., from which it differs by the larger size of the whole plant, and the more undulated and red-tinged tepals.

It seems to be very scarce. A small population was found by me near Arroyo Central, on the way to Cabureí. Some plants are now cultivated at the park-guard's house, near the latter village; others were introduced into cultivation here in Buenos Aires. Apparently the same was collected (dried) by Prof. Hatschbach at Lagoa Sêca, municipe of Guarapuava, in the State of Paraná (Brazil). Bulbs of the latter place were gathered by both of us, and planted in our respective collections.

Amaryllis rubropicta Rav. **sp. nov.**

Bulbus completus non vidi. Folia ad anthesin circ. quinque crassiuscula lorata ad 26-38 cm longa circ. 10-21.5 mm lata viridia in facie abaxiale pallidiora. Scapus robustus usque 49 cm longus prope basin circ. 17-18 mm latus brunnescens. Inflorescentia biflora. Spathae valvae marcescentes anguste lanceolatae subaequales usque 8 cm longae; bractea interior lanceolato-filiformis membranacea ad 34 mm longa; pedicellis subaequales usque 57 mm longi. Flores erecto-patentes vel suberecti (?) ad 10.6-10.4 cm longi circ. 7-8 cm lati. Tepala usque 7 mm connata viridia praeter margines et apicem versus rubro-tincta et striata, exteriori-superius ad 92 mm longum circ. 37-38 mm latum, exteriora-inferiora usque 93 mm longa circ. 45 mm lata, interiora lateralia ad 83 mm longa circ. 30 mm lata, interiori-inferius ad 8 cm longum circ. 12 mm latus peracutus. Filamentia declinato-ascendentia, sepalina lateralia ad 67 mm longa, sepalinum superius usque 70-72 mm longum, petalinum inferius ad 74-75 mm longum, petalina inferiora circ. 77-80 mm longa. Antherae lutae oblongo-reniformes circ. 5-5.5 mm longae. Ovarium oblongum ad 16-17 mm longum circ. 4.5-5 mm latum. Stylus declinato-ascendens usque 95-98 mm longus. Stigma leviter trifidus, lobis erecto-patentibus interdum inaequalibus ad 1.8-2 mm longis.

Perfect *bulb* not seen. *Leaves* about five *at* anthesis, somewhat fleshy, lorate, to 26-38 cm long, ca. 10-21.5 mm broad, green, abaxial face paler. *Scape* robust to 49 cm long, brownish and 17-18 mm broad toward the base. Inflorescence two-flowered. *Spathe-valves* marcescent, narrowly lanceolate, subequal, to 8 cm long; inner bract lanceolate-filiform, membranous, ca. 34 mm long; *pedicels* subequal to 57 mm long. *Flowers* spreading upright or suberect (?) to 10.6-10.4 cm long,

7-8 cm wide. *Tepals* connate for 7 mm, green excepting margins and apex, which are red-tinged and striate; upper outer to 92 mm long, 37-38 mm broad; lower outer pair about 93 mm long, 45 mm broad; lateral inner pair to 83 mm long, 30 mm broad; upper inner to 8 cm long, 12 mm broad, very acute. *Filaments* declined-ascending; lateral episepal pair to 67 mm long; upper episepal pair about 70-72 mm long, lower epipetal ca. 74-75 mm long; lower epipetal to 77-80 mm long. *Anthers* yellow, oblong-reniform, about 5-5.5 mm long. *Ovary* oblong, ca. 16-17 mm long, 4.5-5 mm in width. Style declined-ascending, to 95-98 mm long. *Stigma* faintly trifid, its lobes ascending, some times unequal, to 1.8-2 mm long.

Hab.—Apparently only from the type-locality, growing under shade.

Specimens: Brazil, Paraná, mun. Río Branco do Sul, Santaría; leg. G. Hatschbach 19683, 10-IX-1968 (type in Herb. Ravenna, isotype HH).

A pretty species closely related to the preceding, but the almost fleshy leaves and the green tepals deeply stained with red at the apex, distinguish it at once. This color pattern could remind one of *Amaryllis psittacina* Ker-Gawl.; though, the latter's flower shape is different.

In the last volume of this Journal, Mr. Harry Blossfeld published the illustration of a flower which he identificates as *A. moreliana.* In my opinion, that plant could be the species here described, rather than the latter. Nevertheless, and in order to clear this point, a pressed specimen or bulbs from Mr. Blossfeld's source, are cordially requested.

Amaryllis vittata L'Her. ssp. **guarapuavae** Rav. **ssp. nov.**

A subspecie vittata flore majore (usque 16-18 cm longus circ. 9-10 cm latus) basin versus tenuiore recedit.

Differs from subspecies *vittata* on account of its larger flower (ca. 16-18 cm long, 9-10 cm in diam.), narrower toward the base.

Hab.—Undulated fields in the south-western part of the State of Paraná in Brazil; also in the province of Misiones, Argentina. It grows among bushes, apparently the remnants of woody vegetation.

In the second series of these contributions (1969), the range of *A. vittata* was cleared up, assigning it to South Brazil. This conclusion was based on the examination of dry material and photographs of living plants from that region. In the meantime, *Hippeastrum ambiguum* Hook. var. *tweedianum* Herb. was identified with this species. I do maintain this position, on account of the size of the single flower in the type-sheet (at Kew). Nevertheless it appears now that the species is a complex of forms. This can be seen by comparing the photograph of the typical *vittata* (Pl. Life 25, f. 20), with the present illustration of subspecies *guarapuavae.* The latter approaches somewhat to *A. ambigua* Hook., a plant apparently raised by crossing *A. vittata* and *A. solandraeflora* Lindl.

The location where this pretty plant grows, is subject to devastation with fire and other hazards, in order to plant pine trees. No

doubt this subspecies will disappear in a short time, at least in that location.

The same was found near Bonpland, in the province of Misiones (Argentina), a long time ago, by P. Joergensen Hansen. The specimen of this collector, cited above, represents the first report of *Amaryllis vittata* in the flora of Argentina. In 1958 I explored the same places, in order to find this and other plants, but was unsuccessful. The environment of that region is at present much modified by man. Nevertheless, it is possible that the plant could be found, in the future, in some other place in the province.

II. **ZEPHYRANTHES** NOTES

A new subgenus, additional, synonyms for *Zephyranthes boliviensis* Bak., and an undescribed subspecies in *Z. minima* are included. Genus *Haylockia* is recognized as a subgenus of *Zephyranthes*, as was previously maintained by Traub (1951).

Genus **Zephyranthes** subgenus **Argyropsis** Herb. ex. Rav., **subgen. nov.**

Herb. Amaryll. 176, 177. 1837.

A subgeneri *Zephyranthes, Pyrolirion* et *Haylockia* stigmate capitato-trilobato foliis saepe valde succulentis, subgeneri *Cooperia* tubo perigonii nullo vel subnullo differt. Typus speciei: *Z. candida* (Lindl.) Herb.

It differs from subgenera *Zephyranthes, Pyrolirion* and *Haylockia*, on account of its capitate-trilobed stigma and often rather succulent leaves; from *Cooperia* it is also separated by its obsolete perigone-tube. Type—species: *Z. candida* (Lindl.) Herb.

Four species from eastern and north-eastern Argentina, Uruguay, Paraguay, and southern Brazil.

1a. Flowers yellow .....1. *Z. flavissima*
1b. Flowers white, pink or purple-tinged with age.
  2a. Style curved, ascending.
    3a. Leaves almost filiform, 1 mm or less broad. Flower ca. 17-26 mm in diam. Plants weak, with a resting period .....2. *Z. stellaris*
    3b. Leaves not filiform, ca. 3-5 mm broad. Flowers about 30-50 mm in diam. Plants not weak, evergreen, inhabiting damp or inundated places .....3. *Z. candida*
  2b. Style straight, erect.
    4a. Fertile stamens 3, and 3 staminodes .....4. *Z. minima* ssp. *minima*
    4b. Fertile stamens 6 .....4b. *Z. minima* ssp. *hexandra*

The name *Argyropsis*, was provisionally suggested by Herbert (1837, pp. 176, 177), if it could be proved that *Zephyranthes candida* represents the type of a separate genus. He said: "My belief is that this plant belongs to a genus intermediate between Zephyranthes and Cooperia, though I will not disturb it till the further species of those

genera can be thoroughly examined''. *Cooperia* Herb. was integrated as a subgenus of *Zephyranthes* (see Pl. Life 7: 43).

To my hand, I am convinced that the four species above enumerated, represent a natural group of subgeneric rank within *Zephyranthes. Z. stellaris* Rav., and *Z. flavissima* Rav., recently described (1967), both give strength to this position. The latter is sometimes subaquatic in Argentina, even if it also inhabits the highlands of Southern Brazil; it shows considerable resemblance, in habit, with *Z. candida.*

Stigma shape and the lack of perigone tube are the main characters which separates *Argyropsis* from the rest of subgenera.

Zephyranthes minima Herb. ssp. **hexandra** Rav., **ssp. nov.**

A subspecie minima planta in omne parte majora staminibus antheris sex polleniferis instructibus.

Hab.—in campis provinciae Entre Rios Argentinae. Crescit prope subspeciem typicam, *Marsillea concinna* Bak., *Habranthus tubispathus* ssp. *macranthus* Rav. *Alophia lahue* (Mol.) Espin. ssp. *amoena* (Gris.) Rav. et caet.

Specimens: Argentina: prov. Entre Ríos, Concepción del Uruguay, cerca del puerto; leg. Ravenna 628, IV-1967 (type in Herb. Ravenna).— Idem, dept. C. del Uruguay, Campichuelo, orillas río Uruguay; leg. Burkart et Troncoso 24141, 10-IV-1963 (SI). Idem, Banco Pelay; leg. ipses 24142, 11-IV-1963 (SI).

The plant is similar to the type, but larger in all its parts; it has six fertile stamens instead of three as in subspecies *minima.* It is frequently found near the latter. The barriers which obstruct hybridation between both subspecies, are at present unknown.

Zephyranthes boliviensis, Bak.

Baker, Handb. Amaryll.: 38. 1888.; *Zephyranthes xyphopetala* Baker, Mem. Torr. Bot. Club 4: 268. 1896.; *Z. viridilutea* Kraenzlin, Fedde Rep. 13: 118. 1914.; *Pyrolirion boliviense* (Bak.) Sealy, Journ. Roy. Hort. Soc. 62: 207. 1937.; *P. xyphopetalum* (Bak.) Sealy, loc. cit.: 208.; *Habranthus viridiluteus* (Kraenzl.) Traub, Pl. Life 7: 42. 1951.

Bulb ovoid or subglobose ca. 41-44 mm long, 27-39 mm in width, produced into a short pseudo-neck. *Scape* cylindrical to 8.7-32 cm long. Spathe membranous, lanceolate, about 25-30 mm long, tubular for 10-14 mm, then entire upwards. *Flower* erect, sessile, yellow, about 26-50 mm long, 30-44 mm in diam. *Ovary* almost cylindrical, ca. 7-11 mm long, 1.5-2.2 mm wide. *Tepals* oblanceolate, subequal, connated at the base for 5-10 mm, about 27-42 mm long, 5-8 mm broad. *Filaments* filiform, somewhat curved, biseriate, episepals ones ca. 6-9 mm long, epipetal to 9-10 mm long. *Anthers* linear oblong, to 6 mm long, after dehiscence markedly circinate. Style erect, ca. 20-29 mm long, trifid at the apex; *style* branches about 6-11 mm long, the stigmatic portion clavate-emarginate or spathulate.

Hab.: Bolivian plateau and northern adjacent valleys, about 2700-

3500 m over the sea level. In the Sorata valley is found in slippery grades of schist stones, above the river Challasuyo, growing near *Chlidanthus soratensis* (Bak.) Rav., and *Cypella peruviana* (Bak.) Bak. ssp. *soratensis* Rav. A plant which I have seen between Cochabamba and Challa (on the way to Oruro), seems to be the same.

Specimens: Bolivia, Dept. La Paz, prov. Larecaja, viciniis Sorata, inter Hunaypata et rivum Challasuyo; leg. Mandon 1194 pp. IX-X-1858 (phototype from K, neg. 11515).; Idem, Bolivian plateau; leg. Bang 890, 1891 (NY, type of *Zephyranthes xyphopetala* Bak.).; Idem, in der Felsheide bei Teneria, in 3000 m ü d. M; leg. Herzog 2486 (B, type of *Zephyranthes viridilutea* Kraenzl.).

A time ago, I requested on loan the type-specimens of *Zephyranthes xyphopetala* Bak. and *Z. viridilutea* Kraenzl. After an accurate examination, it was possible to ascertain that the latter was identical to the former. A photograph from the type of *Z. boliviensis* Bak., lately received from Kew Gardens, revealed that this is the earlier name for the species.

Z. viridilutea Kraenzl. was transferred by Traub (1951, p. 42) to *Habranthus;* but, according to the characters given in the description above, that position seems untenable to me.

The species is now placed in subgenus *Pyrolirion,* but the markedly biseriate stamens with circinate anthers are in disagreement with this, statement. Moreover, the deeply trifid stigma (which I consider as true style arms), seems to be an unusual feature. It is probable that the species should deserve a special placement in a new subgenus. Nevertheless, I prefer not to erect it for the present.

Genus **Zephyranthes** subgenus **Haylockia** (Herb.) Traub

Traub, Pl. Life 7: 43. 1951.—Genus *Haylockia* Herbert, Bot. Reg. 16: tab. 1371. 1830.

Haylockia Herb. was reduced to a subgenus of *Zephyranthes* by Traub (1951). His viewpoint, in my opinion, was correct. Whereas, several years later (1963), he apparently changed his mind. Thus, it is necessary to review its characters, comparing them with the recognized subgenera of *Zephyranthes (Cooperia, Zephyranthes* and *Argyropsis):*

1) The type-species, *Haylockia pusilla* Herb., has sessile flowers with a long perigone tube, the same as *Cooperia.* 2) Stamens are bibiseriate with arquate moderately produced (long) filaments, as in several species of *Zephyranthes.* 3) The style, although very long (most of its length is included in the perigone tube), does not reach the anthers; sometimes only a short part of its arises from the tube. Almost the same feature is found in *Cooperia,* but in this subgenus the stigma is capitate-trilobed, and the tepals are much spreading. 4) In subgenus *Argyropsis,* although the tepals are connate for 1-3 mm, there is no tube; the stigma is capitate-trilobed. 5) The scape is included in the pseudo-neck of the bulb at anthesis (it arises with fructification); this appears to be the only exclusive character in subgenus *Haylockia.*

In other words, *Haylockia* is an intermediate between subgenera *Zephyranthes* and *Cooperia,* within the genus *Zephyranthes.*

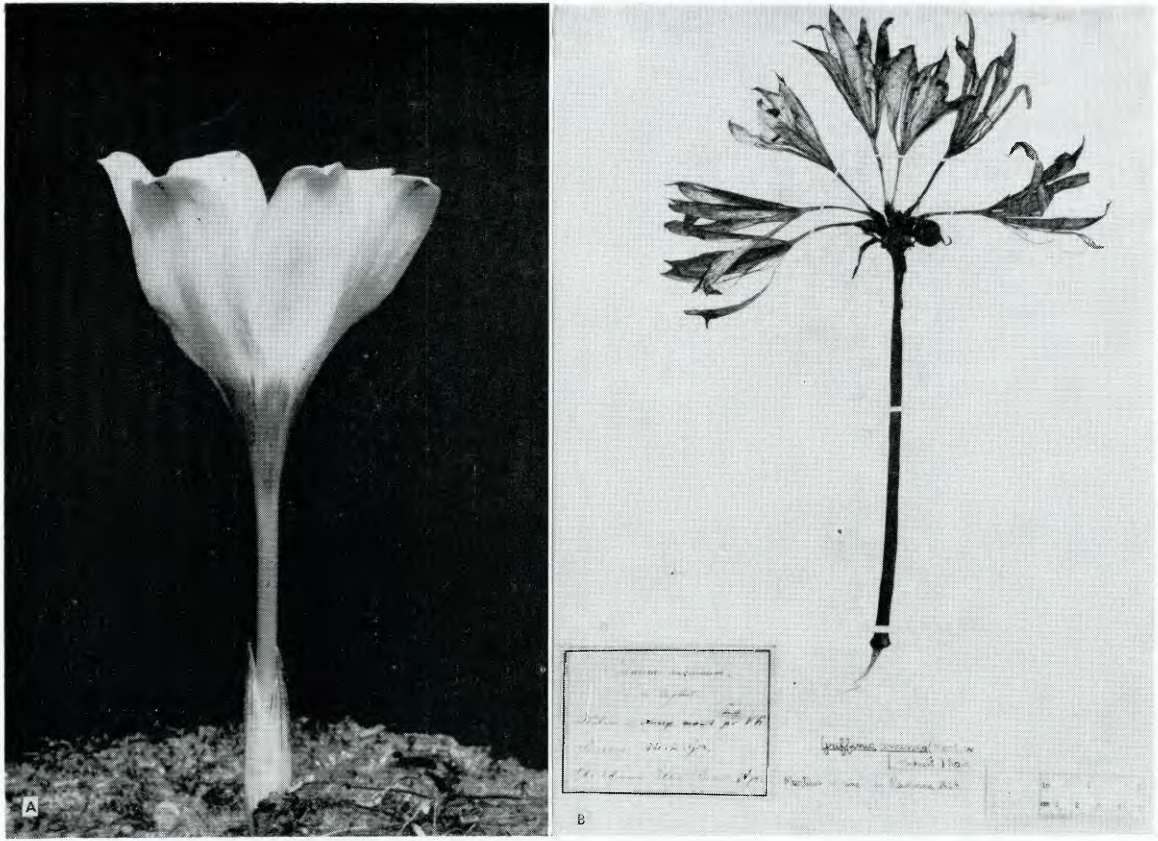

Fig. 22. **Left, Zyphranthes pusilla** (Herb.) Dietr., as cultivated in Buenos Aires, from bulbs collected at La Paloma, Uruguay. **Right,** the type specimen of **Griffinia concinna** (Mart. ex Schult.) Rav., in the Muenchen Museum (M).

Zephyranthes pusilla (Herb.) Dietr. (Fig 22-A)

Dietrich, Syn. Pl. 2: 1176. 1840.; *Haylockia pusilla* Herbert, Bot. Reg. 16: tab. 1371. 1830.

Plant ca. 45-65 mm tall. *Bulb* almost globose, to 18-20 mm in diam., covered by brown coats and produced into a pseudo-neck for 4-8 cm. *Leaves* absent at anthesis, serotine, produced in autumn, linear, channelled, rosulate, a dark green, about 7-15 cm long, 1-2.2 mm broad. *Scape* subterranean when in flower, included in the pseudo-neck, to 3-5 cm long when in fruit, ca. 2-2.5 mm broad, compressed, a brownish green. *Spathe* often subterranean or appearing from the soil for half of its length, to 25-35 mm long, very thin, hyaline, compressed, bifid at the apex for 6-8 mm, sometimes with brownish veins. *Ovary* oblong, whitish, ca. 3.8 mm long, 2.5 mm broad, sessile. *Perigone-tube* to 36-42 mm long. *Tepals* oblanceolate, connate above the tube for 3.5-4.5 mm; the outer about 20-30 mm long, 4.8-7 mm broad, shortly apiculate, with diminutive streaks near the base; the inner ca. 7-11.6 mm broad, without streaks near the base. *Filaments* lanceolate-filiform, upright; episepal about 6-10 mm long, connated to its tepal for 3.5 mm; epipetal ca. 11-14 mm long, connated to its tepal for 3.7-3.8 mm. *Anthers* orange-yellow, semilunate or very often twisted, ca. 2-4.7 mm long. *Style* reaching the length of stamens or not, often concealed by the perigone-tube, to 38-45 mm long; *Stigma* trifid, its divisions recurved ca. 3.5-3.8 mm long. Capsule rounded, compressed, ca. 6 mm in diam. Seeds compressed but not with papyraceous edges, semilunate or almost deltoid, black, to 2.4-2.5 mm.

Hab.—Dry fields or hills of Southern Brazil (Río Grande do Sul), Uruguay and the Argentine provinces of Entre Ríos and Corrientes. Cultivated in my collection, from bulbs collected near Mercedes, in the prov. of Corrientes, and at La Paloma, in the Republic of Uruguay.

Specimens: Argentina: Entre Ríos, Concepción del Uruguay; leg. Lorentz 728 (BAF). Corrientes, Tapebicua; leg. Martinez Crovetto & Leguizamón 5524 (BAB) fl. yellow. Idem ibid.; leg. ipses 5523 (BAB), fl. white. Idem, Mercedes; leg. R. A. Spegazzini, 23/31-III-1940 (BAB 60824).

Brazil: Río Grande do Sul, Porto Alegre, Montserrat, in campo; leg. K. Emrich, 17-II-1942 (PACA 10176). Idem ibid., campo pedregoso; leg. ipse (PACA 11505). Idem ibid, campo pedregoso; leg. ipse, 25-I-1943 (PACA 30008). Idem ibid; leg. ipse (PACA 25009).

Uruguay: Dept. Tacuarembó, Rincón de la Laguna; leg. Castellanos, 15-II-1947 (BA 55397). Idem, Villa La Paz, arroyo Rosario; leg. Doello Jurado, 18-II-1920 (BA 16746).

Zephyranthes pusilla (Herb.) Dietr., was recorded in the flora of Buenos Aires by Kunth (1850, p. 480), Baker (1888, p. 30) and Holmberg (1903, p. 119). Hicken (1910, p. 70) follows these authors, but he remarks: "no hallada aún" (not found yet). Kunth's and Baker's citations are based on specimens from Sello's collection labelled "Buenos Aires". Most of the sheets of this collector were ambiguously annotated, apparently after his death, as "Brasilia meridionalis", "Montevideo", and so.

It must be said that there is no specimen in any Herbarium here, to confirm those assertions, and nobody has seen the species in any place of the province of Buenos Aires. Nevertheless, some sheets from Entre Ríos and Corrientes truly proved the existence of it in Argentina.

III. STUDIES IN THE GENUS **CHLIDANTHUS**

Rhodophiala soratensis (Bak.) Traub (*Hippeastrum soratense* Bak.) is transferred to the genus *Chlidanthus.*

Chlidanthus soratensis (Bak.) Rav. **comb. nov.**

Hippeastrum soratensis Baker, Handb. Amarll.: 42. 1888.; *Amaryllis soratensis* (Bak.) Traub & Uphof, Herbertia 5: 123. 1938.; *Rhodophiala soratensis* (Bak.) Traub, Pl. Life 9: 60. 1953.

A comparison of the description of *Rhodophiala soratensis* (Bak.) Traub, with the current characters in the genus, showed considerable discrepancy. In fact, the existence of a long, slender, perigone-tube, (to 45-50 mm long) was an unusual feature. For this reason, I asked for a photograph of the type specimen, which is deposited at Kew.

The type-sheet, as shown by the photograph, represents a single plant, about 12 cm tall, with a two-flowered inflorescence. The long-tubed flowers are erect, and supported by distinct pedicels (ca. 17-21 mm long). Stamens appear to be short and upright. These characters suggest a *Chlidanthus,* not a *Rhodophiala;* therefore, the species is transferred to the former genus.

Baker says that the bulb is "under an inch in diam.", but it seems to me that he missed it with the pseudo-neck, which was apparently cut above the bulb in digging.

The recogniton of this species as a *Chlidanthus,* makes more natural and clear the distribution area of *Rhodophiala.*

Specimens: Bolivia, dept. La Paz, prov. Larecaja, inter Hunaypata et rivum Challasuyo, 2700 m; leg. Mandon 1194 pp., 8-IX-1858, removed from the type-sheet of *Zephyranthes boliviensis* Bak. phototype from K, neg. 10889).

IV. A SECOND SPECIES IN THE GENUS **CASTELLANOA**

In 1967, Dr. D. Werner, of Hamburg, brought a collection of plants from the plateau of northern Argentina. Some specimens and bulbs were presented to me for study. A single sheet of the *Amaryllidaceae,* was deposited in the herbarium of the La Plata Museum (LP). After an accurate examination, this proved to be a second species of *Castellanoa.*

Castellanoa yaviensis Rav. **sp. nov.**

A *Castellanoa marginata* parti alati filamentorum breviori ad apicem dentis duobus lateralibus differt.

Plant about 40-45 cm tall. *Bulb* large, broadly ovoid, ca. 7 cm in diam. produced for 10-14 cm into a pseudo-neck. *Leaves* linear distinctly

channeled, ash-green, pruinose, to 30-40 cm long, 8 mm broad, obtuse, with minutely denticulate-papilose, somewhat scabrous margins. *Scape* compressed ca. 40 cm long. *Spathe* ca. 5-10-flowered; valves membranous, rufescent, subequal, narrowly lanceolate, to 75-82 mm long; inner bracts as much as flowers, linear, subfiliform, about 4-5 cm long. *Pedicels* ca. 5-8 cm long. *Flowers* horizontal or declined, pink-orange, to 40-55 mm long, 18-21 mm in diam. *Ovary* oblong or narrowly elliptic, obtusely trigonous, ca. 5 mm long, 2.5 mm broad. *Perigone-tube* slightly curved, ca. 36-38 mm long, somewhat ampliated toward the apex. *Tepals* oblanceolate, subequal, ca. 14-17 mm long, 5-6.5 mm broad, the outer apiculate; apiculum ca. 1.5-2 mm long, with a callus velvety-penicilled at its base. *Stamens* biseriate. *Filaments* flattened and winged below; winged portion rather adnate with the tepals, ca. 1.2-1.4 mm broad in its upper part, ending in two lateral, slightly curved, ca 0.4 mm long, teeth; their base connected by a thin membrane; epipetal filaments 10.7 mm long, its winged portion 4 mm long, adnated for 1.7 mm, upper filiform part about 6.5 mm long. *Anthers* elliptic, yellow, to 5 mm long before dehiscence, afterwards reduced to 3.4 mm. *Style* ca. 37-44 mm long; *stigma* trifid, its divisions spreading, about 1.5-1.9 mm long.

Specimens: Argentina, Jujuy, dept. of Yaví, downward ravine from Yaví to Bolivia, 3380 m of altitude; leg. D. Werner 877, 25-X-1967 (type LP).

The presence of a pair of teeth on each filament, might be considered as unusual. However, we should remember the variations in the staminal cup of *Stenomesson. S. aurantiacum* for instance, has no teeth (see fig. 25), in contrast with most of the species in the genus. The new species is, in other respects, similar to *Castellanoa marginata* (Fries) Traub.

A bulb of *Castellanoa yaviensis* is cultivated in my collection from Dr. Werner's source, but never flowered. Characters of bulb and leaves were taken from this plant.

V. STUDIES IN THE GENUS **STENOMESSON**

During a long collecting trip to the Andes, bulbs of several *Stenomesson* species were gathered and introduced into cultivation. Some of them flowered here; this material permitted the preparation of descriptions and photographs.

From the first moment, identification of the plants appeared difficult. Apparently, problems of misinterpretations of species, originating in the last century, were still unsolved. In the following lines, I attempt to treat this subject. Moreover, four new species and a number of new combinations are proposed.

Stenomesson glareosum Rav. **sp. nov.** (Fig. 23)

Planta circ. 14 cm alta vel minor. Bulbus subovatus ad 30 mm longus circ. 24 mm latum in collo plus minusve longus productus. Folia unica vel dua aestivalia oblanceolato-petiolata fusco-viridia prefoliationis revolutis ad 10-15 cm longa circ. 30-35 mm lata. Scapus subteres gracilis

Fig. 23. **Left, Stenomesson flammidum** Rav., inflorescence, as cultivated in Buenos Aires. **Right, Stenomesson glareosum** Rav., as flowered in Buenos Aires, from bulbs collected at Churín, Dept. of Lima, Peru. Photos by Pedro F. Ravenna.

ad 5-8 cm longus pallide viridis. Spatha bivalvata saepe uniflora raro biflora et rarissime triflora; valvae ad anthesin siccae usque 3 cm longae angustissime lanceolatae. Flos cernuus vel horizontalis viridescens usque 50 mm longus circ. 20 mm latus. Pedicellus usque 30 mm longus. Perigonii tubus versus circ. 13.2 mm longus circ. 2.2 mm latus ad basin leviter ampliatus, deinde tepala usque 18 mm concrescentia; pars libera lanceolata erecto-patentia, exteriora ad 18 mm longa, interiora circ. 19 mm longa. Corona angusta submembranacea viridescens irregulariter dentata circ. 7.5 mm longa; dentis integris vel raro crenulatis ad 1.5-3 mm longis. Filamenta filiformia usque 12 mm longa. Antherae versatiles reniformes circ. 2.6 mm longae. Stylus filiformis ad 6.7 cm longus; stigma capitato-trilobatus.

Plant about 14 cm high or smaller. ***Bulb*** almost ovoid to 30 mm long, 24 mm in width, produced into a somewhat long pseudo-neck. *Leaves* two or single, produced in summer, oblanceolate, petioled, a dark green, vernation revolute, to 10-15 cm long, 30-35 mm broad. *Scape* almost cylindrical, weak, to 5-8 cm long, a pale green. *Spathe* bivalved, often one-flowered, rarely two-flowered or three-flowered; valves dry at anthesis, to 3 cm long, very narrowly lanceolate. *Flower* cernuus or horizontal, greenish, to 50 mm long, 20 mm in diameter. Pedicels to 30 mm long. *Perigone-tube* about 13.2 mm long, 2.2 mm wide, slightly ampliated at the base, then *tepals* concrescent for 18 mm; free portion lanceolate, spreading upwards; the outer series to 18 mm long, inner about 19 mm long. *Staminal cup* narrow, membranous, greenish, irregularly dentate, about 7.5 mm long; teeth entire or rarely crenulate, about 3 mm long. *Filaments* filiform about 12 mm long. *Anthers* versatile, reniform, about 2.6 mm long. *Style* filiform, to 6.7 cm long; *stigma* capitate-trilobed.

Hab.—Stony slopes above Churín, in the dept. of Lima, Perú.

Specimens: Culta in Bonaria ex bulbis in glareosis supra Churín Limae Peruviae collectis; leg. Ravenna 288, IX-1960 (typus in Herb. Ravennae).

This greenish flowered species is the only one so-colored in the subgenus *Stenomesson*. It can be easily separated from the rest of the species on account of the very narrow irregularly dentate staminal cup. It appears somehow mimetic, among stones, on the nearly desert slopes above Churín, in the dept. of Lima, Perú.

It flowered in my collection, but the bulbs were lost after a few years.

Stenomesson campodense Rav. **sp. nov.**

Planta circ. 20-32 cm alta. Bulbus ovatus ad 3.4 cm longus circ. 2.8 cm latus in collo distincto productus. Folia ad anthesin nulla, post anthesin linearia crassiuscula canalículata laxa viridia haud pruinosa ad 15-18 cm longa circ. 7 mm lata ad apicem subobtusa. Scapus subteres ad 20-32 cm longus circ. 5 mm latus. Spatha bivalvata usque 8-flora valvis sublanceolatis marcescentes circ. 34 mm longis et bracteis interioribus

linearis multis instructa. Flores penduli rosei pedicellati. Ovarium oblongum ad 3.9 mm longum circ. 1.9 mm latum. Perigonii tubus circ. 8-10 mm longus curvatus. Tepala usque 5-6 mm concrescentia oblongo-lanceolata ad apicem viridi-suffusa, exteriora ad 19-21.3 mm longa circ. 2.5 mm lata apiculata, interiora ad 18-20 mm longa circ. 3-3.5 mm lata. Corona grandis ad 15.5-18 mm longa circ. 7.5-8.5 mm lata dentibus cochleariformibus leviter bifidis circ. 3.7 mm longis instructa. Filamenta sepalina ad 3.7-5.8 mm longa, petalina leviter minora. Antherae oblongae circ. 2.4-2.5 mm longae versatiles; pollen loculique lutei. Stylus circ. 3 cm longus; stigma capitato-clavatus.

Plant about 20-32 cm tall. *Bulb* ovoid to 3.4 cm long, 2.8 cm wide, produced into a distinct pseudo-neck. *Leaves* none at anthesis, linear, somewhat fleshy, canaliculate, lax, green, not pruinose, to 15-18 cm long, 7 mm broad, almost obtuse. *Scape* almost cylindrical, to 20-32 cm long, 5 mm wide. *Spathe* bivalved 8-flowered; valves almost lanceolate marcescent, about 34 mm long; inner bracts several, linear. *Flowers* nodding, pink, pedicellate. *Ovary* oblong to 3.9 mm long, 1.9 mm wide. *Perigone-tube* about 8-10 mm long, curved. Tepals concrescent for 5-6 mm, oblong-lanceolate, green-tinged at the apex, the outer about 19-21. 3 mm long, 2.5 mm broad, apiculate, the inner to 18-20 mm long, 3-3.5 mm broad. *Staminal cup* large to 15.5-18 mm long, 7.5-8.5 mm in diameter; teeth spoon-shaped, slightly bifid, about 3.7 mm long. *Filaments* episepals to 3.7-5.8 mm long, epipetal slightly shorter. *Anthers* oblong about 2.4-2.5 mm long, versatile; pollen yellow. *Style* about 3 cm long; *stigma* capitate-clavate.

Hab.—Open dry places with sandy soil (with *Bombax* sp.) on the way to the Hacienda Campodén (Casa Grande), circ. 1980 m above sea level, dept. of Cajamarca, Perú. The same species was found also between Membrillar and Llaguén, in the province of Otusco, dept. La Libertad.

Specimens: Perú: Cajamarca, in convalle fluminis Chicama ad viam praedii Campodén circ. 1980 m supra mare; leg. Ravenna 103, VII-1960 (type in Herb. Ravenna). Idem, La Libertad, prov. Otuzco, entre Membrillar y Llaguén; leg. A. López (HUT 1514).

This pretty species has a large staminal cup with concave, spoon-like, teeth. It is nearly related to *S. breviflorum* Herb.; the latter has similar-colored flowers, but a smaller cup with much bifid spreading of teeth, and no green-tipped tepals.

I found it also in the valley near the small town of San Juan, near the city of Cajamarca. It flowered in August 1961 under cultivation in Buenos Aires.

Stenomesson flammidum Rav. **sp. nov.** (Fig. 23)

Planta circ. 15-20 cm alta. Bulbus late ovatus ad 35 mm latus in collo circ 3 cm vel ultra productus, tunicis fusco-ochraceis obtectus. Folia usque quinque serotina linearia crassiuscula subcanaliculata prostrata usque 25 cm longa circ. 5.5 mm lata. Scapus teres ad 26 cm longus circ. 5-6 mm latus. Spatha multiflora, valvis marcescentibus. Flores

nutantes pedicellati insigniter rubri ad 42 mm longi circ. 12-13 mm lati. Ovarium anguste aellypticum ad 3.8 mm longum circ. 1.8-2 mm latum obtuse angulatum. Perigonii tubus usque 13 mm longus deinde tepala circ. 12 mm conata; pars libera tepalorum exteriorum ad 17 mm longa circ. 5 mm lata, interiora paullo minora. Corona staminum circ. 5 mm longa inter filamentos dentibus brevis usque 1.2 mm longis ultra medium bifidis patentibus instructa. Filamenta filiformia petalos subaequantia vel brevia. Stylus usque 47 mm longus; stigma capitatus.

Plant to 15-20 cm tall. *Bulb* widely ovoid about 35 mm in width, produced into a pseudo-neck for 3 cm or further; outer coats of a dark brown. *Leaves* about five, serotine, linear rather fleshy, almost canaliculate, prostrate, to 25 cm long, 5.5 mm broad. *Scape* cylindrical about 26 cm long, 5-6 mm wide. *Spathe* several-flowered; valves marcescent. Flowers nodding, pedicellate, of a bright red, to 42 mm long, 12-13 mm in diameter. *Ovary* narrowly elliptic about 3.8 mm long, 1.8-2 mm wide, obtusely trigonous. *Perigone-tube* to 13 mm long. *Tepals* concrescent for 12 mm, then about 17 mm long, 5 mm broad; inner slightly smaller. *Staminal cup* to 5 mm long; teeth short, to 1.2 mm long, bifid for more than half of their length. *Filaments* filiform, almost equalling the tepals or shorter. *Style* about 47 mm long; *stigma* capitate.

Hab.—Grassy places and mountains of the depts. of La Libertad and Cajamarca, Perú.

Specimens: Cultivated in Buenos Aires from bulbs collected in Perú, at the road cross to Otuzco, dept. La Libertad (province of Otuzco); leg. Ravenna 902, Spring 1961 (type in Herb. Ravenna). Idem, Cerro San Lorenzo, entre rocas y cultivada, 2860 m; leg. N. Angulo, 19-VII-1950 (HUT 1231). Idem, prov. de Bolivar, arriba de Longotea, 3200 m; leg. A. López & A. Sagástegui 27-V-1960 (HUT 3176). Idem, prov. Huamachuco, entre Yanazara y Huaguil (carretera al Maranón); leg. A López & A. Sagástegui 3750, 24-VI-1958 (HUT 2752).

A specimen of this species was apparently examined by Macbride (1936, p. 682), and misidentified as *Stenomesson suspensum* Bak., a synonym of *S. aurantiacum* (H.B.K.) Herb.

Stenomesson flammidum is somewhat allied to *S. breviflorum* Herb. However, our plant has longer and narrower flowers.

Stenomesson mirabile Rav. **sp. nov.** (Subgen. **Callithauma**)

Planta supra solum circ. 40 cm alta. Bulbus oblongo-ovatus ad 9 cm longus circ. 4 cm latus in collo crasso saepe longissimo (usque 35 cm) productus, tunicis brunneis vestitus. Folia ad anthesin nulla serotina lorata viridia haud pruinosa valde carinata ad 30 cm longa circ. 18-20 mm lata ad faciem abaxialem nervio crassiusculo notata ad apicem subacuta. Scapus compresso-ancipitus ad 30-35 cm longus. Spatha complanata bivalvata quadriflora; valvae obtusae saepe persistentes paullo inaequales, inferior ad 7 cm longa circ. 2.4 cm lata, superior ad 6 cm longa circ. 2 cm lata; bracteae interiores tres lanceolatae. Flores horizontales brevissime pedicellati extus bicolores textura crassa. Pedicelli usque 3 mm longi. Ovarium oblongum ad 7-10 mm longum circ. 5 mm

latum fusco viride. Perigonii tubus et pars cnncrescens tepalorum inter se edistincti, totum fusco viride circ. 40-60 mm longum superne circ. 6 mm latum. Tepala (pars libera) contigua in urceola conniventia oblongo-aellyptica rubra, exteriora ad 20.4 mm longa circ. 11 mm lata ad apicem pennicillato-apiculata, interiora ad 18 mm longa circ, 12.4 latum fusco viride. Perigonii tubus et pars concrescens tepalorum inter ad apicem pennicillato-apiculata, interiora ad 18 mm longa circ. 12.4 mm lata ad apicem obtusa velutina. Corona staminum integra crassiuscula alba obtuse lobata. Filamenta usque 2 mm infra marginem corona inserta filiformia erecta, sepalina ad 95 mm longa, petalina circ. 8 mm longa. Antherae oblongae rectae ad 5.3-5.5 mm longae; pollen subfusiformis. Capsula tricocco-globosa. Semina semicircularis nigra complanata ad margines papyracea.

Plant to 40 cm tall above the soil. *Bulb* oblong-ovate, about 9 cm long, 4 cm wide, produced into a thick, often very long (to 35 cm) pseudoneck; outer tunics of a blackish brown. *Leaves* none at anthesis, serotine, lorate, green, not pruinose, rather carinate, to 30 cm long, 18-20 mm broad, with a thickened midrib on the abaxial face, subacute. *Scape* compressed, ancipitaed, to 30-35 cm long. *Spathe* compressed, bivalved, 4-flowered; valves obtuse, often persistent, somewhat unequal, the lower to 7 cm long, 2.4 cm broad, upper about 6 cm long, 2 cm broad; inner bracts three, lanceolate. Flowers horizontal very shortly pedicellate, externally of two colors, of a thick texture. *Pedicels* to 3 mm long. *Ovary* oblong, to 7-10 mm long, 5 mm wide, a dark green. *Perigone-tube* and concrescent part of tepals not differentiated, a dark green, about 40-60 mm long, to 6 mm wide in the upper part. *Tepals* contiguous, forming a cup, oblong-elliptic, red; the outer about 20.4 mm long, 11 mm broad, penicilate-apiculate; the inner to 18 mm long, 12.4 mm broad, its apex obtuse but velutinous. *Staminal cup* entire, thickened, white, obtusely lobed. *Filaments* attached about 2 mm below the edge of the staminal cup, filiform, erect, episepal to 95 mm long; epipetal about 8 mm long. *Anthers* oblong, straight, to 5.3-5.5 long; pollen almost fusiform. *Capsule* globose-tricoccous. *Seeds* semi-circular, black, compressed, with papyraceous margins.

Hab.—In black soil, on rocks or among them, in slopes, at Hacienda Sunchobamba (Caso Grande), about 3500 m above the sea level, dept. of Cajamarca, Perú; also on mount Chungarrán, near Guzmango, prov. of Contumazá, Cajamarca, about 2900 m.

Specimens: Perú, Cajamarca, prov. of Contumazá, cerro Chungarrán; 2900 m; leg. A. Sagástegui, 1-VIII-1960 (type HUT 3387).

This very handsome species I discovered at the Hacienda Sunchobamba (Casa Grande), during explorations in the valley of the Chicama river. Most of plants were growing on rocks in a rich alluvional soil. Unfortunately, in traveling, the dry material was lost together with the description of the species. In the meantime, and as a lucky coincidence, Prof. Sagástegui (University of Trujillo) found the same plant in another area. The specimen was kindly made available to me for study.

The description above was taken from it, complemented with my notes on living plants brought to Buenos Aires. These were not able to resist our damp winter climate.

Stenomesson fulvum (Herb.) Rav. **comb. nov.**

Coburgia fulva Herbert, Edwards' Bot. Reg. 18: tab. 1497. 1832.

This distinct species was overlooked by authors; it has been forgotten in *Coburgia,* a name used in the past for several species of *Stenomesson.*

Coburgia trichroma (Cerv. ex Llav. et Lex.) Herb. seems to be a closely ally. The latter binomial was based on *Pancratium trichromum,* a plant which was cultivated in Mexico (see La Llave & Lexarza, Nov. Veg. Desc. 1: 20. 1824-25). At present the latter species seems doubtful.

Hab.—A native of the Lake Titicaca region, in Perú, and probably also in Bolivia.

Specimens: Perú, Puno, Isla Estébez; leg. Soukup (BA).

Stenomesson coccineum (Ruiz et Pav.) Herb.

Herbert, Appen. Bot. Reg.: 40. 1821.; *Pancratium coccineum* Ruiz et Pavón, Fl. Peruv. Chil. 3: 54: tab. 285. 1802.; *Stenomesson Peruvianum* Traub, Pl. Life 7: 36. 1951.

The complete list of synonymy for this species is given. *S. peruvianum* Traub, collected by Prof. Ferreyra near the type-locality of *S. coccineum,* is apparently the same.

Stenomesson curvidentatum (Lindl.) Herb.

Herbert, Curtis' Bot. Mag. 53: tab. 2640. 1826.; *Chrysiphiala curvidentata* Steudel, Nomencl. Bot. ed. II, 1: 358. 1840.; *Stenomesson pauciflorum* (Lindl.) Herb. var. *curvidentatum* (Herb.) Macbride, Fieldiana Bot. 11: 11. 1931.

Despite its distinctness from *S. pauciflorum* (Lindl.) Herb., *S. curvidentatum* was reduced to varietal rank by Macbride. According to this author, it was never collected again since its introduction in England in 1825.

Stenomesson breviflorum Herb. (Fig. 24)

Herbert, Amaryll.: 199. tab. 28, f. 7-8. 1837.; *Coburgia praecipitata* Herbert, Edwards' Bot. Reg. 28: misc. 54. 1842.; *Coburgia coccinea* Herbert, Curtis' Bot. Mag. 67: tab. 3865. 1841.; Excl. syn.: *Stenomesson coccineum* (Ruiz et Pav.) Herb. (1821).

This very distinct small species, was wrongly considered as a synonym of *Stenomesson coccineum* (Ruiz et Pav.) Herb., by Baker (1888). The latter concept was followed by Macbride (1936). *S. breviflorum* has shorter reddish-pink to red flowers. Its bulbs are prolific of bulblets. I have seen apparently the same in the neighborhoods of Oyon, in the department of Lima, at an altitude of almost 3500 m.

Specimens: Cultivated, from Maclean (photograph of the type of *Coburgia praecipitata* Herb., by courtesy of K).

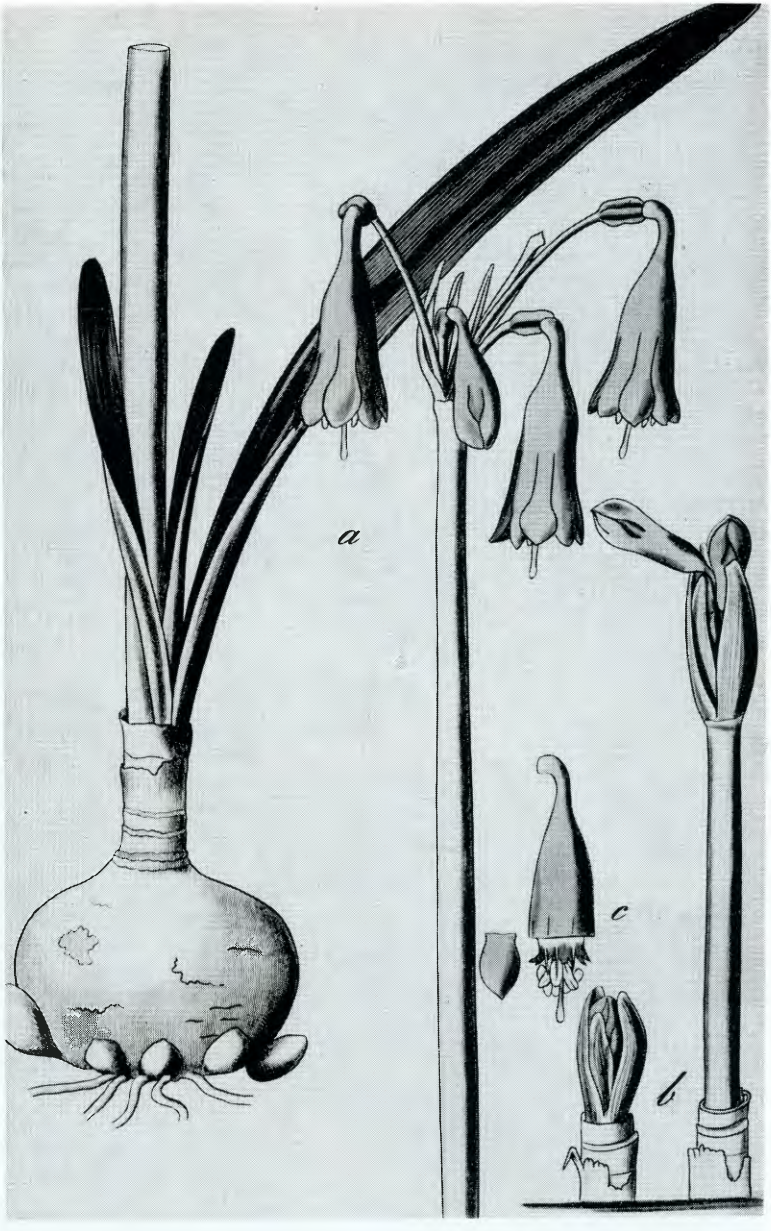

Fig. 24. **Stenomesson breviflorum** Herb., (a) plant with inflorescence; (b) two stages in the growth of the scape; (c) flowers with tepalsegs removed, showing staminal cup, on the left of the tepalseg (all magnified X 1.2). After Curtis' Bot. Mag. 67: tab. 3865. 1841.

Stenomesson flavum (Ruiz et Pav.) Herb.

Herbert, Appen. Bot. Reg.: 40. 1821. (as name but not as plant).; *Pancratium flavum* Ruiz et Pavón, Fl. Peruv. Chil. 3: 54, tab. 284. 1802.; *Stenomesson latifolium* Herbert, Curtis' Bot. Mag. 67: tab. 3803. 1841.; *Stenomesson ruizianum* Kunth, Enum. Pl. 5: 642. 1850.; *Chrysiphiala flava* (Ruiz et Pav.) Ker, Edwards' Bot. Reg. 10: 778. 1824. (as name but not as plant).

Stenomesson flavum has an unfortunate nomenclatural history. The species was hitherto misidentified, since it was classified as *Pancratium flavum* by Ruiz and Pavón.

The misinterpretations began with Ker. In 1824, this author published *Chrysiphiala flava* (Ruiz et Pav.) Ker. He quotes *P. flavum* Ruiz et Pav. under synonymy, therefore, there can be no doubt about his intention of making the new combination. Unfortunately, his description and illustration were made on a different plant: a form of *Stenomesson aurantiacum* (H.B.K.) Herb.

Some years later (1837), Herbert gave a description and a figure of another species under the name *Stenomesson flavum* (Ruiz et Pav.) Herb. (1821). Apparently the plant which he had studied is still unclassified. On the other hand, he redescribes the genuine *S. flavum* as *S. latifolium* Herb. (1841).

Furthermore, it is important to note that *Stenomesson croceum* in the sense of Herbert (1837, p. 199, pl. 28, f. 4), is not the same plant as *Pancratium croceum* Sav. (in Redouté, Liliacées: 4: tab. 187. 1807). Herbert failed again in this respect. It seems possible to me that the plant figured by Redouté is a mixture: the scape in flower, from *Stenomesson aurantiacum,* and the bulb and leaves possibly from a *Zephyranthes.*

Baker (1888), reports *Chrysiphiala flava* Ker-Gawl. (1824) as basonym of *Stenomesson flavum* Herb. (1826). He did not consider the fact that Herbert quotes *Pancratium flavum* Ruiz et Pav., showing his intention of making the new combination upon the latter species. Baker evidently interpreted *S. flavum,* as the plant figured by Ker, which is a form of *Stenomesson aurantiacum.* Moreover, Baker includes *Pancratium* flavum, Ruiz et Pav., under synonymy of *Stenomesson croceum* (Sav.) Herb. (a doubtful species, see above). *S. ruizianum* Kunth, also quoted as synonym of the latter species, is an additional superfluous name for *S. flavum* (Ruiz et Pav.) Herb.

Furthermore, Baker recognizes two varieties under *S. flavum* (sensu Bak.). The first, var. *latifolium,* was based on *S. latifolium* Herb. which is an absolute synonym of *S. flavum* (Ruiz et Pav.) Herb. It must be noted that *S. vitellinum* Lindl., quoted as synonym of this variety, is a different species. The second variety, *curvidentatum,* must be referred to *S. curvidentatum* (Lindl.) Herb. *Chrysiphiala pauciflora* Lindl., under synonymy, if correctly delineated (see Hook. Exot. Fl.: 2: tab. 132. 1823-27) may be considered as different; its erect wider flowers disagree with *S. curvidentatum* Herb.

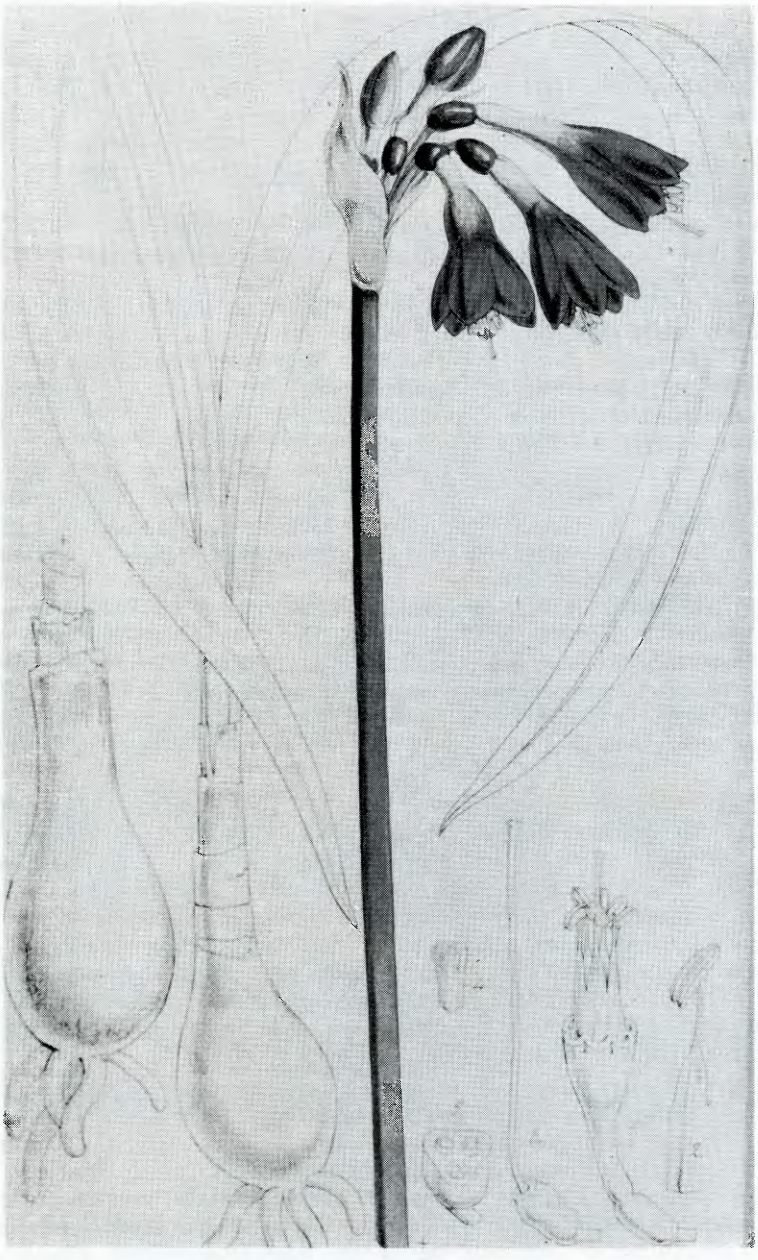

Fig. 25. **Stenomesson aurantiacum** (H. B. K.) Herb., copy of illustration accompanying the description of **S. suspensum** Bak. (Saund. Refug. Bot. 1: tab. 22, 187, 1869), by courtesy of Kew Gardens.

Macbride (1936), in his treatment of the *Amaryllidaceae* for the "Flora of Peru", follows Baker except that he revalidates *Stenomesson latifolium* Herb. as a species, quoting *Chrysiphiala flava* Ker, *Stenomesson flavum* Herb. and *S. flavum* of auth. not R. & P. (sic!), under its synonymy. The latter statement is, in my opinion, untenable.

The species was collected by Ruiz and Pavón on the Lurín hills, near the Pachacamac castle. I gathered bulbs in the latter locality and also in several coastal elevations from the Lima department to Trujillo (La Libertad). A few plants flowered here in Buenos Aires.

Specimens: Perú: dept. of Lima, cerro Agustinos, 300-400 m; leg. Soukup 1437, XI/XII-1940 (SI).

Stenomesson aurantiacum (H. B. K.) Herb. (Fig. 25)

Herbert, Appen. Bot. Reg.: 40. 1821.; *Pancratium aurantiacum* H.B.K., Nov. Gen. Sp. Pl. 1: 280. 1816.; *Chrysiphiala aurantiaca* (H.B.K.) Schultes, Roem. et Schult. Linn. Syst. Veg. 7(2): 904. 1830.; *Stenomesson eustephioides* Herbert, Edwards' Bot. Reg. 29: misc. 62. 1843.; *S. hartwegii* Lindley, loc. cit. 30: tab. 42. 1844.; *S. suspensum* Baker, Saunders' Refug. Bot. 1: tab. 22, 187. 1869.

Plant about 15-30 cm high. *Bulb* ovoid to 55 mm long, 45 mm in width, produced into a pseudoneck. *Leaves* none at the flowering time, petioled; the blade lanceolate, a dark green in the adaxial face, a whitish-green and with a thick midrib in the abaxial face, revolute in vernation, to 33 cm long, 25-35 mm broad. *Scape* cylindrical, not fistulose. *Spathe* bivalved, marcescent 2-5-flowered; inner bracts two or more. *Pedicels* cylindrical to 3 cm long, recurved at the apex. *Flowers* nodding, a bright orange-red, infundibulate. *Ovary* oblong, obtusely trigonous, green, to 6.8 mm long, 4.5 mm wide. *Perigone-tube* curved about 8-9 mm long. *Tepals* connated for 11 mm, narrowly elliptic, about 9-12.5 mm long, 4.5-5.4 mm broad, the outer series with a short apiculum (to 0.5-0.7 mm long), the inner often obtuse. *Filaments* slightly biseriated about 10-11 mm long, connated into a staminal cup for 5-6 mm; teeth absent. *Anthers* narrowly elliptic to 2.4-3.3 mm long. *Style* about 38 mm long. *Stigma* capitate.

Hab.—Northern Peru (dept. of Piura) to northern Ecuador (prov. of Imbabura), at an elevation of 2800-3500 m over the sea level.

Specimens: Ecuador, prov. of Pichincha, slopes of the Pichincha volcano (above the city of Quito), 3000 m; leg. Ravenna 236, 20-VII-1963 (Herb. Ravenna). Idem, prov. Imbabura, Lake Cuicocha, near Otavalo; leg. ipse 256, 4-VIII-1963 (Herb. Rav.).

Stenomesson suspensum Bak., is a further synonym of this species. I have collected it in the slopes of the Pichincha volcano, above the city of Quito, Ecuador, where it grows abundantly, associated with *Sisyrinchium jamesoni* Bak. *(Iridaceae)*. I found it also in the north of the country, at lake Cuicocha, near Otavalo, growing near *Phaedranassa dubia* (H.B.K.) Macbr. Moreover, the plant is quite common in the

department of Piura, Perú, as for instance, on the way to Huancabamba and near Ayabaca.

An additional synonym for **Stenomesson humile** and report of the genus in Argentina

Stenomesson humile (Herb.) Baker, Saunders Ref. Bot. 5: tab. 308, 114. 1872.; *Clitanthes humilis* Herbert, Edwards' Bot. Reg. 25: misc. 87. 1839.; *Coburgia humilis* (Herb.) Herbert, loc. cit. 28: tab. 55. 1842.; *Crocopsis fulgens* Pax, Engler Bot. Jahrb. 11: 324, tab. 7, f. 1-4. 1890.; *Stenomesson acaule* Kraenzlin, loc. cit. 40: 237. 1908.; *Zephyranthes pseudocolchicum* Kraenzlin, Fedde Rep. 8: 118. 1915.

Some time ago I asked on loan, from the Botanisches Museum of Berlin-Dahlem, the type of *Zephyranthes pseudochicum* Kraenzl. This species served Traub (1951, p. 43) for erecting the monotypic section *Brachylirion*, described as "stamens subequal; style straight; peduncle included in the neck of the bulb".

After the type-sheet reached my hands, a careful dissection was made on one of the mounted plants. As a result, I noted that they represented *Stenomesson humile* (Herb.) Bak. Therefore, the section *Brachylion* Traub, becomes a synonym of subgenus *Clinanthus* Herb., within *Stenomesson*.

Cabrera (1957) quotes *Crocopsis fulgens* Pax, in the province of Jujuy. Traub (1963) placed *Crocopsis* Pax under synonymy of *Stenomesson*. Despite these facts, the presence of the latter genus in Argentina, was not formally reported. The southern most record of the genus is found in Tucuman. Some specimens from the high mountains of the latter province, are here referred to *Stenomesson humile* (Herb.) Bak. for the first time.

Hab.—Andes of Peru, Bolivia and Argentina, from depts. of Lima and Junin, in Peru, to the province of Tucumán in Argentina. It grows at high elevation (3000-4200 m above the sea level), especially in a dry semi-arid soil.

Specimens: Argentina: Tucumán, dept. Trancas, Quebrada del Chorro, 3000 m; leg. Schreiter 625, XII-1917 (LIL). Idem, San Pedro de Colalao, Lomas de Gualinchay; leg. M. Lillo s/n, X-1915 (LIL 30761). Jujuy, Mina Pirquitas; leg. Cabrera 9331 (BAB, LP). Idem, dept. Tilcara, al oeste de Huacalera, 3850 m; leg. D. Werner 896, 30-X-1967 (LP).

Bolivia: Auf steinigem Boden des Cerro de Oruro ("Onero", sic!), 3950 m ü d M.; leg. Herzog 2524 (type of *Zephyranthes pseudocolchicum* Kraenzl. B)

VI. STUDIES IN THE GENUS **GRIFFINIA**

Griffinia concinna (Mart.) Rav. **comb. nov.** (Fig. 22-B)

Crinum concinnum Martius, in Roemer et Schultes Linn. Syst. Veg. 7(2): 857. 1830.

Crinum concinnum Mart., seemed to have an unusual habitat in the highlands of Minas Gerais. In fact, *Crinum* species are confined, in

South America, to lowlands, river estuaries and sea shores. In order to verify the status of the species, the type was requested, on loan, to the Botanisches Anstalten of München (M).

The specimen consisted of a scape in flower; bulb and leaves were lacking. After an accurate examination, some features of importance were noted: the large flowers were lilac, with narrow tepals, and the upper episepal stamen was ascending, partially hidden by its own tepal; the rest of stamens were declined. In other words a *Griffinia* species was revealed.

Griffinia concinna is closely related with *G. dryades* (Vell.) M. Roem., from which is separable mainly because of its very short pedicels.

Specimens: Brazil: In campis montibus prope Villa Rica, Minas Gerais; leg. Martius (type M).

VII. AN ADDITIONAL SPECIES IN THE GENUS **TRISTAGMA**

In Traub's brief statement of the genus *Tristagma* (1963), one species was overlooked. It was described in the genus *Milla* by Baker (1875), and lately figured in Curtis' Botanical Magazine (v. 102).

Tristagma leichtlinii (Bak.) Rav., **comb. nov.** (Fig. 26)

Milla leichtlinii Baker, Gard. Chron. 1875 (1): 234.—Curtis' Bot. Mag. 102: tab. 6236. 1876.

A distinct species allied to *T. sessile* (Phil.) Traub. The latter has one-flowered, practically subterranean, spathe; moreover, the sessile flowers have longer filaments inserted in the inside of the tube. In *T. leichtlinii,* however, although congested and somewhat hidden by the leaf sheaths, spathes are not subterranean, and they are 2—3-flowered; the flower is shortly pedicellate but not sessile, and filaments are inserted at the throat of the tube.

It flowers immediately after the spring thaw; leaves and inflorescences develop simultaneously. I have seen it in flower, in October, at Farellones, near the top of the mountains above Santiago.

VII. **NOTHOSCORDUM** NOTES 1970

A new species from the Uruguay Republic is described. A bulb of this was gathered by Dr. John Christie at Punta Ballena, not far from Punta del Este, and given to me for study.

Nothoscordum balaenense sp. nov.

Species a *N. bonariensi* affinis sed foliis latioribus carinatis vel subcarinatis striatis tepalis latioribus ovato-lanceolatis differt.

Plant to 24 cm tall. *Bulb* pyriform or oblong-pyriform, to 25-30 mm long, 7-9 mm broad, whitish. *Leaves* 3-4, spreading upright, to 10-17.5 cm long, 3-3.5 mm broad, linear, a dark green, not pruinose, somewhat striate, channelled, carinate or subcarinate, scabrous on the keel and margins, obtuse. *Scape* erect to 20 cm long, 1.3-1.7 mm broad (some-

Fig. 26. **Tristagma leichtlinii** (Bak.) Rav., (a) general view of plant (X 1.17); (b) flower (X 1.17); (c) long section of flower (X 1.25); **(d)** transverse section of ovary (X 4). After Curtis' Bot. Mag. tab. 6732.

what broader at base), pruinose. *Spathe* ca. 9-flowered, the valves free to the base, clasping, subequal, membranous, lanceolate, marcescent, whitish-hyaline with diminutive reddish streaks, ca. 12 mm long. *Pedicels* slender to 21-22 mm long. Expanded flowers at first three, white, green at the base, ca. 15-16 mm in diam., very fragrant. *Tepals* broadly lanceolate or ovate-lanceolate, connate for 1.5 mm, rarely the outer pink-tinged, outer to 7.5 mm long, 4.2 mm broad, inner subequal, ca. 3.3-4 mm broad. *Filaments* narrowly lanceolate, white, sepaline 4.8 mm long, petaline 5 mm long, both series green at the base for 0.8 mm. *Anthers* versatile, yellow, at dehiscence subreniform, ca. 1 mm long. *Ovary* oblong or prismatic-oblong, ca. 2.5-2.6 mm long, 1.4-1.5 mm broad, a pale green. *Style* filiform white, to 5.4-5.5 mm long; stigma capitate.

Hab.—In stony and rocky places of Punta Ballena, on the coast of the Uruguay Republic. It grows near *Habranthus estensis* sp. nov. (inedit), *H. gracilifolius* Herb., *Tristagma recurvifolium* (C.H.Wr.) Traub, *Stenandrium trinerve (Acanthaceae), Oxalis macachin* and *O.* sp. Cultivated in my collection.

Specimens: Culta in Bonaria ex bulbo a J. Christie in Punta Ballena dep. Maldonado Uruguariae collecto; leg. Ravenna 1030, VI-1970 (typus in Herb. Ravenna).

Nothoscordum balaenense is somewhat related to *N. bonariense* (Pers.) Beauv.; it differs, however, by the different shape of tepals and filaments. Some of Beauverd's species also approach to our plant. These are: *N. grossibulbum,* which has leaves 1 mm broad and a scabrous scape; *N. minarum,* with "very narrow linear leaves" and yellow tepals; *N. scabridulum,* which bears leaves 1.3 mm broad and tepals 2-2.5 mm broad; *N. nudum* has no leaves at flowering time and anthers are 2 mm long. *N. balaenense* does not match any of the mentioned characters.

The species seems to be endemic in stony places of the Uruguayan coast. I was unable to trace it in any of the Herbaria from Uruguay.

VIII. ERRATA IN THE SECOND PART OF THIS SERIES

On page 56 of Plant Life 25, 1969:

[A] In the key of the tribe *Stenomesseae,* the genus *Pamianthe* was omitted. The alternative contrasting characters under 2b must be as follows:

2b. Staminal cup very large, prominent, not hidden by the tepals.
3a. Stamens arising from the inner surface of the staminal cup, some distance below its edge ..... *PARAMONGAIA*
3b. Stamens arising from the edge of the staminal cup ..... *PAMIANTHE*

[B] Under 3b, Key to species of *Phaedranassa,* characters which separate *Phaedranassa schyzantha* and *Ph. lehmanni,* must be corrected as follows:

7a. Stamens exceeding the perigone for 17-20 mm. Flowers constricted at the end of the concrescent portion of tepals ..... *Ph. lehmanni*

7b. Stamens exceeding the perigone for only 6.35 mm. Flowers not constricted ..... *Ph. schyzantha*

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A NEW **MILLA** SPECIES FROM MEXICO

Pedro Felix Ravenna
Melian 2240, Buenos Aires, Argentina

During my explorations in Mexico in 1963, I had the opportunity of going over the same route followed by Pringle, in the Sierra de San Felipe, in the State of Oaxaca. At that time I was searching for *Iridaceae*. Nearly halfway up the mountain top, I found a *Milla* species which proved to be new.

Milla oaxacana Rav. **sp. nov.**

Planta flexuosa gracilis usque 35 cm alta. Cormus parvus depresso-globosus ad 10-12 mm latus tunicis fibrosis obtectus. Folia ad anthesin dua laxe procumbens cylindrica laevia fusco-viridia, usque 40 cm longa circ. 2mm lata. Scapus teres gracilis usque 23 cm longus circ. 1.5-1.7 mm latus. Spatha bivalvata biflora; valvae subaequales divergentes lanceolatae membraceae ad 5-6 mm longae basin circ. 0.7 mm connatae; bracteae interiores duae parvae inaequales ad 1.5 mm et 2.5 mm longae. Flores sessiles rotacei albi extus viridescentes ad 14.4 cm longi circ. 30-32 mm lati. Perigonii tubus gracilis viridescens ad 14 cm longus ad basin circ. 1 mm latus prope apicem leviter ampliatus in vivo circ. 2.5 mm latus. Tepala oblanceolata, exteriora ad 17-18 mm longa, usque 3 mm lata in facie abaxiale usque 6-7 nervis viridis notata breviter apiculata, apiculus fusco-viride circ. 0.7-0.8 mm longus ad sinum glandulosopapillosus,

interiora ad 6.5 mm longa circ. 5 mm lata obtusa in facie abaxiale praecipue nervis tribus notata. Filamenta complanata oblongolanceolata ad basin ampliata subaequalia ad 1.7 mm longa ad basin circ. 0.75 mm lata. Antherae introsae oblongae lutae ad sextum inferiorem dorsifixeae usque 2.7-3 mm longae prope basin circ. 0.6-0.7 mm latae. Ovarium anguste fusiforme stipitatus faucem tubi haud aequante ad 6.5 mm longum circ. 0.7-1 mm latum; stipes usque 11 mm longus ad faciem interiorem perigonii tubi insertus. Stylus filiformis ad 10 mm longus perianthium circ. 7 mm superante. Stigma capitato-trilobus ad 1.5-1.6 mm latus glandulis oblongis circ. 0.2 mm longis instructus.

Plant flexuose, weak, to 35 cm tall. *Corm* small, depressed-globose, about 10-12 mm in width, covered with fibrous coats. *Leaves* two at anthesis, laxly curved, smooth, of a dark green, cylindrical, to 40 cm long, 2 mm broad. *Scape* cylindrical weak about 23 cm long, 1.5-1.7 mm wide. *Spathe* bivalved, two-flowered; valves subequal, diverging, lanceolate, membranous, to 5-6 mm long, connated for 0.7 mm at the base; inner bracts two, small unequal, about 1.5 and 2.5 mm long. *Flowers* sessile rotaceous, white, greenish on the outside, to 14.4 cm long, 30-32 mm in diameter. *Perigone-tube* weak, greenish to 14 cm long, 1 mm wide, slightly ampliated at the apex (about 2.5 mm wide in fresh flowers). *Tepals* oblanceolate, the outer to 17-18 mm long, 3 mm broad, marked with 6-7 veins on the abaxial face, shortly apiculate; apiculum of a dark green, about 0.7-0.8 mm long, glandular-papilose in its sinus; the inner to 6.5 mm long, 5 mm broad, obtuse, with three veins on the abaxial face. *Filaments* flattened oblong-lanceolate, broader at the base, subequal, about 1.7 mm long, 0.75 mm broad at the base. *Anthers* introrse, oblong, yellow, dorsifixed in the lower sixth, to 2.7-3 mm long, 0.6-0.7 mm broad near the base. *Ovary* narrowly fusiform, stipitate, not reaching the mouth of the tube, about 6.5 mm long, 0.7-1 mm in width; stipe to 11 mm long, attached to the inner surface of the tube. *Style* filiform about 10 mm long, exceeding the perianth for 7 mm. *Stigma* capitate-trilobed to 1.5-1.6 mm wide, covered with oblong glands, 0.2 mm long.

Hab.—Southern Mexico, on the Sierra de San Felipe, State of Oaxaca. It grows in the shade under Oak trees near *Oxalis deppei, Alium* sp. and *Calochortus* sp.

Specimens: Culta in Bonaria ex bulbis ad meridionem Mexicii ad Sierra de San Felipe civit. Oaxacae collectis; leg. Ravenna 403, aest. 1965 (typus in Herb. Ravennae).

This graceful *Milla* species is closely related with *M. biflora* Cav. The latter has much larger flowers with tepalsegs connate, abruptly narrowed near the base, and it is a much more robust plant confined, as far as I have seen, to northern drier regions. It seems possible that the existing records of *M. biflora* in southern Mexico and Guatemala, should, in the future, be referred to *M. oaxacana,* rather than to the former. I have examined and collected *M. biflora* near Guadalajara (Jalisco),

RAVENNA—NEW MILLA SPECIES—continued on page 60.

3. GENETICS AND BREEDING

AMARYLLIS CHROMOSOME STUDIES

M. Burnham, E. N. O'Rourke, J. E. Love, and F. B. Schmitz,
Louisiana State University, Baton Rouge, Louisiana

INTRODUCTION

Recent literature (4, 6) on plant chromosome numbers has added little if any information on the genus *Amaryllis*. The reason for this is largely that the people (excluding the commercial breeders) possessing the largest and best collections of species and hybrids lack the necessary equipment. Many techniques for determining chromosome numbers are available but all require a microscope, an instrument which few amateur collectors and breeders have available. These same people when faced with crossing failures must speculate on the reasons for failure and frequently include differences in chromosome number. The purposes of this paper are to provide information on chromosome numbers of some amaryllis species and cultivars, explain some reported crossing failures, and describe the techniques used to determine the chromosome numbers.

MATERIALS AND METHODS

Actively growing root tips obtained from Mr. Fred J. Buchmann, Baton Rouge, Louisiana, of the species *Amaryllis yungacensis*, the cultivars 'White Christmas', 'Maria Goretti', and the cross 'White Christmas' x *A. yungacensis* were collected at 10 a.m. Some root tips were immediately fixed in acetic-alcohol (1 part glacial acetic acid: 3 parts absolute ethyl alcohol) and others were treated for 3 hours with either of two chromosome contracting and division arresting chemicals prior to fixing. The chemicals used were a cold saturated aqueous solution of para-dichlorobenzene (PDB) and a 0.01% aqueous solution of colchicine at room temperature. Treated root tips were washed in running tap water for 15 minutes prior to fixing in acetic-alcohol. The root tips were stained using the Feulgen technique (7), squashed and the slide preparations made permanent prior to observing.

Chromosome counts were also obtained using pollen according to a technique developed by Burnham (3). The pollen was cultured in 2 ml of the Brewbaker and Kwack (1) liquid medium containing in parts per million, 100 H_3BO_3, 300 $Ca(NO_3)_2 \cdot 4H_2O$, 200 $MgSO_4 \cdot 7H_2O$, and 100 KNO_3; with 0.005% colchicine and 10% lactose. After 18-23 hours incubation at 22 C, pollen tubes were harvested by centrifugation and fixed with acetic-alcohol. Feulgen staining was carried out in the culture tubes with fluid changes made after the centrifugation following each step. Feulgen-stained, resin mounted preparations of pollen tubes with arrested metaphases were observed and the chromosomes counted.

Pollen used in this study was obtained from Mr. J. L. Doran, Burbank, California, and Dr. E. N. O'Rourke. The samples of pollen

obtained from Mr. Doran were D-25, D-32 (*Amaryllis blossfeldiae* Traub & Doran (9)), and D-52, three of the acquisitions reported by him in Plant Life 1970 (5). This pollen had been stored with a dessicant in a refrigerator prior to air mailing from California and was refrigerated about 2 weeks in Louisiana. The pollen obtained from Dr. O'Rourke was that of the Ludwig hybrid 'Wedding Bells'. This pollen was collected 1-2 days before culturing and was refrigerated.

RESULTS AND DISCUSSION

Varying success was obtained with the chromosome contracting and division arresting chemicals. PDB gave unsatisfactory results. The untreated and colchicine treated root tips provided many cells with countable chromosomes (Fig. 27). The chromosome numbers determined using root tips are:

'White Christmas'	2n = 4x = 44	tetraploid
'Maria Goretti'	2n = 4x = 44	tetraploid
A. yungacensis	2n = 2x = 22	diploid
'White Christmas' x *A. yungacensis*	2n = 2x = 33	triploid

The chromosome counts on 'Maria Goretti', 'White Christmas', and *A. yungacensis* provide considerable enlightenment on the crosses described by Buchmann (2). Buchmann reported a lack of success in selfing, sibbing, and backcrossing the hybrid from the 'White Christmas' x *A. yungacensis* cross. According to the present study, the parents are tetraploid and diploid respectively and the hybrid a triploid. Since most of the gametes formed by triploids do not have a balanced complement of chromosomes, very few are viable. The progeny that may be produced are generally aneuploids.

Buchmann also described his cross 655 [(*A. evansiae* x *A. aglaiae*) x *A. evansiae*) x 'Maria Goretti'] as being self and sib sterile. *A. evansiae* is described in the literature (8) as being a diploid with 22 chromosomes. Since the cross *A. evansiae* x *A. aglaiae* was fertile as evidenced by the backcrossing to *A. evansiae*, it might be assumed that *A. aglaiae* is also a diploid with 22 chromosomes. This should be verified by an actual count. In the present study, the cultivar 'Maria Goretti' was found to be a tetraploid with a 2n chromosome number of 44. Therefore, the seedlings obtained from Buchmann's cross 655 are most likely triploids. Their self and sib sterility is, therefore, explained on the basis of an unbalanced gamete chromosome complement. The pollen fertility of these seedlings reported by Buchmann when backcrossed to the diploid seed parent does not eliminate the possibility of the triploid condition. During selfing and sibbing, unbalanced gametes were present on both the pollen and seed side of the cross but in the backcross the diploid seed parent possessed gametes with a balanced chromosome complement. Suspected chromosome numbers should be verified and the seedlings obtained from the backcross of Buchmann's cross 655 to the diploid seed parent checked for aneuploidy.

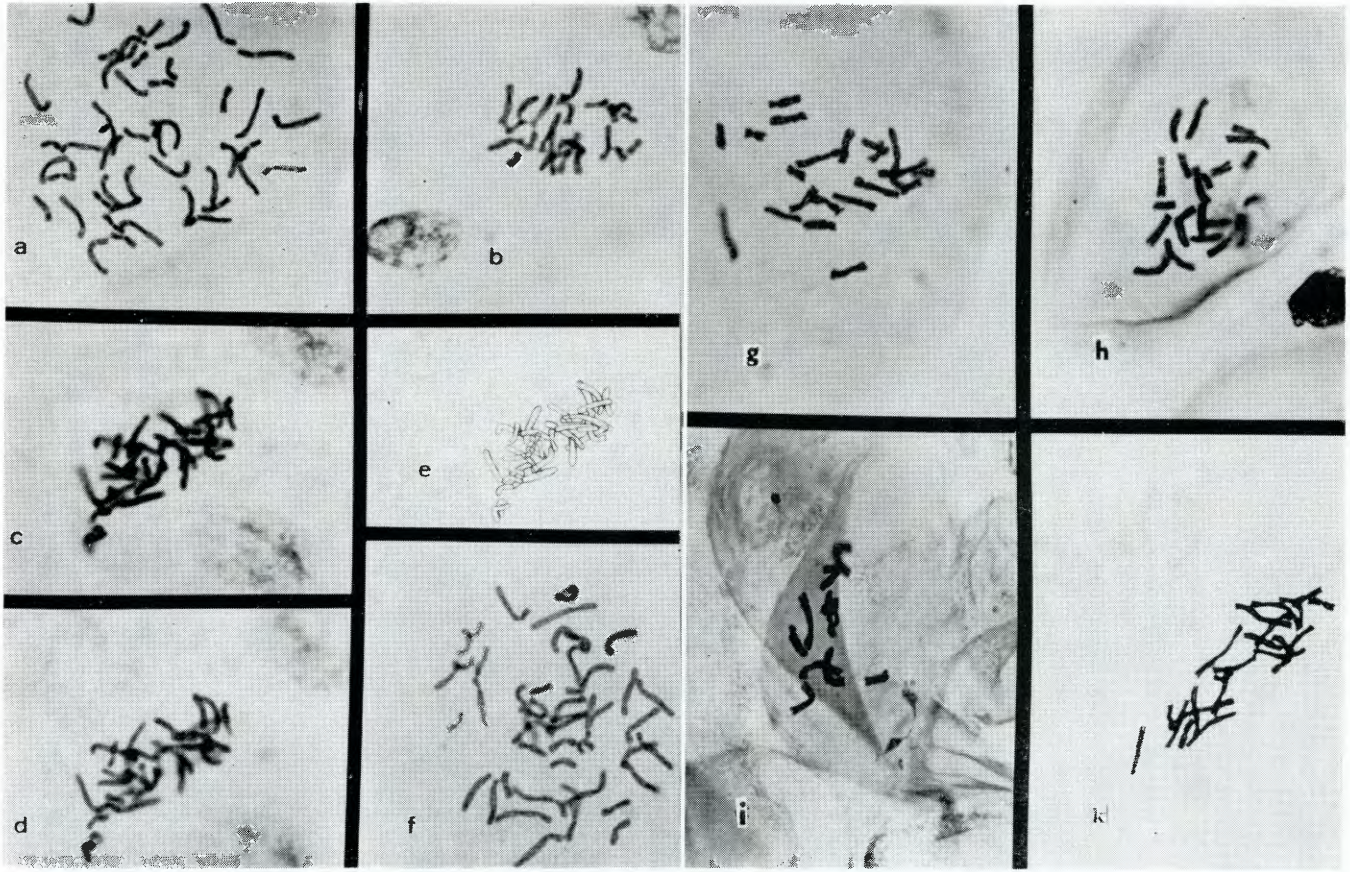

Fig. 27. Root tip squashes of **(a)** 'White Christmas,' **(b) Amaryllis yungacensis, (c)** 'White Christmas' x **A. yungacensis, (d)** same as **(c)** but focused at different depth to show overlapping chromosomes, **(e)** composite drawing of c and d, and **(f)** 'Maria Goretti.'

Haploid metaphases of chromosome in generative nuclei of pollen tubes: **(g)** D-25; **(h)** D-32; **(i)** D-52, and **(k)** 'Wedding Bells.'

The pollen culture technique gave good results and provides an additional means to determine chromosome numbers. Different pollens required different culturing times to obtain the greatest number of pollen tubes containing countable chromosomes. The chromosome counts determined are:

D-25	$2n = 4x = 44$	tetraploid
D-32 (*A. blossfeldiae*)	$2n = 4x = 44$	tetraploid
D-52	$2n = 2x = 22$	diploid
'Wedding Bells'	$2n = 4x = 44$	tetraploid

Since the number of chromosomes in the gametes is less than that in the root tips, the pollen culture technique provides an easy means of determining chromosome numbers. Root tips of diploids and tetraploids have 22 and 44 chromosomes respectively while the pollen tubes contain 11 and 22. (Fig. 27.) Pollen tube counts with triploids, other odd numbered levels of euploidy, and aneuploids can be misleading. Pollen from triploids can contain chromosome complements indicative of diploids and tetraploids and all levels of aneuploidy between. Chromosome counts, especially from pollen tubes, should not be based on single determinations but *should be verified through multiple observations.*

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IDENTIFICATION AND CHARACTERIZATION OF THE ANTHOCYANIN PIGMENTS IN VARIOUS **AMARYLLIS** SPECIES AND CULTIVARS

J. E. Love, E. N. O'Rourke, M. Burnham,
J. Carson and F. B. Schmitz,
Louisiana State University, Baton Rouge, Louisiana

INTRODUCTION

The anthocyanin pigments are responsible for most of the pink, red, violet, and blue colors found in the leaves and petals of higher plants. These pigments add to the attractiveness of many horticultural species, and also attract many insects and birds which assist in pollination.

Very little research has been done on the anthocyanins of the *Amaryllidaceae*. Harborne (1) tentatively identified the anthocyanin pigments in various *Amaryllis* Linn. 1753 (syn.—*Hippeastrum* Herb. 1821) cultivars as Pelargonidin 3-Rutinoside and Cyanidin 3-Rutinoside. Only a small number of species have been studied so it has been impossible to generalize on the pigments associated with flower color.

This report represents the initial phase of a study on flower color of *Amaryllis*. The objectives of this study were to identify the anthocyanins and characterize the pigments extracted from various species and hybrids. The ultimate goal of this project is to provide plant breeders with basic information on the inheritance of flower color.

MATERIALS AND METHODS

The plant material used in this study included various *Amaryllis* species or suspected species and various cultivars and seedlings from the Dutch hybrid group. Cultivars were selected to give a wide variation in petal color including red, pink, salmon, orange, purple, white, yellow, green and several blushes.

Chemical determinations for color were made using paper chromatography and with spectral analyses of the pigment solutions. The anthocyanins were extracted with methanol containing 1% HCl, band loaded on Whatman No. 1 chromatography paper and developed in two solvents. Solvents used for chromatography were n-butyl alcohol-acetic acid-water (BAW, 4:1: 5, by volume), and hydrochloric acid (1%). Absorption spectra for the anthocyanin solutions were determined with the Beckman DBG recording spectrophotometer. Flowers with yellow pigments were extracted with ethanol and the extracts were mixed with equal volumes of hexane and distilled water. Spectral data for the yellow extracts were determined as above.

RESULTS AND DISCUSSION

Two anthocyanin pigments were extracted from *Amaryllis* petals (cyanidin 3-rutinoside and pelargonidin 3-rutinoside). The chromatographic and spectral data for these pigments are shown in Table 1. Identifications were also made on the pigment extracts from at least

forty other cultivars and only the pigments mentioned above have been observed.

TABLE 1. The anthocyanin flower pigments of various **Amaryllis** L. species and hybrids.

Cultivar or species	Flower color	Anthocyanins† present: Pelargonidin 3-Rutinoside	Anthocyanins† present: Cyanidin 3-Rutinoside	Absorbency peak
Species				
A. belladonna L. (Doran 52)	rose	—	**	528
A. belladonna L. (Beckham)	bright red	**	*	517
A. reginae L. (Doran)	v. bright red	**	trace	513
A. blossfeldiae (Doran 32)	orange	***	—	512
Hybrids				
"Gracilis" (O'Rourke)	bright red	**	*	520
Dutch hybrids:				
White seedling (Beckham)	white	—	—	—
'Queen of the Pinks' (Ludwig)	pink	trace	*	527
'Siren' (Ludwig)	rose	trace	**	523
Ludwig's H-9	lt. pink	*	**	525
Ludwig's H-109	dark red	*	****	526
Beckham seedling A	dark red	***	***	520
'Minerva' (VM)††	red, white throat	***	*	515
Ludwig's H-32	dark orange	***	—	512
Ludwig's H-85	orange	****	*	516
'Adenda' (VM)	dark orange	***	—	512
Beckham seedling B	dark orange	****	trace	513

† The number of asterisk (*) signs is proportional to the amount of pigment present.
†† (VM) = VanMeeuwen.

The orange and pink bands produced by chromatographing the pigment extracts were used to calculate the Rf values (a ratio of the solvent front to the pigment front X 100) in Table 1. The bands produced from the pigments of one plant extract were identical to corresponding bands from other sources when developed in BAW or HCl solvents. Likewise, the Rf values obtained from *Amaryllis* petals were very similar to those produced by chromatographing the cyanidin and pelargonidin compounds. Anthocyanins have a characteristic peak in the visible portion of the light spectra and the absorption maximum can be used to aid in pigment identification. The absorption maxima of the amaryllis pigments were very similar to those of the authentic compounds and further substantiated the identification made above.

A survey of the anthocyanin pigments in various *Amaryllis* species and Dutch hybrids is shown in Table 1. Pelargonidin 3-rutinoside was the most abundant pigment and was observed in the pigment extracts of most flower types. This pigment was associated with orange, salmon, and red flower colors. Cyanidin 3-rutinoside was the least abundant pigment and was frequently associated with pink, rose, "purple" or red flower colors. Most red flowers contained a mixture of the two anthocyanins in varying amounts. White flowers did not contain either of the two pigments.

The above data clearly indicate that several genes control the synthesis or modification of anthocyanin pigments in *Amaryllis*. For example, flowers of *A. belladonna* (Doran No. 52, Rose C type) contained only the cyanidin pigment, whereas, flower color in one species (*Amaryllis blossfeldiae* Traub & Doran, Doran No. 32; see PLANT LIFE 27. 1970) resulted from the presence of pelargonidin alone. Most flower color differences, however, appeared to result from quantitative differences in the two pigments. Indications are that white flower color is due to a suppressor gene, since crosses between white and red parents have not resulted in a predominance of red seedlings.

The pigments extracted from two yellow flower types (*A. evansiae* and an *A. evansiae* x *A. aglaiae* cross) were not anthocyanins. The yellow pigments were soluble in hexane and exhibited absorption spectra that are characteristic of the carotenoids. Thus, more than one class of pigments may add to the flower color of amaryllis.

In conclusion, the results of this study have shown that many breeding experiments will have to be conducted to completely elucidate the effects of various gene differences on flower color in amaryllis.

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AMARYLLIS BREEDING—1970 REPORT

JOSEPH K. MERTZWEILLER,
9266 N. Parkview, Baton Rouge, Louisiana 70815

It would indeed be a pleasure for me to describe many new seedlings, but unfortunately they did not materialize during the 1970 season. It was simply not a good season for me; and the general consensus among other growers and hybridizers in this area leads to the same conclusion. My poor results in greenhouse culture was simply a matter of not achieving sufficient growth during the growing season. This was my own fault because I kept most of the plants in the greenhouse through the summer of 1969. With temperatures reaching 100 degrees and above (in spite of the exhaust fan and misting nozzle) *Amaryllis* species and hybrids do not make optimum growth. So I learned by this sad experience. In the spring of 1970 all my *Amaryllis* were placed

outdoors such that they received 2-3 hours of morning sun. Most of the smaller pots were buried in bagasse (fibrous residue from processing sugar cane) to minimize moisture loss. This approach plus fertilizing at three week intervals has given the most luxurious foliage growth I have yet experienced. The anticipation is that the 1971 season will be far better than the 1970 season.

Very few new seedlings bloomed in 1970. The most interesting was a very small ribbon pink, about 2½ inches across. The parentage was *A. starkii* X [(*A evansiae* x *A. aglaiae*) x *A. evansiae*]. It was a true miniature but there is some question in my mind whether it will remain this small.

I had sufficient bloom among the older established species and hybrids to make more than fifty pollinations—and realize some half dozen seed pods for my efforts. But all represent interesting crosses some of which I have been attempting to set for several years. I obtained a good pod and almost complete germination of the cross *A. evansiae* x White Dutch Hybrid. The *A. evansiae* was the first bloom of a seedling bulb obtained several years ago from Mrs. Alek Korsakoff. The white Dutch in this case was supposedly 'White Giant', the pollen being obtained from Fred Buchmann since I had none available at the time. Fred later told me this white was self fertile and so was not 'White Giant'. The seedlings are vigorous growers. Previously I had attempted this cross with three different clones of *A. evansiae* and most of the named white Dutch hybrids, but always without success. So here again it was simply a matter of bringing together the right clones.

The same clone of *A. evansiae* was used as the pollen parent on *A. belladonna* x *A. striata*) and gave a large crop of vigorous seedlings. This cross had also been attempted previously, and without success. using other clones of *A. evansiae*. Different clones of the same species do behave differently in hybridizing.

I was also able to set seed with the pollen of the above mentioned White Dutch clone on the SA 63-20 X (*A. evansiae* x *A aglaiae*) hybrids which I have described previously. Similar pollinations attempted with the pollen of 'Nivalis' and 'White Christmas' were unsuccessful. Although the seed appeared to be good, germination was very poor, three from one pod and one from another. This has been the general experience in crossing white Dutch hybrids on these SA 63-20 hybrids. This might be indicative of a difference in ploidy level or some other type of chromosomal incompatibility.

Late in 1969 I received a shipment of *Amaryllis* bulbs from Dr. Martin Cardenas. There were six different *Amaryllis*, under number. Dr. Cardenas had the bulbs collected in the vicinity of Apolo, a remote area of Bolivia not frequently visited by collectors. This is the general locality where *A. viridiflora* is found. These bulbs were given as wide distribution as possible. Five of the bulbs (Nos. 2-6) are growing exceptionally well for me and I feel certain that some of these will bloom in 1971. One bulb (No. 1) was somewhat soft when received and was cultured very carefully. It has hardened up and made some

leaf growth, though not as much as the others. I have every reason to believe that this group may contain some new species and I hope that next year I will be able to describe some of the blooms.

Both Fred Buchmann and I received bulbs collected by Dr. C. Gomez Ruppel. These included *A. aglaiae,* a form of *A. belladonna,* "Red Cochuna" and a "brown Aulica" as well as some of the interesting long trumpet species. These included *A. immaculata, A. elegans* var. "albostriata" and *A. elegans* var. "Mrs. Sosa". The latter is described as a pea green or chartreuse green self. The varieties "albostriata" and "Mrs. Sosa" have made very good growth during the one season I have grown them. Very recently I acquired from Dr. Ruppel *A. ambigua, A. angustifolia* and *A. "yanellosianum".*

A few comments are in order on the culture of *A. fosteri.* My large bulb retained its leaves through the spring of 1970 despite being maintained almost completely dry. Since midsummer I have watered it lightly, but there is no evidence of growth at this writing (early September). The bulb remains very firm. Two smaller bulbs which went dormant earlier than the large one each put up a single leaf in July. I suspect the larger bulb has not yet completely reversed its seasons. I note *A. fosteri* has a marked tendency to pull itself deep into the potting medium, much the same as *A. aglaiae.*

TRIALS OF AN AMARYLLIS SPECIES HYBRIDIZER

Fred J. Buchmann, *1766 Avondale Drive, Baton Rouge, La. 70808*

Species hybridizing is not always easy and simple and sometimes the worst comes to pass. The hybrids arising from (a) 'White Christmas' x *A. yungacensis* (b) [*(A. evansiae* x *A. aglaiae)* x *A. evansiae*] x 'Maria Goretti' described in the 1970 Plant Life (page 108) have now been shown to be triploids, in the first case (or highly suspect as triploids, in the second case) by researchers at Louisiana State University as reported elsewhere in this volume (see *Amaryllis* Chromosome Studies, M. Burnham, et al.). This essentially eliminates using these hybrids as seed parents in future hybridizing programs. Although some success may be achieved using the pollen of these triploids, the ploidy of these potential offspring is somewhat in doubt and the future is not completely bright in this case either. The back cross using pollen from hybrids in case (b) above on the seed parent reported last year have given very weak seedlings which may take a very long time to come into flower and aneuploidy is suspected. The hybrids obtained from one of the crosses made by Joe Mertzweiller using pollen from (a) above are growing fairly well and we can be somewhat more hopeful in this case.

Based on the few simple experiments and data available thus far, some generalities may be reached as indicated in the following tabulation.

Seed Parent	Pollen Parent	Chances for Viable Seed	Seedlings, If Any
Tetraploid	Diploid	Very Low	Probably Triploid. Possibly Tetraploid.
Diploid	Tetraploid	Low	Maybe Aneuploid or Triploid.
Triploid	Diploid or Tetraploid	Near Zero	.....
Diploid	Triploid	Low	Maybe Aneuploid.
Tetraploid	Triploid	Low	Maybe Tetraploid or Aneuploid.

However, these generalities are completely inadequate to explain some of the results that have been obtained. Four different clones of *A. evansiae* were pollinated on all florets with pollen from various white Dutch cultivars; three gave no viable seed at all, one made a seed pod with some viable seed for each pollination. Since the white Dutch are probably all tetraploids, is it possible that this one clone of *A. evansiae* is also tetraploid? This seems unlikely. But for some reason this one clone readily accepted white Dutch pollen and we must wait to see if the offspring are fertile also. In another series of experiments, pollen from *A. yungacensis* was used many times with various white Dutch and only the one seed pod and the four seedlings previously reported were forthcoming. This is easy to accept now that we know that *A. yungacensis* is diploid and the white Dutch are tetraploid. On the contrary, a large red Dutch, 'Tarakan', was pollinated on two florets with pollen from *A. yungacensis* and both gave large seed pods with many viable seed. Is 'Tarakan' diploid or are the seedlings triploids? Are all the current large flowered hybrids tetraploids?

To make hybridizing a bit more scientific, we should have more knowledge of chromosome complements. One of the parent plants that we would like to have is a large white flowered cultivar that is a diploid if such exists. This could be used with diploid species to increase size and improve form but preserve the color or color pattern of the species. Of course, we can use tetraploid species with the tetraploid white Dutch where this will produce something new or improved. This brings to mind a pot of seedlings from 'Maria Goretti' and pollen from a beautiful pink *A. belladonna* collected by Dr. Cardenas near Rurrenabaque, Bolivia. Will these be fertile or sterile? If fertile, they should lead to a line of pink hybrids in shades of pink not currently available.

After these trials and tribulations, the question arises as to what it is really necessary for an amateur hybridizer to know about the chromosome complements of his parent plants. Well, it would be nice to know the chromosome count of each one equally as well as we know color, size and form but this just is not very likely. A good microscope is required and, in addition, a great deal of skill, technique and time, of each of which the amateur may not have a sufficiency. We are extremely grateful for the work done at Louisiana State University, but their efforts may not be continued next year.

In the meantime we will have to struggle along making the best choices possible with the knowledge available. Possibly it is just as well for the amateur not to know all; otherwise many pollinations would not be attempted, some of which have a small chance of success and of producing attractive cultivars.

THE GROWING INTEREST IN SMALLER AMARYLLIS

V. Roger Fesmire

Perhaps it may be thought that the writer is referring solely to the miniature *Amaryllis* as classified under Division 8 by the American Amaryllis Society, but not so. The flowers also of the "Belladonna" type as classified under Division 3 are often somewhat smaller than the large-flowered hybrids; these are the flowers over 4″ in size which definitely exhibit species characteristics. Then there is the question of what to do with those flowers of Reginae and Leopoldii form which are under 6″ in size; in the Southern California Amaryllis Show, they have been classified under Division 9. Smaller flowers will also probably be found in the long-trumpet and the orchid-shaped types of Divisions 2 and 6, which have recently begun to attract some interest. In short, with the exception of the large Reginae and Leopoldii type of flower, most *Amaryllis* would fit into this category, yet they have been largely neglected over the years. What they lack in size is usually made up for by other characteristics, such as gracefulness, unusual colors, more variety in shape, etc. More and more *Amaryllis* fans are beginning to realize that this emphasis upon size has surely deprived us of many beautiful flowers. Over the past five years here in Southern California, the writer has noticed a definite increase in the interest shown in these smaller-flowered *Amaryllis*.

Where can bulbs be obtained? This is going to present a challenge to those who would grow them. Some types, such as the Dutch Gracilis hybrids, can be obtained very easily, but others will be more difficult. One should check to see what friends are growing, particularly among members of the local Amaryllis Society. Furthermore, considerable variety in flower type and color may often be found in large plantings of *Amaryllis*. However, the easiest way to acquire smaller-flowered *Amaryllis* is to raise them from seed, which may be purchased or secured by your own crosses. Bought seed is usually from Dutch hybrids, but even that will give some smaller flowers. More desirable results will be achieved, however, if the seed is from crosses involving the smaller-flowered hybrids and species. Every successful cross that the author has made, which involved a species as either seed or pollen parent, has produced flowers which fall into either Division 3, 8, or 9, and with a few exceptions, every cross involving the miniature and Belladonna-type hybrids has likewise produced flowers in these divisions.

CROSSES WITH SPECIES

Until coming to California five years ago, the writer had only three species to use in his *Amaryllis* breeding program: a variety of *A. aulica* secured from Holland, three forms of *A. striata,* and a bulb from India advertised as "A. pardina". Unfortunately, none of his crosses with *A. aulica* were ever successful, but almost all crosses with the other two species were successful. Out of 24 crosses made prior to 1965 with the three forms of *A. striata,* seeds were secured in 22 cases. However, judging by his experience with other species in the last five years, *A. striata* is certainly the easiest species with which to get results. A few of these crosses have never yet bloomed, but the majority have produced flowers which would be classified under Divisions 3 or 8. Some of the more attractive ones have been described in previous numbers of the Amaryllis Year Book. Many of these Striata hybrids were used in further breeding work when they bloomed, such as crosses number C17 and C18.

Cross No. C17 was made between *A. striata fulgida* and an unnamed South African grown clone which bore beautiful large flowers of a lavender rose. The attractive flowers from this cross varied in size from 4″ to 5½″, and every one was a different shade of pink or rose, but unfortunately these hybrids were very tender and all have perished. However, one of these pink hybrids was successfully crossed with another one, and the first bulb of this cross bloomed in 1969, with 5″ flowers of a beautiful crimson rose and a light green throat. This in turn was immediately crossed with another, more vigorous South African grown clone of identical color to that used in the original cross, and also with an unnamed Ludwig white Dutch clone which has a pronounced yellow cast to the flowers. Another of the original C17 clones was crossed with an orange-flowered Striata hybrid, which cross has given ruffled pink flowers with much light green in the throats. Still another C17 clone was crossed with an orange-red Striata hybrid (No. C18), which cross (C98) naturally gave flowers mainly in shades of red, but one clone was a beautiful rose with 4″ flowers. This has bloomed for three consecutive years, and this year had two scapes in bloom at the same time, as seen in Fig. 28. In these three years it has been crossed with 'Violetta', and with the *A. evansiae* x *aglaiae* x *evansiae* hybrid (which seedlings are growing exceptionally well), with another pink-flowered South African clone, and with another clone of the C98 cross. From all of the above crosses, the writer aims to develop a group of hybrids which will be between 4 and 5 inches in size, with graceful, ruffled flowers in various shades of pink to lavender, and which would be classified under Division 3 or 9.

Cross No. C18 was made between a scarlet-flowered Indian miniature and *A. striata fulgida.* These flowers showed considerable variation in size and form, but very little in color, which was an orange red. They were very attractive, but also were quite tender. One of these clones was crossed in 1964 with the species purchased as "A. pardina",

and the first two bulbs to flower of this cross (No. C89) just bloomed in 1970. The flowers were only about 3½″ in diameter, with reflexed and ruffled segments, which were a scarlet red in color with darker red veining and a light green throat. The scapes were only about 6″ tall and the leaves are also rather small; so this cross made a very attractive addition to the writer's growing collection of miniature *Amaryllis*. (See Fig 28-A.)

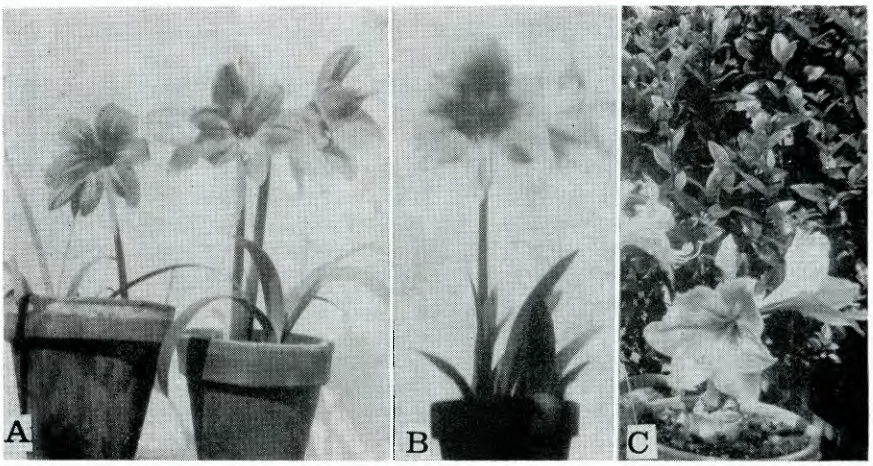

Fig 28. Fesmire Amaryllis crosses: (A), cross No. 89, left; cross No. 98, right; (B) No. C 172, 4½″ white, pink & green flower; and (C) **A. aulica** cross.

In the past four years, successful crosses have been made with the following species (usually as the pollen parent): *A. petiolata* (argilagae), a bulb received as "A. aulica robustum" (but which may be *A. moreliana*), a white form of *A. belladonna, A. evansiae, A. psittacina, A. reginae, A. starkii, A. vittata,* and Goedert's No. SA65-23. When these seedlings reach blooming size, they should produce miniature or Belladonna-type flowers. Nothing but failures have been recorded when using pollen from *A. aglaiae,* other forms of *A. belladonna, A. elegans, A. forgetii, A. fosteri, A. miniata,* "Mrs. Sosa", "Orange Reitz", *A. papilio,* "Red Cochuna", *A. reticulata,* and several yellow-flowered long trumpet species from Argentina. However, thru the generosity of friends, seeds or bulbs of crosses involving 16 different species have been received, including: *A. immaculata, A. aglaiae, A. cybister, A. correienesis, A. fragrantissima,* and SA66-27.

In January of 1969, the writer received from a friend in Pasadena seven blooming size bulbs of a cross between *A. aulica platypetala* and the named clone "New Orleans". These bulbs had been growing in the ground, but had to be dug and removed from that site in the fall of 1968; so after being kept in dry storage until January, they were finally potted up. They began to grow at once and three of them promptly bloomed with very attractive flowers, which averaged 5″ in

size. (Fig. 28-C) Two of them had a white background overlaid with red markings, plus a green throat, while the third was a beautiful pink with much green in the throat. By July of this year, these bulbs were just starting to grow again; so hopefully they may be late summer or fall bloomers.

CROSSES WITH SMALLER-FLOWERED HYBRIDS

Crosses made with species are one source of smaller flowers, but crosses made with the smaller-flowered hybrids now in circulation are still another and easier source. The writer once had some bulbs of the Houdyshel orange-scarlet hybrids (while living in Colorado), which he used in many crosses, producing flowers that he called "window-sill hybrids" (See 1969 Year Book). Actually, these were mainly Reginae or Leopoldii type flowers that were less than 6″ in size, and so belonged in Division 9. There is also a red and white *Amaryllis* commonly grown outside in the ground here in Southern California which is a very cold-resistant and vigorous grower. This has been used in a number of crosses with the idea of securing hardier forms of *Amaryllis*, but the seedlings will undoubtedly bear flowers under 6″ in size. It has been crossed with various Dutch hybrids, some of the author's Striata hybrids, the Peruvian Miniatures, and the Senorita hybrid, but none have bloomed yet. Rather curiously, pollen from one of Quinn Buck's Calyptrata hybrids was used on this red and white *Amaryllis* in 1967; three flowers were pollinated and all three produced seed. Now these seedlings are growing very well, although the leaves are very narrow.

In 1966 the writer mixed the pollen of the South African clone 'Tangerine' with pollen from a Ludwig seedling which bore small white flowers strongly tinged a greenish yellow. This pollen was used on a white-flowered "Australian" hybrid which also had a tinge of yellow. The first two seedlings to bloom of this cross (No. C172) produced Leopoldii type flowers, but since they were under 6″ in size, they must be entered under Division 9. One was a 5″ flower of orange scarlet with a green throat, and on each segment was a white stripe speckled and edged in dark red. Although the other was slightly smaller, it was my favorite color combination: a beautiful white flushed pink, with considerable green in the throat and green on the tips of each segment (Fig. 28-B).

Two other crosses with 'Tangerine' have also produced smaller flowers. The first bulb to bloom of a 'Tangerine' by White Dutch cross had 5″ flowers of excellent form and color; they were a vivid pure scarlet with no markings, except that the throat was a darker red. The other cross was between 'Tangerine' and the author's orange-scarlet Striata hybrid No. C18; this also bloomed with 5″ flowers of a deep scarlet, but the throat was a light green edged crimson. In this cross, the species influence was quite apparent, since the segs were both reflexed and twisted, and the flower drooped; despite this characteristic, it was an attractive Belladonna-type flower.

This writer aims to develop many more of these smaller-flowered hybrids, with the emphasis upon pastel colors and ruffled segs. He has had to do considerable experimenting with soil mixtures and growing procedures in the past few years since moving here to California, but hopefully the difficulties have been overcome so that "production" can now be increased. If others would work on developing long trumpet and orchid-shaped hybrids, the day will come eventually when every type of Amaryllis will be represented in both flower show and bulb catalogue.

AMARYLLIS IN AUSTRALIA

JAMES GORDON BLEAKLEY, *19 Beaver Street, East Malvern 3145, Victoria, Australia*

Twelve years ago I happened to be in Town and looking at plants in a chain store I noticed some large bulbs. The sales girl told me they were *Amaryllis* (syn.—*Hippeastrum*). I bought one for 30 cents. Little did I know that it was to be the start of a wonderful hobby. I potted the bulb in ordinary sandy loam from the garden. After four to six weeks a flower bud started to appear and it reached a height of eighteen inches before the sheath burst open, revealing four reddish coloured flower buds. When the flowers eventually opened I was amazed at their beauty. Nice scarlet colour with a greenish throat. I still have the bulb and many of its offsets have flowered for me. It was really a lucky day when I decided to walk into that chain store.

Not knowing how to care for *Amaryllis* I decided to see if I could find some literature, so visiting a bookstore I purchased "Amaryllis and How to Grow Them" by Peggy Schulz. I then found out that they belonged to the Amaryllis Family. I found a list of growers in the book and from Ludwig and Co. I obtained a catalogue. I purchased a large number of clones and I had notification from the Department of Agriculture that they were in quarantine at the Botanical Gardens. A couple of months later I visited the gardens to inspect the bulbs and most of them were in flower. They were really beautiful and the flowers and bulbs were so large. After a few months they were released from quarantine and when the following spring arrived I was so eager to see them in flower again, but to my surprise only a few had blooms and I also discovered the bulbs were shrinking. A few varieties I lost so I repotted the remainder in a mixture of sandy loam, leaf mould and cow manure. They put on growth yet at the end of the growing season the bulbs did not seem to be any larger.

It was by chance I had gone to visit our Agriculture Show and in the plant section a grower from the Blue Dandenong Bulb Farm had a large display of *Amaryllis* in flower. I asked him many questions and told him how my bulbs were shrinking instead of getting larger and he was surprised when I said I had them in pots from year to year. He

advised me to put them in the garden. A week later I prepared a bed and dug in large quantities of cow manure. I took the bulbs out of the pots and planted them with the neck above the soil. At the moment I am lifting the bulbs and repotting them. They are nice and solid and they are larger and some have offsets.

Looking back to my first purchase twelve years ago I can say I have had success and failure yet I have gained a lot in experience. The lessons I have learned are (1) amaryllis are heavy feeders (2) they need a rich, well drained compost with plenty of manure (3) be very careful with the watering can in the early stages of growth (4) don't spill any water in the neck of the bulb or it may cause rot (5) plant the bulbs in the garden after flowering.

This year I am trying a few bulbs in a mixture of leaf mould, cow manure and coarse sand and I shall make notes on how they grow.

I cross pollinate most of my flowers and have full seed pods. When the seed are ripe I sow them in boxes 18 inches by 14 inches by 4 inches in depth using a mixture of coarse sand, leaf mould and sandy loam. I steam sterilize the mixture. I leave the seedlings in the trays for two years, feeding them with a soluble fertilizer mixed in water. I then plant them in individual pots or six to eight in a large pot. They stay in the pots until they flower and I rogue out any that don't come up to my standard. The remainder I plant in the garden. I do find that when I take seed from a variety it usually does not flower the following year. I have decided the bulb needs a special feeding programme to build up its strength and that usually takes a year. I also believe that is the reason so many people are disappointed when they buy a bulb and it fails to flower the following year. They don't realize that they have to feed the bulb and keep it nice and plump.

Pests are very few. The bulbs in the garden may be troubled with a few snails and slugs. I don't use baits. I find that going into the garden at night with a torch one can pick them off the leaves and a size 9 boot will despatch them very quickly. In the greenhouse I have to watch for mealybug which can be troublesome.

Propagation. I have cut wedges in the base of a few of the bulbs and I obtained offsets. The varieties were 'Apple Blossom', 'Candy Cane' and 'White Witch'. With some of my seedlings I have been surprised to have offsets appearing normally when the bulb is only about eighteen months old. Some have had nine to ten offsets. Has any other member experienced this? As they have not flowered I am keeping my fingers crossed and am hoping the flower is a good one. I have not tried scaling the bulbs like the large growers in Holland do. I would appreciate any information on how to do this.

As I only grow hybrids I have read with great interest about the species of *Amaryllis* that Peggy Schulz talks about in her book. Most of these are unobtainable in Australia. I have written to most of the addresses listed in the book. Mr. W. Hayward forwarded my letter

BLEAKLEY—AMARYLLIS IN AUSTRALIA—continued on page 132.

4. AMARYLLID CULTURE

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

YEAR ROUND AMARYLLID BLOOM IN LIMITED SPACE

WILLIAM R. ADEE, *916 Sunset Avenue, Waukegan, Illinois 60065*

For a year I have had almost constant blooming of *Amaryllis* in a four foot by twelve feet lean-to greenhouse. Among the factors which made this possible were reblooming species and species hybrids, bulbs newly acquired from the wild, and species and hybrids that naturally flower in off seasons. I have not purposely manipulated the dormant periods of these bulbs but have dried off those which are ready to rest according to their growth patterns.

Amaryllis belladonna (Equestre) x *evansiae,* Senorita, Green Senorita, *A. belladonna* var. *haywardii* x *striata,* and *A. striata* blossom two and three times a year. This group is evergreen, small, attractive, easily managed and useful as house plants.

Dormant bulbs received from foreign collectors will often blossom as soon as received. A bulb received as *A. apertispatha* blossomed in late October on its arrival from Argentine. It started a bud as soon as it was planted. A red flowered species from Brazil flowered in late June and again in July with two scapes with two flowers on each.

Species that blossom naturally at odd times extended the flowering over the entire year. A small salmon *A. belladonna* collected by Mr. Len Doran, his number 14, flowered in June. The "Holtville Amaryllis" received from Mrs. Frank McCown blossomed in early August. Various *A. evansiae* have flowered in December and January. *A. starkii* blossomed in early February. Another species, a beautiful white with one-half inch of red veining all around a regular shaped flower opened in late February. March brought flowers from two handsome seedlings of a picotee Peruvian miniature x *A. striata.* Mr. Doran's *A. reginae,* numbered 10, sent forth two species of three flowers each in April and May. His *A. striata* number twenty-five and a Blossfeld number thirty-three, both attractive small plants, flowered at the same time as *A. reginae.*

I did not expect any flowers in the summer because of the tremendous heat in the greenhouse, but a yellow trumpet Argentine miniature sent up two scapes in July. A handsome white miniature with magenta-rose markings hybridized by Mrs. Flores Foster, using Howard & Smith purple x white Dutch, blossomed for the first time in July. Another of Dr. Carlos Gomez Ruppel's Argentine imports, a white trumpet which he calls "albostriata" flowered just after the yellow one.

I do not raise many named Dutch varieties preferring to use my limited space for the more varied possibilities of the species and their hybrids.

I am interested in other amaryllids and have been fortunate to see some of them blossom this year. *Clivia caulescens* and *C. nobilis* blossomed this spring and summer. Nobilis' thirty flowers lasted over a long period. *Cyrtanthus* have not been generous with bloom. A "Stenomesson"(?) received from Mrs. Elizabeth Naundorf of Ecuador blossomed in June for the second year. *Nerine filifolia* is a dependable bloomer in September. *N. undulata,* not so dependable, blossoms at the same time. Late July and August brought flowers of *Pancratium maritinum. Phadramassa chloracra spectabilis* is now in bud in late August.

HYBRIDIZING ACTIVITIES

I have seedlings that are the result of other hybridizers' activity but will list a few of my own successful attempts: *A. apertispatha* x mixed pollen of *A. calyptrata* and *A.* "Holtville clone", (*A. belladonna* var. *haywardi* x *striata*) x various mixed pollens, *A. evansiae* x *A. apertispatha,* Argentine trumpet miniature yellow x *A. elegans* var. *elegans,* the same yellow trumpet x *viridiflora,* yellow trumpet x a larger yellow Argentine trumpet, (picoteed Peruvian miniature x *A. striata fulgida*) x the a white species with one-half inch border of red veining, *A. reginae* x *A. fosteri,* Senorita x *A. apertispatha, A. starkii* x Mr. Doran's rose pink *A. belladonna* miniature number fifty-two, *A. striata fulgida* x *A. apertispatha,* and 'Zenith' x Mr. Doran's beautiful pink and white double hybrid.

The *A. apertispatha* from Argentine was a very potent pollen parent, "taking" on almost every cross I tried. I sent pollen to several people who reported similar successes. The yellow Argentine trumpet miniature was an outstanding pod parent making four pods from five pollens. I'm sure there would have been five pods had the fifth pollen been fresh. The pollens used were from various trumpet types.

I try to keep in constant communication with persons of similar interest in order to know what pollen will be available at any time and in order to supply pollen to others. Resulting seeds are distributed among our group of correspondents. Pollen is stored in a jar in the refrigerator with dessicator capsules that extend its usefulness over a long period. The dessicator capsules may be had from your friendly pharmacist, if he will give you the ones from his wholesale vitamin pill bottles.

Whenever I find a bud started, I bring the plant into the house from the greenhouse until it has flowered, has been pollinated, and the pod started.

Last spring I changed potting mediums from dirt to sphagnum moss. This has led to improved growing under my conditions for *Amaryllis, Cyrtanthus* and nerines, but led to decline in clivias. I prefer to plant seeds in soil having found that Sphagnum held too much moisture for newly germinated seeds and led to the loss of some particularly treasured crosses. I do not soak seeds for more than twenty-four hours before planting them, although I know that others have success with longer periods of soaking and floating on water.

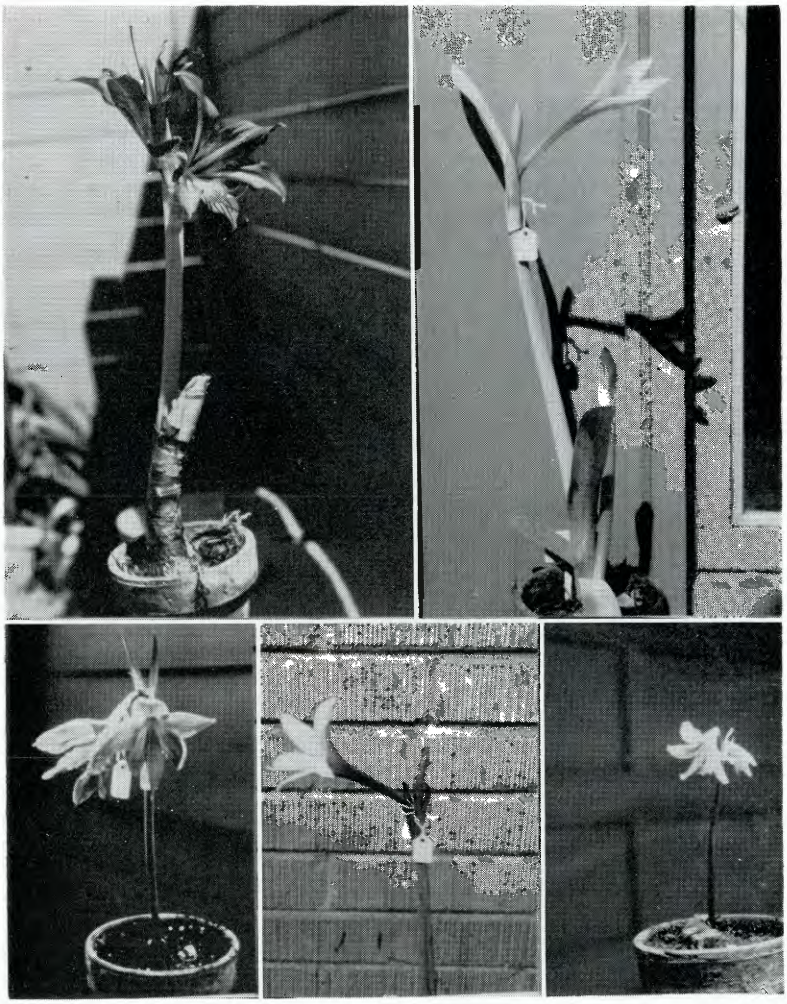

Fig. 29. Amaryllis flowered by Mr. Adee: **Upper left,** a Brasilian red species imported by Hugh Bush, flowered in 1970; **Upper right,** A yellow trumpet miniature species from Argentina, collected by Dr. Ruppel; flowered in 1970; **Bottom left, Amaryllis apertispatha** from Dr. Ruppel; **Bottom middle,** "A. albostriata" from Dr. Ruppel, flowered in 1970; and **Bottom right, Amaryllis blumenavia,** flowered in 1969.

Mealybugs are not a problem under my growing conditions but mites are. The mites enjoy aulicas more than they do the others and I have yet to find a satisfactory control.

GOALS

My goal is to learn to grow these plants efficiently to blooming size, develop more rebloomers, discover new flower forms, colors, and patterns through hybridizing with species *Amaryllis*. I am interested in flowering and hybridizing *Haemanthus*, *Clivia*, nerines, and *Lycoris*. I have imported hybrid nerines from England this summer in the hope of getting a more free flowering type. I have the small *N. filifolia* and *N. filamentosa* to use in breeding for small types. I have not been so fortunate in getting the big tetraploid ones.

My *Lycoris* collection includes many species but I have not had them long enough to know much about their growth and flowering habits. *Lycoris sprengeri* grows and blossoms nicely out of doors in northern Illinois. The others are grown in pots.

In August 1969 I visited southern California where I first saw *Haemanthus* in flower. Since then I have added fourteen different kinds to my collection and am looking forward to learning about the growth habits of this odd-looking group.

Cyrtanthus have been a disappointment. I have many kinds but only a few flower each year. They have grown better since they were repotted into sphagnum and plastic pots. I recently acquired *Cyrtanthus obliquus* which was reported to be difficult. The report was not incorrect.

Although they are large I like the clivias very much and raise many types for hybridizing. They are not very demanding except for space. In summer they are kept outdoors in the shade of a high fence with frequent sprinklings with the hose. Some have flowered with various orange, red-orange, yellow-orange, and greenish tubular flowers. The leaves of a white striated leaf Belgian hybrid is particularly nice. A generous friend sent pollen of his yellow *Clivia* and seeds appear to be setting as the result of these pollinations. I have had better luck with *Clivia* by wintering them in a dry basement with some light from florescent lights than by keeping them in my greenhouse.

ACKNOWLEDGMENTS

It would be impossible to make a collection such as mine from commercial sources alone, without the kindness and generosity of other plant collectors and hobbyists most of this plant material would be completely unobtainable. Therefore I am most grateful to Mrs. Flores Foster, Prof. Hugh Bush, Mr. Roger Fesmire, Dr. Carlos Gomez Ruppel, Mr. Len Doran, Mr. Alek Korsakoff, Mr. Russell Manning, Mr. Les Hannibal, Mr. Paul H. William, Jr., Mrs. Mary Jeane Forberg, Dr. Hamilton P. Traub, Mr. Sherman Beahm, Mr. Sterling Harshbarger, Dr. Phillip Corliss, Mr. Joseph Mertzweiller, Mrs. Frank McCown, and the United States Plant Introduction Station, for their generosity with bulbs, pollen, seeds, and sharing of information.

A LONG-LIVED AMARYLLIS HYBRID

DARA E. EMERY, *Santa Barbara Botanic Garden, Santa Barbara, California 93105*

These few comments on my experience in growing amaryllis are stimulated by and in response to Robert D. Goedert's fine article "Amaryllis Season 1969" Plant Life vol. 26. In his article Mr. Goedert stated he received many reports that the bulbs of commercially imported large-flowered amaryllis usually degenerate shortly. He further stated that the plant's culture is not really easy, hence the price of $5.00 per bulb.

This is the brief record of three amaryllis, one of which has apparently escaped the short-life syndrome and has flowered well for the last six years. In mid-November 1964 I responded to the beautiful pictures of Van Meeuwen's Superisosa strain in our local seed store and purchased one bulb of "Paradise" white. During the following two weeks I purchased two more, a "Paradise" scarlet and a "Paradise" salmon for possible Christmas gifts.

Never having grown amaryllis before, I first carefully read the planting directions received with the bulbs. On November 30, 1964 the bulb of the scarlet-flowered form was given the preplanting treatment recommended by the grower. On December 16th the plant had its first flower open, but no leaves. By December 23rd there were four flowers open on one umbel and a second umbel was developing nicely, but still there were no leaves showing. The plant was given away at this time and, I recently learned, it had a very short life.

The first flower on the second umbel of the salmon-flowered plant opened 38 days after the preplanting treatment was started, but no leaves had yet appeared. In September 1965 this plant stopped growing and did not respond to fertilization—it had lost its roots. All soil was removed, the bulb base dusted with Captan, and the plant repotted. By November it was in flower again. The plant made a nice gift in January 1966. It died a year or so later.

Both the scarlet and salmon-flowered bulbs were given the same initial treatment as the white-flowered form (described below) except for the hot bed treatment. Probably the starting temperature on the salmon and scarlet forms was a little too high, as two umbels developed and flowered entirely from reserve plant food contained in the bulb. The lack of leaves at the first flowering was a disappointment and contrary to the pictures on the grower's instruction sheet.

The following are notes recorded on the "Paradise" white plant, the longest lived of the three:

11-21-64—Put lower ¼ of bulb in water to soak.

11-26-64—Planted in 6″ pot in a modified U.C. Mix (Canadian peatmoss, #30 crystal white sand, and coarse Sponge Rok in the ratio of 4:4:1, plus one of the balanced inorganic fertilizers recommended for the U.C. Mix) and sank the pot in the hot bed (in the lath house) with the temperature set for 70° F. (It was the warmest spot available at the time.)

12-1-64—Hot bed a mistake; too moist and not warm enough, was only 68° F. Moved to hot house and set on bench directly over floor heater.

12-16-64—Apparently it was the hot bed treatment that rotted the umbel; two leaves are about 3″ long.

1-2-65—Second umbel coming nicely; two leaves about 5″ long.

6-18-65—One umbel well developed.

7-1-65—One "double" flower open today; is actually two flowers with connate pedicels. Very pretty. (Note: this flower abnormality did not occur again.)

7-23-65—Last flower fading.

9—65—In flower again. A beautiful plant.

1-28-66—New umbel showing.

2-16-66—First flower open; plant in hot house.

6-18-66—First flower open; plant in lath house the last three months.

8-12-66—First flower open, five per umbel.

6-26-67—One umbel just finished and two others now open. The plant has split its tub (12″ or 14″ cymbidium tub) needs a 16″ or 18″ tub. A most satisfactory tub specimen. Gave plant to Paul T. Emery, my father, who lives in North Hollywood, California. (Note: this area is inland from the coast and subject to considerable frost in winter as well as high temperatures in summer.)

The record is unfortunately brief, but the plant was just wonderful. During the period from November 1964 to June 1967 it was moved back into the hot house at least one winter. It was fed rather often with a balanced commercial fertilizer as I am apt to force plants at first to see how they will react. The amaryllis forced nicely, as shown by the two to three flowering periods in 1965 and 1966. It remained fully evergreen for the two and one half years and was attractive as a tub specimen both in and out of flower. No seed was allowed to develop during that period.

After receiving the plant, my father commented each year on how well it was doing, how many flower clusters it had, and the flower size.

In May 1970 I asked him for a few comments on his culture of the plant and he sent me the following notes:

White Amaryllis: Placed the plant, three unseparated bulbs, in 16″ diameter redwood tub under mulberry tree which allows sun in winter and full shade in summer except for about three-quarters of an hour in late afternoon. Rather heavy application of a balanced fertilizer twice a year. Bulbs have multiplied until top of tub is covered except for a few inches at several places around edges. Kept damp but not wet. Sandy loam, drains well. Some leaves stay all winter; blooms in late April and May. This year had 36 umbels showing at once. Each one with two to four flowers five to seven inches across, white with green throat and center stripe blending to white over all.

Due to my lack of experience with amaryllis, I do not know if the above plant is unusual or not. It would be interesting to hear, through

PLANT LIFE, from other members who have large, long-lived amaryllis that bloom so profusely.

EXPERIENCES WITH AMARYLLIDS

HUGH L. BUSH, *109 East 33rd Street, Kansas City, Missouri 64111*

Since writing my brief article for Plant Life, 1970, many new and wonderful things have happened. *Amaryllis* species and hybrids have bloomed, additional bulbs have been received and distributed, and new and interesting friends have been made.

With a little help from my friends—indeed, much help—I have acquired many additional *Amaryllis* species and hybrids, *Lycoris* species, and several huge blooming size bulbs of *Worsleya rayneri*. Wherever possible, these were shared with others interested in the amaryllids. My *Crinum* species and hybrids now number well over 100, all growing and blooming well in huge clay pots. Three of these, new to me and very exciting, are tremendous bulbs of *C. angustifolium* (the "Queen Emma Lily"), the purple-bronze leaved *C. procerum* var. *splendens* and the "Golden Crinum," a new species, all from Hawaii. These came as a gift from a very wonderful *Crinum* enthusiast whose name I am not at liberty to mention. Others of interest are two from Argentina, one purported to be "purple", the other a "large white," and from Brasil a fairly large bulb collected as a "pink *amaryllis*," but obviously a *Crinum*. Perhaps it will have pink blooms.

Several *Amaryllis* species received from South America have already been reviewed by others, but one of particular interest, collected in the Organ Mountains area of Brazil and sent as a "red-flowered *Amaryllis* with green white-striped leaves" was not red at all. Three of these bulbs distributed to friends have not yet bloomed but the bulb which I planted produced a single eleven-inch scape with four very lovely 2½″x4″ blooms of *white* heavily netted and veined inside, the top portions with rose-madder, giving a definite appearance of lavender in the early stages of flowering. The lower portions of the blooms are almost pure white. The spathe-valves are pink, tipped with a beautiful emerald green, the ovaries are pink. Using my brief descriptive notes and color film, our Editor has identified this clone as a "fine specimen of *A. reticulata,* var. *striatafolia.*" Unfortunately, self-pollination produced no seed. A very robust-growing red-flowered *Amaryllis* from the same area performed excellently. Two bulbs which were distributed have bloomed, one has not. Hopefully, this *Amaryllis* will be described elsewhere in this issue by Prof. William Adee.

Approximately thirty select clones of hybrid Dutch and African grown *Amaryllis* grew and flowered beautifully under the "Gro-Lux" fluorescent lights. These were received here during prolonged periods of extreme cold and freezing weather and did not take too kindly to setting seed, although a few did produce fairly well. These seed, along

with various others from friends, have produced literally thousands of interesting seedlings.

A dozen or more pots of interesting *Lycoris* species and hybrids grew extremely well during the winter under fluorescent lights placed in the coolest area I could find in my basement. Sufficient time was not available to allow planting these outside in the cold frame.

Again, the *Lycoris squamigera,* growing in an outdoor bed, has outdone itself in a glorious display of blooms; needless to say, the *Hemerocallis* and *Iris* have done likewise.

The tornadoes, so prevalent in this area, mercifully spared us until late summer when a mild one came our way and picked up my potted *Amaryllis psittacina* which had developed two fine ten-inch scapes and dumped it upside down, smashing foliage and scapes into smithereens. This heartbreaking experience is ameliorated somewhat by the excitement of thirty or more 6-inch long, slender, deep wine-red buds emerging from the scape on the large *Crinum angustifolium.*

Space will not permit listing names of all the wonderful *Amaryllis* enthusiasts who assisted in my endeavors, but I hope our Editor will permit this small note:—I would be greatly remiss if I did not express my appreciation and gratitude to all who so generously shared plant material, seed, pollen, and growing notes with me, and who have shown great patience and understanding when business pressures usurped my time to such extent that prompt attention to their correspondence was not always possible. Indeed, I do thank you and am sincerely grateful to you.

AMARYLLIS CYBISTER

During the summer of 1969, the writer received from his good friend, Alek Korsakoff, a two-inch diameter bulb of *Amaryllis cybister.* This clone is one received from Dr. Martin Cardenas of Bolivia by the late Prof. Claude W. Davis and distributed by him in October, 1965.

Placed alongside a stone wall where it received only morning sun, the bulb grew well in a four-inch pot of very porous, well-drained mix which was not allowed to dry out completely at any time. Weekly feedings of soluble plant food in diluted solution were given. When outside temperatures became uncomfortably cool in the fall, the plant was placed inside under "Gro-Lux" fluorescent lights with temperature range from 65° F at night to 73° daytime. Growth continued until January, 1970, when signs of beginning dormancy were noted. Water was withheld gradually until February 1st, then discontinued. In late February a scape emerged from the bulb and watering was resumed.

On March 10, 1970, four of the five curiously fascinating florets were fully open simultaneously in an eight-inch umbel atop a 24-inch scape. Two days later the 5th floret opened. New foliage appeared on March 20th and this bulb is growing well. This clone appears to be identical to the one described by Mr. W. Quinn Buck in *Plant Life,* 1965. Full credit for the flowering of this interesting species *Amaryllis* must be given to the good culture given it by the writer's friend dur-

ing the four years he owned it. In order to preserve as much as possible the strength of the bulb, no attempt at self-pollination was made.

1970 DAYLILY SEASON REPORT

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

Two important things stand out in our retrospective study of the year 1970: the first is the really remarkable number of botanical and scientific papers on the *Hemerocallis* that have appeared in THE HEMEROCALLIS JOURNAL; the second is the reminder that rain and favorable weather are all-important to the breeder and the home gardener alike. 1970 was marked by unusually long dry spells over much of some of the most important daylily growing areas in the country, even the Atlanta convention being adversely affected. Florida, Georgia, Ohio, and Tennessee were especially dry, according to reports received, and hybridizers in these states were badly hurt by the hot, dry weather.

In the Midwest good seasons were reported for Orville Fay, Bro. Charles, James E. Marsh, Clarence Blocher, and others. Mr. Marsh showed further progress in his lavenders and purples, which had been most outstanding in 1969. The Blocher seedlings made an unusually fine show, especially in crosses involving 'Caption' (Griesbach); there were some outstanding pinks and lavenders among these. Mr. Blocher also flowered a satisfying number of good seedlings in other colors such as rose, purple, and red.

Wm. R. Munson, Jr., in Florida flowered a good number of new seedlings of real merit, even though plagued by a dry season that forced him to water the seedling beds with overhead sprinklers to keep them growing—and alive, even.

From Ohio came reports of quite amazing color progress in the work of Steve Moldovan, who had a strenuous year following his illness in the winter of '69-'70. His work in treating diploids with colchicine is beginning to show important results. Similar results should reward the amazing energy with which Dr. Virginia L. Peck has been polyploidizing diploid clones in her greenhouse where she formerly treated and grew-on germinating seed.

Dr. Peck's 'Satin Silk', a wonderful dark pink with yellow throat, was the finest new pink tetraploid used in the Buck garden for hybridizing in 1970. It was combined with many of the finest tetraploids, and in addition it was successfully crossed with treated plants of such clones as 'Frances Fay', 'Fountainhead', 'Sunset Sails', 'Pink Fluff', 'Lavender Parade', 'Curls', 'Rachel', 'Summer Splendor', 'White Jade', 'Louise Russell', 'George Cunningham', 'Pink Superior', 'Pink Darling', and 'May Hall'.

'Tai-Pan' (Moldovan), which has proved to be the best lavender-purple yet grown in my Arcadia garden, has been treated and re-treated,

and it again produced seed freely. As a pollen parent it was used on treated plants of 'Peacock Alley' (Wynne) and 'Dorothy Lambert' (Lambert). The latter a clear lavender with a large pale yellow throat, was very fine when our weather was favorable. 'Tai-Pan' has the admirable quality of not varying so much because of weather fluctuations.

'Scarborough Fair', 'Empress Mei Ling', and 'Domani' were the best performers among the tetraploids from R. W. Munson, Jr., during 1970. His 'Secret Garden' and 'Milanese' lost much of their color quality on hot days. Treated plants of 'Vivacious', 'Jimmy Kilpatrick', and 'Fountainhead' were much enhanced in color, the latter becoming an extremely beautiful thing. The pink 'Mary Read Rosa' was a lovely diploid from this grower, showing clear color and fine shape.

The Greisbach tetraploids in 1970 reacted unevenly to our California weather, some being disappointing in quality and performance. 'Arriba' showed more sunfastness than is normal for this dark red, while 'Vivid Paint' sunburned severely. The lovely melon 'Adela' was a superb pod parent, being matched in this only by 'Seed Setter' (Hardy).

Some other treated clones of exceptional promise were 'Charlemagne' (Moldovan), quite outstanding in color; 'Sholom' (MacMillan); 'Presiden Giles' (MacMillan); 'Annie Welch' (Claar) and 'Prairie Moonlight' (Marsh).

Among the new Buck tetraploid seedlings were several pinks, and an exceptional large pale yellow with wide lighter midrib. One of the finest new tetraploids grown was 'Golden Ring' (Traub). Dr. Traub's "masterpiece" is to be released in 1971 or 1972, and it has exceptionally good multiple branching to recommend it, besides the fine quality of the flowers.

We daylily growers again in 1970 had a happy season with our plants, in spite of all unfavorable factors, and we are already looking forward to another year.

EXPERIENCES WITH AMARYLLIS AND OTHER AMARYLLIDS

Richard E. Tisch, *20516 Clark Street, Woodland Hills, California 91364*

General. This past year has been sprinkled with surprises, mainly pleasant. Procedures on which full reliance had been placed resulted in advances beyond expectations. The rapidity with which improvement occurred was in some cases startling. The margin of maturation of plants grown in plastic juice pitchers over that of plants grown in standard clay pots was even greater than in previous years. By now there were also enough plants in square plastic pots, from 3-inch up to 6-inch square, to note that they, too, matured faster than plants in clay pots. Also, seedlings which were carefully spaced in their original plastic dishpans could be grown on to final transplanting size without

shifting up through a series of gradually larger pots, and they matured before plants which had been shifted up via several transplantings. Had I the space, I would be tempted to grow plants on from seeds sown directly into deep beds or pans, with no transplanting until after they produce their first flowers.

Amaryllis hybrids. The most marked improvement was in the combination of the hardier scrub plant found in so many yards with a vigorous group of plants from a pink-flowered parentage. The seedlings which flowered displayed the vigor of both parents, plus the heads-up attitude of the pink-flowered parent, plus colorations superior to what might normally be expected. Back-crosses and self-crosses have been made, as well as more attempts at bi-generic crosses. Seedlings are larger and more numerous than those of the past generation. Surprisingly, one of those which flowered displayed a tendency to flower repeatedly. Another surprise was their readiness to set seed.

Habranthus andersonii var. *roseus.* From seeds sown in September 1968, 36 bulbs flowered 22 months later. The cold-frame put on an interesting display as 26 flowers popped up simultaneously, followed by 20 more the following day. However charming they are, with their pink faces held upward to the light, they fade quickly. The timing was such that all were deanthered before they were fully open, so that crosses were sure, with no chance for self-pollination. All except the most prolific bloomers and the firmest seed-setters have been rogued out. Crosses are being tried to create a "break", so that bi-generic crosses will be accepted more readily.

Habranthus cardenasiana. These lovely pink flowers are a welcome addition to the late summer show. However, they have not yet accepted any crosses.

Narcissus. Again there were some new seedlings to watch as they flowered for the first time. Again only a few were considered worth saving. But the fun is still there. They are easy to grow, and once they start flowering there is a new crop every year. More species bulbs have been added to the small plantings, including some tiny beauties which have been crossed with the larger commercial hybrids.

Chemical treatments. Results of soaking seeds and bulbs in a colchicine-water solution continue to show up as distorted plants and flowers, with occasional emergences of exceptionally vigorous plants. This summer one of a group of seedlings from a white-flowered *Agapanthus* sent up a tall, straight, strong scape with a large umbel—but the flowers were pale blue! In middle springtime one of the treated hybrid *Amaryllis* sent up a scape with Siamese twin flowers; the flower was two complete flowers and flower parts fused at the ovary and tepal-tube. It would not set seed. In middle July a strong *Brunsvigia rosea* scape made its initial showing. Its first flower had nine (9) anthers and nine (9) petals, all neatly and evenly spaced, with three sets of three alternating. Excitement couldn't be suppressed, even when the subsequent flowers all had the normal six flower parts. The pollen from Number 1 flower was used to self flowers 1, 2 and 3. One of the white-

flowered hybrid *Amaryllis* which had been treated with colchicine solution produced a generation of exceptionally strong seedlings, one of which flowered last May with a dazzling display of three scapes in succession, the first of which had four pure white flowers which opened simultaneously on a tall, strong, straight scape. Pollen from this first flowering, when applied to other plants which had experienced colchicine treatment, produced large pods of fat seeds, most of which are now sending up leaves noticeably longer and stronger than average. The conclusion that such treatment can result in stronger plants is easy to reach, after only three generations of seedlings.

Growing methods. It was interesting to note in the 1970 *Plant Life* (pp. 130 ff.) that the "paper sandwich" method of handling *Amaryllis* seeds is successfully used by others. Since my undergraduate days as a botany lab assistant I have been using layers of absorbent paper for all sorts of seeds. Currently paper towelling is my favorite. Germination is high and uniform, and I am able to water the plastic dishpans so thoroughly that they can be neglected for longer periods of time than flats which do not have the layers of paper. As I write this now I am preparing to leave on a two-week vacation trip, completely confident that the pans of seedlings will be in excellent condition when I return. Next season I intend experimenting with several layers of paper towelling in the pans, approximately ¾ inch apart, to learn how long one can neglect such pans between waterings.

Miscellaneous comments. I should like to address a few words to those who might be wondering if they should attempt hybridizing and other experimental avenues of interest. By all means, do so! It will add an immeasurable set of values to your life. I have been experimenting with plants since I was a lad of six. Although I have never developed anything that could be rated as outstanding, there has been a constant succession of new things to observe, as seedlings came into flower. I fully expect that twenty years from now, when I am 80, I will still be eagerly watching the thrust of flower scapes as they greet the world for the first time. The Amaryllids offer an exceptionally varied and interesting assortment of plants with which to experiment. Growing top quality plants with special care, to try to attain the maximum the plant has to offer, is also rewarding. In addition to the expansion it adds to your appreciation of the basic rules under which we all live, plant breeding affords a healthful exercise of several disciplines which contribute to a vague quality called "peace of mind".

THE CHARMING **EURYCLES AMBOINENSIS**

MRS. F. J. PAHLS, *3035 S. W. 15th Street, Miami, Florida 33145*

Eurycles amboinensis, according to Nicholson's "Dictionary of Gardening" is a tropical bulb which requires "Stove Treatment". If I had read this about three years ago, when I first received the plant

from Mr. Alek Korsakoff of Jacksonville, I might have had more success with it. True, the plant bloomed that first season, but two subsequent years without flowers changed my belief that this was an "easy" plant.

The plant, in a six-inch pot, sits on the moist gravel in our screenhouse. In the winter, our screenhouse is protected on the north and west sides by plastic sheets. This is sufficient protection for our orchids and other tropical plants unless temperatures below 45° are predicted by our Weather Bureau. (I hasten to add that this occurs only infrequently.) Actually, the temperature in our garden probably is several degrees higher than the official figure, because our garden is well protected by

Fig. 30. **Eurycles amboinensis** as flowered by Mrs. F. J. Pahls, Miami, Florida.

a wall of shrubs and many trees which serve to contain the heat stored in the ground.

In addition to all this, we decided to further protect the *Eurycles* by placing over the plant, during "cold spells", a heavy shopping bag, the type so convenient for Christmas shopping.

During the past spring and summer, the plant grew well, especially during humid weather. It was fertilized every two weeks, usually with Hyponex, although occasionally we used orchid fertilizer diluted to half strength. Last November, when we had some cooler weather, all growth stopped, although the plant retained its foliage.

The future looked promising until we had two record breaking cold spells in January, 1970. These in each case lasted three days; the official low at night was 39°, with very little warmup during the daytime, and heavy rains left the ground cold and wet. Many tropical plants in our garden were severely damaged. In the screenhouse, which had been completely covered with plastic and blankets, damage to plants was light. When we removed the shopping bag from the *Eurycles* we found that the foliage was undamaged by the cold. Nevertheless we felt that the prolonged cold probably had ruined any chance of bloom.

By this time, too, the foliage looked old and dilapidated and finally I decided I might as well cut it off, (all but one good leaf). In the spring one new leaf appeared but for weeks thereafter there was no further sign of activity, possibly because of the dry weather.

It was in late May that *Eurycles amboinensis* surprised us by showing its first inflorescence (Fig. 30). Like the *Clivia,* the *Eurycles* flowers begin to open before the flower stalk reaches its full height. Every day one or two flowers opened, and since the flowers are long lasting, by the time the stalk had reached its full height, it was a gorgeous sight with about ten pure white flowers. In all, there were nineteen flowers, each with sepals and petals about 1½″ long, the flowers being about 2¼″ across. Quite spectacular!

Crossing with *E. cunninghami* was unsuccessful but a few pods are developing on the flowers that were selfed.

And while I write this, my plant has a second inflorescence, this with 11 flowers open, and at the base four new leaves have developed, practically all at the same time. Both this second inflorescence and the foliage made very rapid growth, probably because of the very warm wet weather we have been experiencing.

Definitely *E. amboinensis* requires high relative humidity and year 'round warm weather, but how low a temperature the plant will tolerate and still produce bloom is a question. Perhaps someone who grows this plant in a greenhouse with controlled heat can supply this information.

In conclusion, I agree with Mr. Korsakoff that this is one of the most spectacular amaryllids that I have seen and definitely worth growing.

SOME OBSERVATIONS IN 1970

Russell H. Manning, *717 Valley Avenue, Route #1 Box 8, Spring Valley, Minnesota 55975*

Recently the writer quartered an *Amaryllis aulica* bulb and sent the various pieces to several persons who were interested in the dwarf *Amaryllis.* This particular type of *A. aulica* was grown from seed obtained from Rex D. Pearce, Seedman, in 1963. Out of the 17 seeds which were advertised as "Lily of the Palace", 3 matured with two types of bloom, 2 as *A. aulica forma stenopetala* and the other the regular form, *A. aulica* Ker-Gawl. The longest leaves scarcely were seldom over

a foot and usually much less. The bulbs never made any offsets in all these years of growth, the roots were thick and heavy and probably were as large in bulk as the bulb itself was, the flowers had remarkably little green in them considering that many others made mention of this in theirs. Never did any of these set any capsules nor did any of its pollen set any seeds insofar as is known. The leaves were pretty enough to have been grown for their neatness and attractiveness.

In the first week in September of this year, a *Cyrtanthus hybrida,* Thompson & Morgan's #1283n 1966 catalog, bloomed which was remarkable not so much that it does not resemble the plate on page viii (of the above cited catalog) of the seedsman but it does resemble one which Dr. Dyer doubted was in existence. This plant is not the pure species *Cyrtanthus vittatus,* as it has the large 3-pronged stigma and a single bloom per scape from its other parent which may be *Cyrtanthus sanguineus.* These plants have been remarkably weak growers. But the reward of the single bloom has been well worthwhile as it is an old rose color of some two inches wide, and is poised at a jaunty angle which enables the viewer to see the throat's coloration. Its form, from *C. vittatus,* is much more refined and stylish than the more commonly tubular forms.

The writer's recrosses of that original hybrid *C.* x *brownii* bloomed this year and those, who are fond of the colors in which orange sherberts come in, will find these plants well worth reduplicating. The several references which have been noted in HERBERTIA and in PLANT LIFE fail to give much about them except that they are not too strong of growers. The parents for these were from the selfed offspring of *Cyrtanthus purpureus* (syn. *Vallota*), which eliminates a lot of the weaklings if one uses the 1st bloomers as the podparents and I would suggest trying to get your pollen from Alek Korsakoff as not all *C. sanguineus* pollens will set on *purpureus.* While some of the bloomstalks are rather weak, fortunately those with the better forms, poise and size had inherited a good stalk from the podparent. These had blooms up to 3″ and 3¼″ across the face and were poised to be seen and made a good spot of color. These plants are extremely healthy and robust although they are somewhat slow to come into full maturity. Where these can be satisfied to be grown well outdoors, they should make a most stunning border for the fall season as the color inherited from the podparent carries for a long distance without being harsh.

For the last several years in preparing the *Amaryllidaceae* bulbs which have been grown out in the soil for the Winter's storage season, the whole plant is dug ahead of the killing frost, the roots carefully being left-on with all the tops and then are all washed down with a hose. They are then allowed to dry off (the roots are kept covered from the wind and sun) before putting them into storage cardboard boxes into which a layer of 1″ or 2″ of dry, finely ground peat has first been spread. The various whole plants are laid carefully in, and a layer of the same peat is sprinkled over each group until it is thoroughly covered and with enough so that the foliage does not mat-down tightly.

One must not be sparing in the use of the peat as it locks in the natural moisture level of the bulbs. During the Winter's time, the foliage gradually yellows-off through ripening and by Spring, there are nice plump bulbs already to start growth from their storage in the basement.

STORAGE OF CLIVIA SEED

W. Quinn Buck, *Arcadia, California*

A batch of *Clivia* seed from a famous European grower was in rather poor condition when it reached me about the middle of May, 1970. Hoping at least to plump up the shriveled seed and get moisture back into them, the seed were put in a small jar of water and set in a refrigerator maintained at a moderately cold temperature. Very quickly the seed were restored to normal plumpness. Rush of daylily pollinating and other summer work caused delay in the planting of the seed until Sept. 19, 1970, at which time practically all appeared to be in excellent condition as compared with their state on arrival. Several of the very small seed evidently had dried out beyond recovery before they were stored.

This experience, together with past experiences at the Arboretum with "old", shrivelled seed, suggests a number of experiments that could be undertaken by those interested in growing these fine plants from seed: Growers who sell seed might find it advantageous to store their freshly gathered seed in this way to prevent dehydration before shipment to customers. The effects of this cold storage on germination and growth would be most interesting. Storage in weak nutrient solutions, in colchicine solution, or in certain other solutions, could give interesting results and should be tried.

SOUTH AFRICAN LETTER

Leon Boshoff-Mostert,
Kleinskuur, Balfour, Transvaal, South Africa

During the course of my relatively short span of life which has just recently passed the three score mark, I am convinced that I have witnessed the greatest advancement in human progress in every sphere of endeavor. The present generation lives in an era where undreamt-of scientific achievements follow one upon another at an unprecedented tempo, overshadowing everything that has seen the light of day, from the time of separation of sea from land in the first chapter of Genesis, up to the end of the nineteenth century. Many, if not all, of these achievements have been possible because of the discoveries, inventions and research of scientists during earlier centuries upon the foundations of whose work successive generations have built newer structures.

Man has produced things chemical and otherwise which had not previously existed but, nevertheless, the constituents of all these new products are derived from resources provided by nature from time

immemorial. Advancement in the plant world may be viewed in the same light as that in the industrial field. Our resources were the species provided by nature and the improvement thereof was a challenge to those with creative minds and the urging desire to leave to posterity a legacy greater than their own heritage. Their incentive was not motivated by monetary considerations and to those horticultural pioneers of earlier generations we cannot ever pay sufficient homage.

If there is an unbiased specialist in any one single phase of plant breeding, let him now speak or forever hold his peace! I, for one, admit to a biased mind and on that admission and on those premises I express the conviction that of all the flowers, the *Amaryllis* leads the field in the advancement and improvement of hybrids. One is inclined to think that a saturation point should be reached. Each year, evaluating the cream of the new creations among my seedlings. I get the impression that, with the latest improvements, the present collection of monochromes, bi-colours, bi-tones, blends or polychromes cannot be improved upon. But yet the breeding programme is continued and again, somehow, something new is presented which, in some or other characteristic exceeds the best in similar varieties previously egotistically regarded as the apex of achievement in that particular direction. It must be admitted, however, that the scope progressively becomes contracted and the crop of discards proportionally expands.

It would be a revelation to visit horticultural archives in which there are kept sketches or lifelike drawings or paintings of all the forerunners of the latest creations upon which the *Amaryllis* hybridists of the present century have had and still have the pleasure of feasting their eyes. There was a horticultural book published in London towards the end of the eighteenth century which contained hand-painted colour prints of a variety of flowers, including *Amaryllis,* all of which at that time, I am inclined to presume, were grown in Kew Gardens. I do not know who the writer or compiler of the book was, because it was mutilated by its owner, a lady in Natal who specialized in floral art. Opposite each coloured print in the book was a page devoted to the description of and historic and other data on the bloom. The lady in question removed from the book any colour print in which a client was interested. This was then framed under glass and together with the relative page, also cut from the book, was sold at the moderate cost of approximately $7.50.

Some eighteen years ago, during a flower show in Natal at which my wife acted as judge, she came across this lady and, being keenly interested in such antiques, bought three of the plates, being of "Amaryllis Equestris—Barbadoes Amaryllis, or Lily.", numbered (305), "Iris Xiphioides. Pyrenean Flag.", numbered (687) and "Iris Virginica. Virginian Flag.", numbered (703). All pages are headed and subheaded in a similar fashion in successive lines thus: (305 or other appropriate numerals), name of flower in bold print, after which—or rather under which follows the following: "Class and Order", "Generic Character", "Specific Character and Synonyms". The characters are

described in Latin and this is then followed up by references, in English, to the history, habits of flowering and other related data. Every "s" in the script, except one that comes at the end of a word, is printed like the letter "f", but without the stroke through the middle of the "f". The picture was obviously coloured in by hand before being bound in the book and one wonders how many artists were employed for the publication of say, one thousand copies of the book. Beneath the colour print of the *Amaryllis,* the following is printed in italics: "Pub. by W. Curtis, St. Geo. Crescent, July 1, (1795.)" Under the headings on the opposite page, one reads the following:—

"Mr. Aiton, in his 'Hortus Kewensis', has inserted this species of *Amaryllis,* as named and described by the younger Linnaeus; he informs us, that it is a native of the West-Indies, and was introduced by Dr. William Pitcairn, in 1778: as its time of flowering is not mentioned, we may presume, that it had not blossomed in the royal garden when the publication before mentioned first made its appearance; it no doubt has since, as we have seen it in that state in the collections of several Nurserymen, particularly those of Mr. Grimwood and Mr. Colvill.

"It flowers towards the end of April.

"The flowering stem rises above the foliage, to the height of about a foot or more, produces from one to three flowers, similar to, but not quite so large as those of the Mexican *Amaryllis,* to which it is nearly related; it differs however from that plant essentially in this, that the lower part of the flower projects further than the upper, which gives to its mouth that obliquity with (presumed to be which) Linnaeus describes.

"The spatha is composed of two leaves, which, standing up at a certain period of the plant's flowering like ears, give to the whole flower the fancied resemblance of a horse's head; whether Linnaeus derived his name of equestris from this circumstance or not, he does not condescend to inform us.

"Mr. Aiton regards it as a greenhouse plant; like those of many of the Ixias, however, the bulbs are of the more tender kind.

"It is propagated by offsets, but not very readily."

What a pity that such a historic horticultural monument, as the copy of this book certainly was, should have been mutilated. I wonder whether money would ever induce my wife to such action with her rare copy of "The Genus Iris" produced by W. R. Dykes in 1912. Be that as it may, we are glad to have those three pictures with the three pages from that eighteenth century book. It would be interesting if any of the readers, or perhaps our Editor, could tell us the name of the author of the book.

We also have a hand-painted picture of "Amaryllis Johnsoniensis", the caption being similarly printed in italics. There is no indication of the date published or the name of the publisher or artist. It is a present from a friend who bought it some years ago at an antique shop in Israel where it was attributed to a first decade creation of the nineteenth century. With an eye on our present-day hybrids, it is

stimulating to ponder over the fact that in those days—and justifiably so, these two blooms were looked upon as incomparable as regards exquisite beauty of form and colour.

I would urge all Amaryllis fanciers to try their hand at breeding by the simple act of applying the pollen of the "father" bloom to the stigma of the "mother" bloom. To exclude the possibilities of self-pollination, the anthers of the "mother" bloom should be removed before they start shedding their pollen grains. I have found that the time of pollination to ensure optimum fertile seed production is as soon as the stigma gives signs of becoming moist. I am not sufficiently informed to give scientific reasons for my contention and I may be wrong. The observations of our Editor in this regard will certainly be a reliable guidance. Breeding may be done on a scale dictated by the size of available beds to accommodate the crop of seedlings. The sight of the first blooms of one's own breeding is most gratifying and thrilling. But do not develop such a sense of possessiveness as to deter you from discarding, if need be, the entire batch of bloomers. It is fallacious to keep any new variety if its blooms are not an improvement on those of its parents. At the same time, keep in mind that with top quality material, your chances of producing something outstanding are as good as those of the professional breeder or even the trained geneticist. Although by far in the minority, some of the finest blooms have been bred by amateur gardeners and fanciers. The successes of these tyros are by far in the minority for the reason that commercial growers are equipped to raise tens and hundreds of thousands of seedlings over each successive season.

In the 1963 issue of the Year Book I wrote extensively on Amaryllid Culture with a view to covering the various facets of the practical application of methods adopted in my own particular undertaking. Fundamentally, the modus operandi has remained unchanged. There are, however, a few innovations that have since been introduced which may be regarded as improvements and worthy of comment.

Firstly, I refer to the seed bed shown on page 82, Fig. 17 of the 1963 Year Book and then to the portable steel framed hessian covers shown in the same issue on page 85, Fig. 18. These frames effectively served the purpose of protecting the young seedlings against hail and frost but there was an obvious drawback in their construction. During downpours of rain, the hessian persistently inclined to cause continuous dripping on particular spots in the bed, leaving numerous seedlings awash with roots in the air. Holes then had to be filled in and the disturbed seedlings replanted. Changing the order of the covers only changed the location of the erosion spots. This problem was solved by substituting the portable hessian covers with wooden sliding frames with corrugated fibre glass covering. To the underside of these frames are attached two metal sliding rails which are flanged so as to prevent the frames from slipping off the sides of the bed enclosure. Sections of steel fencing posts (12 lb. posts) were used as sliding rails as shown in Figure 31. Here can also be seen one of the sides of the seed bed which

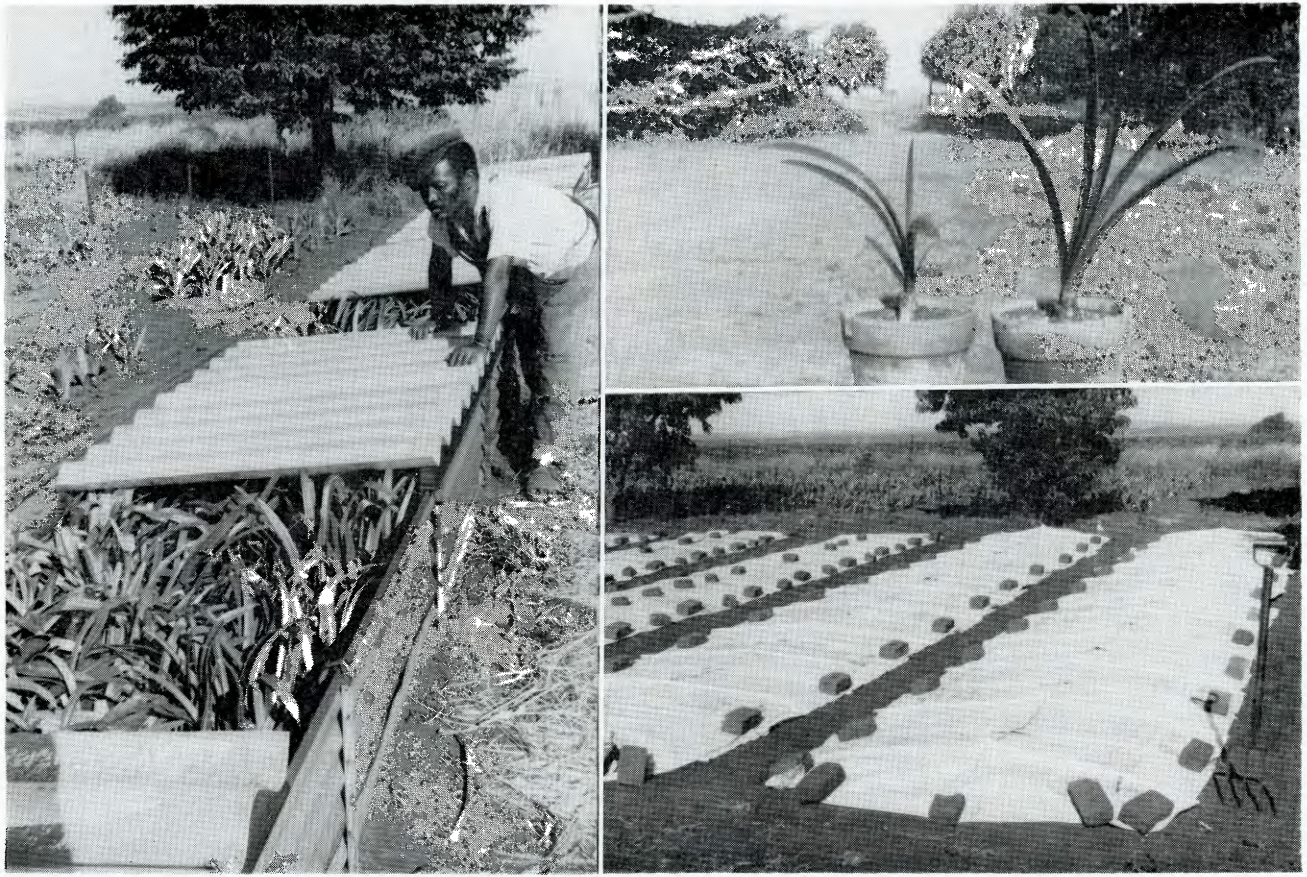

Fig. 31. Amaryllis culture: **Left,** Seed bed with portable hessian covers. **Upper right,** effect of foliar feeding; control plant on left received fortnightly foliar feeding for six months; contrasted with plant on right which received fortnightly foliar feeding throughout the year; and **Lower right,** showing covering during soil fumigation.

is of corrugated steel sheets cut lengthwise in half and bolted to angle iron standards firmly planted in the ground. The only modification to the old structure was the attachment of a 1½″ x ⅛″ flat steel section to the upper edge of the sides on which the new frames freely slide. The fibre glass sheets are of a 60% translucency.

During the past growing season I have continued with the fortnightly liquid fertilizing programme. In addition to this, I also applied liquid foliar feeding with a fine nozzled high pressure spray pump at fortnightly intervals in the intermittent weeks. In order to determine the value of foliar feeding I kept two control specimens of the same size and variety from a batch of bulblets vegetatively propagated in my incubators. These bulbs were planted in the same medium and at the same time in 7″ pots. They received similar treatment in every respect except that one only received foliar sprays over a period of six months. The plant on the right in Fig. 31 advanced in development in a marked degree compared with its untreated counterpart on the left. This control operation has proved not only the value of foliar fertilizer but also that the trifling additional cost is justified.

Lastly, I wish to touch on the matter of soil fumigation which must be accepted as a pre-requisite in nursery activities. Before planting, the beds are treated with an approved liquid soil fumigant, injected with a suitable injector pump to a depth of 10 to 12 inches and at a volume and spacing rate as prescribed by the manufacturers of the fumigant. The suppliers also instruct that, after injection, the beds be raked smooth and then sprinkled with water to provide a "sealed" topsoil covering. The efficacy of such covering, to my mind, is questionable. After the prescribed spray over the treated beds, I cover the beds entirely with the plastic bags in which we receive our granular agricultural fertilizer. Squares of four plastic bags stapled together form ideal "blanket" units which are easily handled and these are spread over the beds, allowing sufficient overlap of "blankets" to ensure minimum escape of fumigant gases. As shown in Fig. 31, the covering is firmly held in position by bricks and when the covers are removed after two weeks, there is a horde of dead centipedes and other pestilential insects which have found shelter under the covering and there shared the fate of nematodes and other undesirable elements in the soil.

Crinum thaianum Joachim Schulze, **sp. nov.** (Amaryl.). **Holotypus:** No. 1007 (TRA), J. Schulze, Apr. 18, 1970; **isotypus:** No. 1010(TRA), J. Schulze, Apr. 18, 1970, deposited in the U. S. Nat'l Herbarium (US).

Planta vere aquatica, bulbo usque ad 15 cm. longo, collo 3—6 cm. longo; follis usque ad 20 vel pluribus 2—3 m. longis 1.5—2.5— cm. latis, scapo usque ad 80 cm. longo 5—8 cm. diametro; umbella 5—8 vel raro usque ad 10-flora; ovario oblongo; tubo tepalorum 12—14 cm. longo; segmentis tepalorum 8—10 cm. longis 8 mm. latis; staminibus 6—8 cm. longis; antheris 12—14 mm. longis; stylo quam staminibus brevioribus. Species indigena Thailandicaest.

The complete article will appear in Vol. 28, PLANT LIFE, 1972.

EDITOR'S MAIL BAG—continued from page 12.

just getting settled. Luckily I was able to ship all my *Amaryllis* bulbs but a number were lost shortly after arriving here. Fortunately, the bulbs planted in the open ground did better than those planted in pots. Presently I am trying to replace some of the bulbs lost. I hope by next year or the following year I will have some material for the Amaryllis Year Book."

It is suggested that the members in California get in touch with Mr. Sudd in the meantime.

Under date of September 18, 1970, Mr. Ralph A. Paulsen, 12726 Kling St., Studio City, Calif. 91604, writes, "Before I entered the military service, Mrs. Anthes and I had quite an extensive collection of *Amaryllis* species and other amaryllids. . . . However, we had only a few specimens of each kind. With my going into service, and Mrs. Anthes' subsequent illness, we lost everything we had, except a form of *Brunsvigia minor* that had gone wild in Peru. . . . I am anxious to get started again. . . ."

It is hoped that members will get in touch with Mr. Paulsen, and help him to build up a new collection. Please write to him directly.

Under date of October 7, 1970, Dr. K. R. Spearman, 2641 Via Pacheco, Palos Verdes Estates, Calif. 90274, writes that "My only worthwhile project is an attempt to develop a large-flowering strain of fall-, and winter-blooming hybrid *Amaryllis*. This project is only now getting started as I try to gather fall-blooming species, and a single American *Amaryllis* hybrid which blooms each fall for Polly Anderson. Results will be reported later."

Will those who have fall-blooming species and hybrids please share their surplus stock with Dr. Spearman so that he can get his project moving more rapidly?

Mr. Charles L. Harris, Route 4, Box 78-G, Griffin, Georgia 30223, writes under date of October 27, 1970, that he has blooming size *Worsleya rayneri,* the Blue Amaryllis, and *Amaryllis calyptrata* bulbs for sale in lots of not less than 50 bulbs at wholesale.

Your Associate Editor, Dr. Harold N. Moldenke, 303 Parkside Road, Plainfield, N. J. 07060, has been seriously ill. Under date of Feb. 21, 1971, he writes, "I have been in the hospital now 130 days in all, on 6 visits. I've had 5 operations. Over Xmas I was for 10 days on the critical list with peritonitis and the nurses had me marked "possible death", but I fooled them and didn't die. I'm home now to recoup strength for my 6th operation in June."

We will all be praying for Dr. Moldenke's full recovery.

It is with great sadness that we have to report the death of Dr. Fred J. Buchmann of Baton Rouge, La., on Jan. 22, 1971. An "In Memoriam" article by his colleague, Dr. Joseph K. Mertzweiller, will appear in the 1972 issue.

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Hamilton P. Traub
Harold N. Moldenke

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

SPARAXIS BREEDING, 1971

CHARLES HARDMAN, *4435 Center Street, Baldwin Park, California 91706*

Early in 1960, my first *Sparaxis* bulbs bloomed. There were only twelve of them, but the impression they made on me went deep. So deep, in fact, that before I quite realized what was happening, I became enthused and decided to hybridize these floral diamonds-in-the-rough. The ten years since then have been spent in developing what impressed me most about them: their potential for improvement.

There have been times, it's true, when this enthusiasm-plus-potential combination has been all but swamped out by the forces of frost, large-scale gopher destruction, a limited time schedule, endless weeding chores, and the monumental tasks of planting and digging bulbs each year. But somehow, while not necessarily scoring an overwhelming victory, the enthusiasm/potential ticket has at least made progress. So much so, in fact, that last year found me planting in excess of 20,000 bulbs and at least twice that many seeds.

While it has been an uphill climb with few rest stops, there have been some wonderfully rewarding satisfactions along the way. The first of these came from learning what a responsive plant I was working with. Although called "Sparaxis", they are, technically, a hybrid form between one or more species of *Sparaxis* and one or more species of *Streptanthera*, a near relative. Species which have been used to produce our modern *Sparaxis* hybrids include *S. tricolor, S. bulbifera,* and *S. grandiflora,* along with *Streptanthera cuprea.* It is possible that *Streptanthera elegans* may have been used as well. The kaleidoscopic effect produced by the color patterns in the throats of many of the hybrids is no doubt due to the *Streptanthera* influence. So, the foundation work of mixing the species already had been done by earlier hybridizers.

My job, then, was to keep the mixing process going. Keep the genetic pool stirred up and when something good appears, develop it.

I have not been disappointed. Within the first few years, an incredible variety of colors and marking patterns was presented. From the original orange-salmon and wine-black of that first dozen—and with some help from a few new bulbs acquired from time to time—the color spectrum reached out every year to include shades I didn't even imagine were possible at first. (More about color later.)

Even so, no breeder works his stock for color alone. To do so leads to serious difficulties with other considerations: health, size, texture, general appearance, and other factors must be considered when an individual plant is chosen for propagation and/or hybridizing.

Having previously hybridized *Gladiolus,* another member of the same plant family—*Iridaceae,* I was not entirely unprepared for working with so similar a genus as *Sparaxis.* Many of the problems which developed were parallels to problems encountered in hybridizing glads.

The basic approach, however, had to be different. Whereas with gladiolus, individual florets could be protected and carefully crossed with a specific pollen, this has proven impractical with *Sparaxis,* except on a limited basis.

Several factors dictate a different approach. Principal among them are the size of the flower parts (they're simply too small for handling with fingers) and their location. The anthers and stigma are so arranged that preventing accidental pollination is tediously difficult. So, insects do the major part of the pollinating for me. Therefore, only the seed parent is known for sure in any given cross. When seed parents with a history of producing good offspring are used, the drawback of not knowing the pollen parent isn't so great as it might seem. (Certainly it would be interesting and even useful to know both parents for the purpose of scientific cataloguing. But it is not essential when the primary goal is achieving results.)

Just such a seed parent was one of my first good seedlings. I call it 'Aruk'. A beauty in its own right—its habits are excellent, and its color, dazzling—'Aruk' throws seedlings in every color known to *Sparaxis.* This is not an unusual trait in this group of plants; many do the same thing. But 'Aruk' adds that extra plus of good quality in a great many of its seedlings.

The original bulb bloomed the second year I grew *Sparaxis* from seed. It was a lucky break for me. Now, many of its offspring are also seed parents. Although most of the stock of this clone was lost in the big freeze of December 21, 1968 (that unfortunate event destroyed two-thirds of my best clones and seriously decimated the remainder), it is making propagation headway again. Hopefully, I'll have enough for sharing someday.

Earlier, I mentioned color. While hybridizers may not breed specifically for color, let's face it, people do buy specifically for color. So expanding the color spectrum becomes an important goal for anyone working with an ornamental plant. Here is a list of *Sparaxis* colors I've been able to isolate over the years. In most of these color classifications, I have at least one clone that shows marked improvement over older varieties and promises even further improvement to come.

REDS—Lots of these, but good sparkling scarlets and intense true reds are still scarce. 'Aruk' is a red.

ORANGE—Salmon-orange is *the* predominant color in any group of *Sparaxis* seedlings. But where are the good, clear oranges? Still few and far between.

SALMON—Take your pick. More good salmons than anything else. So you choose only the very best.

WHITE—Fairly strong here too. Texture needs to be improved. This is true in colored varieties as well, but it's more noticeable in the whites.

PINK—Old rose, dusty rose, describes the color with greater accuracy. Bright baby pinks are just beginning to show up.

ROSE—Same here as in the pinks. Hope one I selected last year repeats its previous performance.

YELLOW—Muddied with purple. Progress here is slow.

CREAM—Same story as "Yellow".

WINE or MAROON—Lots and lots. But good ones—scarce.

PURPLE—Like pink, dusty. A few show some clarity of color now. Purples often have short, twisted stems.

BLACK—Here's a surprise. *Sparaxis* have some of the blackest flowers I've ever seen. Wine-blacks, purple-blacks, and red-blacks. In some cases, the buds have virtually no hue—just black. Progress here has been quite rewarding.

BLUE—I'll be succinct: there aren't any. There is blue in the throats of certain reds and oranges, however. And some purples have a blue base to the color. So hope remains for the future.

In addition to these basic colors, some interesting variations are appearing—a white and orange picotee; a bizarrely patterned three-tone rose; a true lavender; a near-brown; and numerous yellow-purple combinations that people either like very much or hate with equal intensity.

And different forms are appearing. A few now have ruffled petal edges. Some others are star-shaped. While flower size is definitely on the increase in general, several minis have earned their place on the propagation list. All the bulbs I ever purchased from nurseries have been discarded. They were simply inferior to clones I now have.

So where do we go from here? Forward, of course. I'm currently working to induce polyploidy in some individuals, giving them extra chromosomes within their cells. If the experiment is successful, this will give the genetic pool even greater variability. Which means more resources for hybridizers to draw upon and, ultimately, an even wider range of desirable characteristics upon which to base selection of individuals.

Chances are, I'll be busy for at least another ten years.

BLEAKLEY—AMARYLLIS IN AUSTRALIA—continued from page 106.

to Dr. H. P. Traub who very cordially invited me to become a member of the American Amaryllis Society. I would be very interested in any information on the species and also hybrids, how you grow them, what are their wants and needs and *could I obtain seed of the species* as in Australia we have very strict quarantine regulations on the importation of plant material. I would greatly appreciate any letters and in return I could exchange seed or maybe there would be some other varieties of Australian plants I could send. My hybrids usually flower from October onwards.

I do not know of many other growers in Australia. There is the Blue Dandenong Bulb Farm and a few growers in the State of Queensland. I cannot understand why the *Amaryllis* is not so well known here, although lately a few articles have been appearing in our garden magazines.

LATIN AMERICAN AMARYLLIDS, 1970

PEDRO FELIX RAVENNA,
Melián 2240, Buenos Aires, Argentina

[In this department, descriptions of genera and species, and various notes, are translated from foreign languages. The following text represents the writer's collaboration with Correa's Flora Patagónica (Part II, 1969). He here makes the necessary changes of names and additions to the synonymy, as well as notes required because of subsequent studies. Translations on descriptions of some *Tristagma* species are not included because these have already been published in the 1969 edition of Plant Life.—*Pedro Félix Ravenna.*]

NOTHOSCORDUM KUNTH **NOM. CONS**

Kunth, *Enum, Pl.* 4: 457. 1843

Nothoscordum bonariense (Pers.) Beauverd, *Bull. Herb. Boiss.* Ser. II, 8: 1001. 1909.—*Ornithogalum bonariense* Persoon, Syn. Pl. 1: 363. 1805.—*Nothoscordum pulchellum* Kunth, Enum. Pl. 4: 458. 1843.—*N. gaudichaudianum* Kunth, *loc. cit.*—*Allium bonariense* (Pers.) Grisebach, *Goett. Abhandl.* 24: 319. 1879.

1a. Filaments contiguous. Ovary almost cylindrical, somewhat narrowed toward the base. .....1. *inodorum* ssp. *nocturnum*
1b. Filaments not contiguous. Ovary almost ovoid. .....2. *bonariense*

Nothoscordum inodorum (Ait.) Nicholson ssp. *nocturnum* Ravenna, Corr. Fl. Patag. 2: 145. 1969.

Plant about 19-48 cm tall. *Bulb* ovoid about 12-20 mm long, 12-17 mm wide; outer coats blackish; pseudo-neck to 2-6 cm long. *Leaves* 3-4 ca. 14-30 cm long, 3-7 mm broad, glaucous, slightly channelled to almost flat, obtuse. *Scape* to 15-55 cm long. *Spathe* 4-15-flowered; valves ventricose, membranous ca. 18 mm long, connated at the base for 5 mm. *Pedicels* to 5-15 mm, upright at anthesis, longer and radiate at fructification. *Flowers* about 7-8 mm long (in expanded flowers), 10-12 mm in diam. *Tepals* oblanceolate, spreading at night, concrescent for 4-4.5 mm, then 9 mm long, ca. 3-3.4 mm broad. *Filaments* flattened, oblong-subulate, almost equal, always contiguous, sometime partially or irregularly connated toward the base, about 6-6.3 mm long, 1.25-1.4 mm broad; *anthers* oblong about 1.6 mm long. *Ovary* ca. 4.4 mm long, 1.8 mm wide; *style* 4 mm long; *stigma* capitate-trilobed. Capsule obovoid about 7-8 mm long, 3-3.5 mm wide; seeds black, irregular, angled, about 1.3-2 mm long.

A native in the hills of the province of Buenos Aires and also in Río Negro. It differs from the typical subspecies by its nocturnal flowers and the larger almost cylindrical ovary.

Nothoscordum bonariense (Pers.) Beauverd

Plant about 6.5-30 cm tall. *Bulb* ovoid, whitish, to 11-12 mm long.

9-10 mm wide, with a pseudo-neck. *Leaves* linear, to 5-15 cm long, 0.8-1.8 mm broad. *Scape* cylindrical about 4.5-33.5 cm long, 0.9-1.7 mm broad. *Spathe* bivalved; valves somewhat unequal, the lower to 9-11 mm long, the upper ca 6.5 mm, sometimes reddish. *Umbel* 2—4-flowered. *Flower* infundibulate to subrotate, white, tinged purple in the outside of tepals, to 8.5-11 mm long, 9-12 mm in diam.; *pedicels* to 1-1.5 cm long at anthesis, longer and radiating with fructification. *Tepals* concrescent for 1.2-1.8 mm, the outer oblong ca. 7.1-8 mm long, 1.9-2.5 mm broad, inner ones lanceolate, to 1.8-2.8 mm broad. *Filaments* slightly unequal, the episepal to 3.3 mm, epipetal 4 mm; *anthers* small, versatile, oblong. *Ovary* sessile, subglobose, about 1,9-2 mm long; *style* ca. 3.2 mm long; *stigma* capitate.

It grows in damp places. *Nothoscordum pulchellum* Kunth was apparently based on a specimen with buds only; its author says that the flowers are 4-5 mm long. Differences in the size of leaves of this and *N. gaudichaudianum* Kunth, show that they are mere ecological forms. *N. sellowianum* Kunth seems to be identical with this species.

TRISTAGMA POEPP.

Poeppig, Fragm. Syn. Pl. Phan. 8. 1833.

Tristagma ameghinoii (Speg.) Spegazzini, Anal. Mus. Nac. Buenos Aires, Ser. II, 4: 172. 1902.—*Brodiaea ameghinoii* Spegazzini, *Rev. Agronom. La Plata* 7: 575. 1897.

1a. Tepals thickened, almost finger-shaped:
  2a. Tepals narrowed toward the apex, flexuose. Flowers entirely greenish. .....1. *ameghinoi*
  2b. Tepals almost of the same width throughout, somewhat blunt, often recurved but not flexuose. Flowers a brownish purple, sometimes only partially greenish. .....2. *nivale*
1b. Tepals flat, white, often with a brownish-purple or brownish-green streak on the outside:
  3a. Epipetal filaments to 2 mm long, episepal ones shorter. Flowers ca. 8-14 mm in diameter. .....3. *anemophilum*
  3b. Epipetal filaments to 3.9-5.5 mm long, episepal ones shorter. Flowers about 20-35 mm in diameter. .....4. *patagonicum*

Tristagma ameghinoii (Speg.) Spegazzini

Plant about 9-20 cm tall. *Bulb* ovoid ca. 16 mm long, 12 mm in width, sometimes with a weak pseudo-neck. *Leaves* linear, a grayish green, about 12-23 cm long, 1.4 mm broad, slightly channelled. *Scape* ca. 10-16 cm long, 1 mm broad. *Spathe* bivalved, 1-2-flowered; valves subequal, membranous, to 13-15 mm long. *Flowers* pedicelled, an olive green, about 9-12 mm long, 10-18 mm in diam. Tepals thickened, to 5.5-9 mm long, 0.7-1 mm broad. *Perigone-tube* ca. 9.5-12 mm long, 2.3 mm wide. *Filaments* very short and narrow, flattened, the episepal inserted at 7.1 mm from the base of the tube, about 1-1.5 mm long; *anthers* yellow about 2.3-2.4 mm long. *Ovary* ovoid or oblong-ovoid, ca.

2-2.5 mm long, 1.8 mm in width; *style* thick, to 1.2-1.5 mm long; *stigma* widely capitate.

ZEPHYRANTHES HERB.

Herbert, Append. Bot. Reg.: 36. 1821.

Zephyranthes filifolia Herb. ex Kraenzlin, Kew Bull. 1913: 190.

Plant about 15 cm tall, when in flower. *Bulb* almost globose, to 15-23 mm wide, covered with dark brown coats; pseudo-neck to 2.9-8 cm long. *Leaves* present or absent at anthesis, about 10-15 cm long, 1-2.5 mm broad. *Scape* to 12-15 cm long. *Spathe* fenestrate ca. 20-21 mm long, the tubular portion to 12 mm. *Flowers* pedicelled, yellow, about 13-15 mm long, 12-16 mm in diam.; *pedicels* ca. 13.5-19 mm long, the fruiting longer. *Tepals* broadly oblanceolate, connate for 2.5 mm, the outer about 12-14.9 mm long, 4.2-6 mm broad, shortly apiculate; inner ones about 12-13 mm long, 4-5.5 mm broad. *Filaments* episepal to 5 mm long, epipetal about 6.8-6.9; basal scales ca. 0.3-0.4 mm long; *anthers* versatile, curved, to 2.8-2.9 mm long. *Ovary* oblong ca. 5 mm long, 2.5 mm wide; *style* straight to 6.5-7 mm long; *stigma* trifid, divisions ca. 2.4 mm long. *Capsule* globose-tricoccous about 16-18 mm in diam.; *seeds* flattened almost discoid, black, about 4.5 mm broad.

It grows in the north of Patagonia, extending its range through the provinces of Buenos Aires, Mendoza, San Luis, Córdoba and Catamarca. It prefers sandy places.

HABRANTHUS HERB.

Herbert, Curtis' Bot. Mag. 51: tab. 2464. 1824.

1a. Flowers white or a pale pink, ca. 48-60 mm long. Spathe 1-3(-4)-flowered .....1. *jamesoni*

1b. Flowers a sulphur yellow, tinged with purple-brown, ca. 30-35 mm long. Spathe always 1-flowered .....2. *tubispathus*

Habranthus jamesoni (Bak.) Ravenna, Corr. Fl. Patag. 2: 155. 1969.—*Hippeastrum jamesoni* Baker, Trimen Journ. Bot. 16: 83. 1878.—*Zephyranthes melanopotamica* Spegazzini, An. Mus. Nac. Buenos Aires 7: 169. 1902.—*Amaryllis jamesoni* (Bak.) T. & U., Herbertia 5: 121. 1938.—*Rhodophiala jamesoni* (Bak.) Traub, Pl. Life 9: 60. 1963.—*Habranthus melanopotanicus* (Bak.) Fabris. Cabr. Fl. Prov. Bs. As. 1: 527. 1969.

Plants about 17-40 cm tall. *Bulb* ovoid-oblong or sometimes subglobose, ca. 4-6 cm long, 3-4 cm in width, covered with brownish black coats; pseudo-neck about 8-18 cm long. *Leaves* short or absent at anthesis, linear, channelled, about 20 cm long, 3.5-4.5 mm broad, a dark green, sometimes slightly pruinose. *Spathe* 1-3(-4)-flowered; valves membranous, whitish or a pale pink, bifid, tubular for 6-10 mm toward the base, its divisions ca. 39-43 mm long. *Flowers* white or pink, often only at the throat, slightly ochraceous toward the base, spreading obliquely or horizontal, infundibulate, to 48-60 mm long, 33-60 mm in diameter.

Pedicels ca. 16-43 mm long. *Tepals* oblanceolate, connated for 3-3.5 mm; the outer to 42-50 mm long, 15 mm broad, apiculate, inner to 44-55 mm long, 13-14 mm broad; basal scales membranous, lacerated, ca. 0.8-0.9 mm long. *Filaments* declinate; lateral episepal to 21.5-22 mm long, the upper to 14.5-16 mm long, lateral epipetal about 23 mm, lower epipetal to 25 mm long; *anthers* lunulate ca. 9 mm long. *Ovary* oblong about 5.5 mm long, 2.7 mm broad. *Style* curved, ascending, ca. 34 mm long. Divisions of the *stigma* recurved ca. 4 mm long.

A native of the provinces of San Juan, Mendoza, San Luis, La Pampa, Río Negro, Chubut, and the southernmost part of Buenos Aires. It prefers sandy soils.

Habranthus tubispathus (L'Her.) Traub, *Pl. Life* 7: 42. 1951.; *Amaryllis tubispatha* L'Heritier, Sert. Angl. 9. 1788.; *Habranthus andersoni* Herbert, Edwards' *Bot. Reg.* 16: tab. 1345. 1830.; *Amaryllis andersoni* (Herb.) Grisebach, *Goett. Abhandl.* 24: 320. 1879.; *Zephyranthes andersoni* (Herb.) Baker, Handb. Amaryll.: 37. 1888.

Plant about 8-14 cm high. *Bulb* ovoid ca. 23-27 mm long, 11-14 mm wide, often produced into a pseudo-neck. *Leaves* absent at anthesis, linear, a pale green, somewhat pruinose, about 7-18 cm long, 2-3 mm broad. *Scape* slender, to 4-11 cm long, 2 mm broad, an ochraceous green, especially downwards. *Spathe* ca. 18-25 mm long, tubular, one-flowered, an ochraceous green or brownish; tubular part ca. 11.5-16 mm, bifid for 7 mm or sometimes fenestrate. *Flower* ca. 23-24 mm long, 15 mm in diameter, bell-shaped to infundibulate, a sulphur-yellow, coppery or purplish in the outside and the throat. *Pedicel* to 22 mm. *Tepals* broadly oblanceolate, somewhat connate at the base, with incurved margins; the outer to 23-24 mm long, 6.5-7 mm broad, apiculate, inner almost equal but lacking the apiculum; basal scales minute, lacerated. *Filaments* closely fasciculated, lateral episepal to 10-15 mm long, upper episepal ca. 11 mm long, lateral epipetal to 13 mm long, lower epipetal to 12 mm; *anthers* lunulate ca. 2 mm long. *Ovary* obovoid, obtusely trigonous, or sometimes almost cylindrical, ca. 3-9 mm long, 2-2.3 mm broad. *Style* curved, ascending, to 13.5-14 mm long; *stigma* shortly trifid, its divisions ca. 0.8-1.1 mm long, whitish or sometimes purple. *Capsule* globose-tricoccous, ca. 9 mm in diam. *Seeds* oblong, almost cuneate or sometimes semielliptic, black, with papyraceous edges.

A species with a wider distribution beyond the Patagonian region; it is somewhat rare here.

RHODOPHIALA PRESL

Presl, Bot. Bemerk.: 115. 1844.

1a. Stigma capitate or capitate-trilobed. Spathe always one-flowered:
  2a. Longer stamens ca. 12 mm. Flower upright .....1. *andicola*
  2b. Longer stamens ca. 16-26 mm long. Flowers cernous. 2. *rhodolirion*
1b. Stigma trifid. Spathe 2-6-flowered:
  3a. Flowers a lemon yellow. Anthers ca. 3.5-5 mm long. Bulb to 3.8-6 cm long .....3. *mendocina*

3b. Flowers reddish to yellow. Anthers ca. 2-3 mm long. Bulb to 2.7-2.8 cm long ..... 4. *araucana*

Rhodophiala andicola (Poepp.) Traub, Pl. Life 9: 60. 1953.; *Amaryllis andicola* Poeppig, Fragm. Syn. Pl. Phan.: 5. 1833.; *Habranthus andicola* (Poepp.) Herbert, Amaryll.: 168. 1837.; *Hippeastrum andicolum* (Poepp.) Baker, Handb. Amaryll.: 36. 1888.; *H. purpuratum* Philippi, *Anal. Univ. Chile* 93: 156. 1896.; *Amaryllis purpurata* (Phil.) Traub & Uphof, *Herbertia* 5: 131, 1938.; *Rhodophiala purpurata* (Phil.) Traub. *Pl. Life* 9: 60. 1953.

Plant to 17-25 cm tall. *Bulb* ovoid about 3.5 cm long, 2-2.8 cm wide, with dark brown coats; pseudo-neck ca. 8 cm long. *Leaves* ca. 15-30 cm long, 2.5-5 mm broad, channelled, a dark green, often pruinose, obtuse. *Scape* 12-20 cm long. *Spathe* one-flowered, with or without a linear bract inside, free to the base. *Flower* ca. 35-42 mm long, 26-38 mm in diameter, sometimes almost sessile (pedicel 1-4 mm long), upright, purple passing to whitish downwards, the throat a purplish-black. *Tepals* connate for 5-9 at the base, oblanceolate, the outer about 20-37 mm long, 6.8-8 mm broad, inner to 35 mm long, 9 mm broad. *Stamens* only slightly declined, very short (the longer ca. 10-11 mm); *anthers* lunulate; basal scales absent. *Ovary* oblong about 5 mm long, 3 mm broad. *Style* ca. 28 mm long; *stigma* capitate-trilobed. *Capsule* globose-tricoccous ca. 26 mm in diam. *Seeds* semicircular or oval-deltoid, black, papyraceous ca. 8.5-11.5 mm long, 6.5-9 mm broad.

An inhabitant of the Andean-Patagonian region; is also found in Chile. It grows in sandy soil, often in the top of mountains.

Rhodophiala rhodolirion (Bak.) Traub. *Pl. Life* 9: 60. 1953.; *Hippeastrum rhodolirion* Baker, Trimen *Journ. Bot.* 16: 83. 1878.; *Rhodolirion montanum* Philippi, *Linnaea* 29: 65. 1857-58.; *Rh. andinum* Phil. *loc. cit.*

Plant to 14-20 cm tall. *Bulb* about 4-5.7 cm long, 3.2-4.3 cm wide, covered with dark brown coats; pesudo-neck ca. 7.5-12.5 cm long. *Leaves* absent or incipient at anthesis, ca. 2.2-3.2 mm broad. *Scape* 3 mm broad. *Spathe* one flowered; valves almost equal, to 3.3 mm long; inner bract linear ca. 2.4 cm long. *Flower* cernuous, a bright carmine-pink, with blackish streaks and points, and a yellowish green throat, about 3.5-4.5 cm long, 3-4 cm in diam. *Pedicels* to 0.9-9 mm long, occasionally longer. *Tepals* connate for 6-12.5 mm, recurved; the outer ca. 3-4.6 mm long, 6.5-9.5 mm broad, the inner somewhat narrower. *Filaments* declinate-ascending, lateral episepal ca. 13-22.5 mm long, upper episepal to 14-23.5 mm, lateral episepal pair ca. 15-25 mm long, lower epipetal 16-26 mm long; *anthers* reniform or semilunate, ca. 3.5-4 mm long. *Style* to 36-52 mm long; *stigma* capitate, obscurely trilobed, ca. 1 mm in diam.

Habranthus punctatus in the sense of Philippi (Gartenflora 33: tab. 1163, f.3, 1884), is a decolored form of this species. *Rhodophiala maculata* (L'Her.) Rav. and *Rh. uniflora* (Phil.) Traub, are probably earlier names. The latter was found by Philippi near the coast, in the province of Atacama. This should be not surprising; in fact, the species

here described was recently gathered in the mountains of Coquimbo (Chile), much northwards from the places hitherto known for the plant.

Rhodophiala mendocina (Phil.) Ravenna, Pl. Life 26: 87. 1970.; *Habranthus bagnoldianus* Herb. var. *gilliesianus* Herbert, Amaryll.: 163, tab. 23, f. 1. 1837.; *Hippeastrum elwesii* C. H. Wright, Kew Bull. 1914: 330.; *Rhodophiala elwesii* (C. H. Wr.) Traub, Pl. Life 12: 60. 1953.

Plants ca. 28 cm tall. *Bulb* often large, globose or ovoid-globose, to 6-7 cm long, 6 cm in diam.; pseudo-neck ca. 14-15 cm long. *Leaves* slightly channelled, pruinose, obtuse, about 20 cm long, 6-9 mm broad. *Spathe* 2-6-flowered: valves membranous, ca. 3-6.5 cm long; inner bracts several. Flowers erect yellows. *Perigone* funnel-shaped, to 42-43 mm long. *Tepals* oblanceolate, connated at the base; the outer acute ca. 39 mm long, 8.4 mm broad, the inner obtuse, slightly shorter, ca. 37 mm long, 6 mm broad. *Stamens* slightly declined, much shorter than the perigone; *anthers* versatile semilunate. *Ovary* oblong to 5-5.5 mm long, 3.1 mm broad. *Style* declined, longer than the stamens, ca. 30 mm long; *stigma* trifid.

From the province of Mendoza, through La Pampa, southwards to Patagonia.

Recent studies revealed that *Rh. elwesii* is a synonym of this species. *Habranthus bagnoldianus* Herb. var. *gilliesianum* Herb. is also the same, as a photograph from the type had demonstrated. The latter is said that was found by Gillies at Melocotón, supposedly in Chile (see G. H. Card Index 5: 257). In fact, there is a village with this name in the province of Santiago, not far from the capital of that country. Nevertheless, the species was never collected again in Chile, and my attempts of finding it in Melocotón, and neighbouring areas, failed. For this reason, it was thought that this record could be a mistake, and that Gillies might had collected the specimens in Mendoza, rather than in Chile.

Prof. Ruíz Leal, from the University of Mendoza, says that there are two places in his province, which bear the name of Melocotón: a village and a hill. The former had apparently been named lately. The latter, properly named "Cerro del Melocotón", bears such a name from early times. It belongs to the department of San Rafael, and was on Gillies route. According to the facts exposed, the Cerro del Melocotón, in Mendoza, should be regarded as the original place where *Habranthus bagnoldianus* var. *gilliesianus* was found. Therefore, *Rhodophiala mendocina* is exclusively from Argentina. I am indebted to Prof. Ruiz Leal for the information which helped to clear up this point.

Rhodophiala araucana (Phil.) Traub, *Pl. Life* 12: 60. 1953.; *Hippeastrum araucanum* Philippi, *An. Un. Chile* 93: 152. 1896.; *Amaryllis araucana* (Phil.) Traub & Uphof, *Herbertia* 5: 130. 1938.

Plant to 22 cm tall. *Bulb* ovoid ca. 2. 5-3 cm long, 1.6-1.7 cm broad. *Leaves* present at anthesis, to 9-16 cm long, 3-5.5 mm broad, flattened, often falcate. *Scape* cylindrical, ca. 17 cm long, 2-3 mm broad. *Spathe* two-flowered, with 1-2 filiform inner bracts. *Flowers* erect or slightly

cernuous, reddish to yellow. *Perigone* ca 3.2-3.3 cm long, funnel-shaped. *Tepals* oblanceolate, connate at the base, the outer ca. 3 cm long, 6.5 mm broad, apiculate, the inner ca. 2.7 cm long, 6 mm broad, acute. *Stamens* declined, shorter than the perigone. *Anthers* versatile, semilunate, to 3 mm long. *Ovary* oblong, ca. 4.5 mm long, 2.4-2.5 mm broad. *Style* to 2.5 mm long; *stigma* trified.

Known only from the region of Copahue, in Neuquen, and the pass of Cupullhue (the border), not far from the former village.

PELARGONIUM LEAF AND ROOT CUTTINGS

HAMILTON P. TRAUB, *2678 Prestwick Court, La Jolla, Calif. 92037*

In landscaping the grounds of a new home, many plants of the dwarf, closely-branching Nutmeg Geranium, *Pelargonium* x *fragrans* Willd., were required as edging plants. One many-branched plant was available for propagation material. It was easy to remove the very short branches which rooted readily, but this did not produce a sufficient number of plants in a reasonable time. Experimentation revealed that firm, *immature* leaves snapped off close to the stem, when placed lower end shallowly in peat moss kept moist, first rooted profusely and then put out sprouts. In this manner the required large number of plants was obtained in a reasonable time. This brief note is published for those who may be confronted with a problem similar to the one which faced the writer.

Experimentation also established that *Pelargonium* x *fragrans* roots readily from root cuttings. The many-branched plant, referred to above, was removed by cutting the roots in a circle near the plant stem, leaving the roots in the ground. After about six weeks sprouts appeared from the cut ending of the roots. In this way 35 sprouting plants were harvested. Apparently more may sprout from the same cut root endings.

Helen Van Fleet Wilson, in "The Joys of Geraniums" (1965), M. Barrows & Co., New York, does not mention leaf and root cuttings in connection with Pelargoniums.

It is known that the Rose Geranium, *Pelargonium graveolens* L'Herit., spreads extensively by sprouting from the roots, and thus may become invasive. The extent of this phenomenon among the other *Pelargonium* species is not known at present to the writer.

PLANT LIFE LIBRARY—continued from page 5.

HERBALS: THEIR ORIGIN AND EVOLUTION, 1470—1670, by Agnes Arber. Facsimile of the 1938 edition, with preface to the reprint edition by Muriel A. Arber. Hafner Publ. Co., 866 3rd Av., New York, N. Y. 10022. 1970. Pp. 326. Illus. Characterized by the author as a chapter in the history of botany, this profusely illustrated classic, which has been out of print for some time, is now again available. The text is written in a concise and lucid style by the late Agnes Arber. The chapters are concerned with the early history of botany, the earliest printed herbals, the early herbals of England, the botanical renaissance of the 16th and 17th centuries, the evolution of the art of plant description, plant classification, the art of botanical illustrations, the doctrine of signatures and astrological botany, and conclusions. Appendices I, II and III and an index complete the volume. This charming book by an outstanding authority in this field is required reading for all interested in plant life. Most highly recommended.

FLORA NEOTROPICA, Monograph No. 2. BRUNNELIACEAE, by Jose Cuatrecasas, (Phamphlet issued Aug. 21, 1970), and MONOGRAPH NO. 3, OMPHLEALINAE (CLITOCYBEAE—TRICHOLOMATACEAE BASIDIOMYCETES), by Rolf Singer; MONOGRAPH NO. 4, PHAEOCOLLYBIA (CORTINARIACEAE BASIDIOMYCETES), by Rolf Singer, and MONOGRAPH NO. 5, STROBILOMYCETACEAE (BASIDIOMYCETES) by Rolf Singer (Nos. 3, 4 and 5 in Pamphlet issued Oct. 1, 1970). All published for the Organization for Flora Neotropica, by Hafner Publ. Co., 866 3rd Av., New York, N. Y. 10022. A periodical designed to present in monographic form taxonomic accounts of all plants growing within the Western Hemisphere tropics. Geographic, ecologic, cytologic, ananomic, morphologic, chemical and economic data are presented as well as bibliography, citations of species names and indices, for each group treated. Highly recommended to all interested in the flora of the New World tropics.

THE BIOLOGY OF THE HIGHER CRYPTOGAMS, by William T. Doyle. Macmillan Co., 866 Third Av., New York, N. Y. 10022. 1970. Pp. 163. Illus. Paper covers. This important new book is designed to give the student an indepth view of the principal aspects of mosses, liverworts, ferns, horsetails and club mosses. The chapter headings provide an inventory of the subjects covered—an introduction to higher cryptogams, life cycle, adaptations to life on land, diversity, and special topics. This concise, informative text is very highly recommended.

THE METHOD OF SCIENCE, by R. Harre. Springer-Verlag, 175 5th Av., New York, N. Y. 10010. 1970. Pp. 120. Illus. $3.50 (paper covers). This is one in the Wykeham Series which aims to broaden the outlook of the advanced high school student, and introduce the undergraduate to the present state of science as a university study. The subject matter is elaborated under the following chapter headings—science before Copernicus; the magical tradition and atomism; early history of magnetism; William Gilbert; origins of the knowledge of plants; early modern ideas on the life of plants; the life of Stephen Hales; the sap; the air; and vegetable life. Very highly recommended.

HOW TO GROW ORCHIDS, by the Sunset Editors. Lane Books, Menlo Park, Calif. 94025. 1970. Pp. 64. Illus. Paper covers, $1.95. This concise, popular treatise on the culture of orchids is presented with a wealth of illustrations. The chapters are concerned with the great diversity and appeal of the orchids; the requirements for healthy growth; indoor culture; culture in the garden; propagation; utilization of the flowers; specialties, and an index. Very highly recommended to all gardeners.

NEW KINGDOMS, SUBKINGDOMS AND PHYLA OF ORGANISMS

HAMILTON P. TRAUB

It is now widely recognized that the procaryotic and eucaryotic cellular organization represents a profound structural and developmental discontinuity in biology (Chatton (1937); Doughtery (1957); Stanier, Doudoroff and Adelberg, 1963, 1970; Stanier, 1970). Thus it is no longer tenable to include the bacteria and blue green procaryotes (ex blue green algae) under one of the so-called kingdoms along with other organisms which are eucaryotes. On a cellular basis there are two kingdoms—the procaryotes or *Procaryotae* and eucaryotes or *Eucaryotae* (Traub, 1964). In line with the recognition of these facts, a new arrangement of living organisms has been proposed (Traub, 1964). For the sake of completeness, it appears to be useful to typify these lineagic groups (taxa).

It has been customary *not to typify* the names of taxa above the rank of family. This was logical as long as the basic features on which to base these ranks were obscure. Now that the subject has been clarified by the concept of *procaryotic* and *eucaryotic* organisms, there is no longer any doubt since the cellular organization goes to the root of the problem and offers a sound basis for the primary grouping of organisms, and there appears to be no longer any probability that this outlook will be modified, except in details, in the future. The typification of the taxa above the rank of family in this report is based on the following rules:

Nomenclatural types above the rank of family. The nomenclatural type (or more accurately, the name bearer or nomenifer) of a phylum (division) or any taxon between phylum (division) and family is a family, that of a kingdom or any taxon between kingdom and phylum (division) is a phylum (division). In order to avoid unnecessary name changes, and for other obvious reasons, the name of the group typified above the rank of order, need not necessarily be based on the name of the type (nomenifer) chosen.

The typification of the names of the primary taxons will serve the useful purpose of eliminating such differences in spelling as *Prokaryotae* for *Procaryotae* and *Eukaryotae* for *Eucaryotae*.

Kingdom 1. **Procaryotae** Traub, **reg. nov.** Res vivae cellulis procaryoticis. (Cf. Plant Life 19: 160. 1963 & Lineagics, p. 141. 1964, anglise.) Typus: Phylum **Cyanobacae** Traub. Organisms with the procaryotic cellular organization. **Lysine synthesis is through the intermediate α, E-diaminopimetic acid (DAP) path.** (Vogel et al. 1970)

Subkingdom 1. **Autobacae** Traub, **subreg. nov.** Res vivae procaryoticae autotrophicaeque et neoheterotrophicae affines. cf. Traub, Lineagics, pp. 132, 141. 1964, anglise. Typus: Phylum **Cyanobacae** Traub. Autotrophic procaryotic organisms and related neoheterotrophs.

Infrakingdom 1. **Chemoautobacae** Traub, **infrareg. nov.** Procaryotic organisms; obligate and facultative chemoautotrophs; and related neoheterotrophs. cf. Traub, Lineagics, 1964, pp. 132, 141-142. Typus:

Phylum **Autonitrobacae** Traub.

Phylum 1. **Autonitrobacae** Traub, **phylum nov.** Res vivae obligato-chemo-autotrophicae compositiones nitrogenias inorganicas per energiae origines et CO_2 per carbonis solam originem usurpentae. cf. Traub, Lineagics, 1964, p. 141. Typus: Family **Nitrobacteraceae.** Obligate chemoautotrophs that utilize inorganic nitrogen compounds as energy sources, and CO_2 as the sole source of carbon.

Phylum 2. **Autohalobacae** Traub, **phylum nov.** Res. vivae obligato-, vel facultato-chemo-autotrophicae per energiae origines in fixatione carbonis aut sulphurem elementale aut compositiones sulphuricas inorganicas vel compositiones ferreas usurpentae. Typus: Family **Thiobacillaceae.** cf. Traub, Lineagics, 1964, pp. 141-142. Obligate or facultative chemoautotrophs utilizing elemental sulfur, or inorganic sulfur compounds, or ferrous iron compounds, as sources of energy in fixing carbon.

Phylum 3. **Hydrogenobacae** Traub, **phylum nov.** Res vivae facultato-chemo-autotrophicae energiam de H_2-oxidatone in fixatione carbonis usurpentae. Typus: Family **Hydrogenomonaceae,** cf. Traub, Lineagics, 1964, p. 142. Facultative chemoautotrophs utilizing energy from the oxidation of H_2 in fixing carbon.

Phylum 4. **Methanobacae** Traub, **phylum nov.** Res vivae obligato-chemo-autotrophicae per carbonis energiaeque originem CH_2 usurpentae. Typus: Family **Methanomonaceae,** cf. Traub, Lineagics, 1964, p. 142. Obligate chemoautotrophs utilizing methane (CH_4) as the source of carbon and energy.

Infrakingdom 2. **Photoautobacae** Traub, **infrareg. nov.** Procaryotic organisms; obligate or facultative photoautotrophs, and the related neoheterotrophs. cf Traub, Lineagics, 1964, pp. 132-133; 142. Typus: Phylum **Cyanobacae** Traub.

Phylum 5. **Chlorobacae** Traub, **phylum nov.** Res vivae anaerobo-photo-autotrophicae chlorobio-chlorophylla contientes et CO_2 per carbonis originem et H_2S per redacto-potentiam originem usurpentes. Typus: Family **Chlorobiaceae.** cf. Traub, Lineagics, 1964, p. 142. Anaerobic photoautotrophs, containing chlorobium chlorophylls, using CO_2 as the carbon source, and H_2S as the source of reducing power.

Phylum 6. **Chromobacae** Traub, **phylum nov.** Res vivae anaerobo-photo-autotrophicae bacterio-chlorophyllum continentes. Typus: Family **Chromatiaceae.** cf. Traub, Lineagics, 1964, p. 142. Anaerobic photoautotrophs containing bacteriochlorophyll.

Phylum 7. **Cyanobacae** Traub, **phylum nov.** Res vivae procaryotices obligato-, vel facultato-photo-autotrophicae α-chlorophyllum continentes, endomembrana non circumsistentae. Typus: Family **Nostocaceae** (Naegeli) Rabenhorst. Procaryotes; obligate or facultative photoautotrophs containing α-chlorophyll, not surrounded by an endomembrane. cf. Traub, Lineagics, 1964, p. 142.

Subkingdom 2. **Heterobacae** Traub, **subg. nov.** Res vivae procaryoticae heterotrophicaeque. Typus: Phylum **Eubacae** Traub, cf. Traub, Lineagics, 1964, p. 142. Heterotrophic procaryotes.

Phylum 8. **Myxobacae** Traub, **phylum nov.** Res vivae procaryotices heterotrophicae unicellulares bacilliformes non-flagelliter prolapses moventes. Typus: Family **Myxobacteriaceae,** cf. Traub, Lineagics, 1964, p. 142. Heterotrophic procaryotes; unicellular, cells rod-shaped, with gliding nonflagellar movement.

Phylum 9. **Spirochetobacae** Traub, **phylum nov.** Res vivae procaryotices unicellulares spirilliformes. Typus: Family **Spirochaetaceae,** cf. Traub, Lineagics, 1964, p. 142. Heterotrophic procaryotes; unicellular; cells spiral-shaped.

Phylum 10. **Eubacae** Traub, **phylum nov.** Res vivae procaryotices plerumque unicellulares interdum filamentosae vel myceliales, cellulis sphaericis vel bacilliformibus vel heliciformibus. Typus: Family **Bacillaceae,** cf. Traub, Lineagics, 1964, p. 142. Heterotrophic procaryotes; mostly unicellular, sometimes filamentous or mycelial; cells spherical, rod-, or helical-shaped.

Kingdom 2. **Eucaryotae** Traub, **reg. nov.** (cf. Plant Life 19: 160. 1963, and Lineagics, 1964, pp. 145—147, anglise.) Res vivae cellulis eucaryoticis. Typus: Phylum **Chlorophyta.** Organisms with the eucaryotic cellular organization.

Subkingdom 1. **Plantae.** Obligate or facultative photoautotrophs containing α-chlorophyll as the main photosynthetic pigment; and related neoheterotrophs. cf. Traub, Lineagics, 1964, pp. 143—144. Typus: Phylum **Chlorophyta.**

Infrakingdom 1. **Anembryophytae** Traub, **infrareg. nov.** Unicellular and multicellular non-embryobearing eucaryotic organisms. **cf. Traub,** Lineagics, 1964, p. 143. Typus: **Chlorophyta.**

Province 1. **Euglenophytiae** Traub. Euglenoids. **Lysine path through the intermediate α-aminopimelic acid (AAA) path.** (Vogel et al., 1970.) Phylum 11. **Euglenophyta.**

Province 2. **Chromophytiae** Traub. Non-grass-green algae. Phyla 12 through 15: **Rhodophyta, Paeophyta, Chrysophyta** and **Pryyophyta. Lysine paths not determined.**

Province 3. **Chlorophytiae** Traub. Grass-green algae. **DAP lysine path.** Phylum 16. Chlorophyta.

Infrakingdom 2. **Embryophytae** Traub. Embryo-bearing plants. **DAP lysine path.** Typus: Phylum **Tracheophyta.**

Phylum 17. **Bryophyta.** Non-vascular embryophytes.

Phylum 18. **Tracheophyta.** Vascular embryophytes.

Subkingdom 2. **Heteroplantae** Traub, **subreg. nov.** Res vivae eucaryoticae inter plantas et animales characteribus mediae. Typus: Phylum **Eumycota** Engler, in Syllab. ed. 3. 25. 1903. Eucaryotic organisms (mesoheterotrophs) intermediate between **Plantae** and **Animalia.** cf. Traub, Lineagics, 1964, pp. 144—145. Fungi (mesoheterotrophs): unicellular, plasmodial and multicellular plant-like parasites and saprobes.

Infrakingdom 1. **Gymnomycotae** Traub, **infrareg. nov.** Naked fungi or slime moulds. Organisms without cell walls; somatic phase consisting of simple uninucleate amoebae, or of a multinucleate plasmodium. Typus: **Myxomycota** Haeckel, 1866. cf. Traub, Lineagics, 1964, pp. 144—145. **Lysine paths not determined.**

Phylum 19. **Communomycota** Traub **phylum nov.** Res vivae eucaryotices heterotrophicae communales; aggregationes amoebarum distinctarum pseudoplasmodium communale ante sporarum formationem facientes; reproductione asexuali per devorationem amoebae unicae per amoebam aliam et postea per nucleorum. Typus: Family **Sappiniaceae.** Communal eucaryotic heterotrophs; aggregations of distinct amoebae into a communal pseudoplasmodium preceding spore formation; asexual reproduction is by "engulfment of one amoeba by another" and subsequent fusion of the nuclei. cf. Traub,

Phylum 20. **Reticulomycota** Traub, **phylum nov.** Res vivae heterotrophicae eycaryotices parasiticae vel saprobiticae, structura somatica simplici, cellulis ovalibus vel raro fusiformibus, filamenta mucosa conjungentes et reticulum tenuissimum facientes in qua cellulae prolapses secernentibus; reproductione sexuali non demonstratus. Typus: Family **Labyrinthulaceae.** Heterotrophic eycaryotes; parasites and saprobes; somatic structure simple, oval, or rarely spindle-shaped cells, secreting mucous filaments which unite to form a fine net-work on which the cells glide; sexual reproduction has not been demonstrated. cf. Traub, Lineagics, 1964, p. 144.

Phylum 21. **Myxomycota** Haeckel (1866). Plasmodial slime moulds. Typus: Family **Liceaceae** Rost. cf. Traub, Lineagics, 1964, pp. 144—145.

Infrakingdom 2. **Eumycotae** Traub, **infrareg. nov.** True Fungi. Organisms provided with cell walls, with few exceptions; usually filamentous, rarely unicellular; reproducing sexually and asexually. cf. Traub, Lineagics, 1964, p. 145. Typus: Phylum **Eumycota** Engler.

Phylum 22a. **Oomycota** Traub, **phylum nov.** ("Phycomycetes" Group 1a) Water moulds, white rusts and downy mildews (cf. Class 3, subphylum 1. **Sporangimycotina** in part, Traub, Lineagics, 1964, p. 145.) Cell walls of cellulose; sporangium-bearing fungi; **DAP lysine path.** cf. Vogel et al., 1970. Typus: Family **Saprolegniaceae** Kuenzig, Phy. Gen. 157. 1843.

Phylum 22b. **Hypochytrimycota,** Traub, **phylum nov.** ("Phycomycetes" Group 1b) Sporangium bearing fungi; cell walls do not show a cellulose reaction. **DAP lysine path** (cf. Vogel et al., 1970). Typus: Family **Hypochytriaceae** Fisher (1892).

Phylum 22c. **Eumycota** Engler, in Syllab. ed. 3. 25. 1903. Cell walls with fungus chitin predominating. **AAA lysine path** (cf. Vogel et al., 1970).

Subphylum 1. **Sporangimycota.** ("Phycomycetes" Group 2) Sporangium-bearing fungi, including classes **Chytridiomycetes, Plasmodiophoromycetes, Zygomycetes** and **Trichomycetes.**

Subphylum 2. **Conidimycota.** Conidia-bearing fungi, including classes **Ascomycetes** and **Basidiomycetes.**

Subkingdom 3. **Animalia.** Eucaryotic organisms (archiheterotrophs), usually ingesting materials from which elaborated food is absorbed. For tentative subdivisions, including Phyla 23 through 46, see Traub, Lineagics, 1964. pp. 145—147. **Capacity for lysine synthesis lost.**

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NEO-BESSEYAN OR SYNTHETIC EVOLUTIONARY LINORDINATION OF FLOWERING PLANTS [1]

HAMILTON P. TRAUB

In the past attempts have been made by a single worker, or limited group of workers, to achieve a satisfactory grouping in the most difficult field of flowering plants. But it has been clear for many years that such a grouping has to rest on the combined work of a great many researchers in phytomorphology, paleophytology, caryology, embryology, phytochemistry, etc. Such information has been accumulating since the time of Alexander Braun (1875), Bessey (1897, 1915) and Hallier (1912). These researches are far from completed in all of the required phases, but the time will surely come, perhaps within our life time, when such a synthesis based on a consensus will be possible. It is in this context that students of angiosperm evolution, dispersal and linordination will be grateful to Mr. Jeffery, the translator, and the publishers, of this fine English edition of Dr. Takhtajan's 1961 Russian text on "Flowering Plants: Origin and Dispersal", which has been revised and brought up-to-date.

Before considering Dr. Takhtajan's book, it is worthwhile to note that linordination of organisms is now in its third historical period (Traub, 1964; 1970). Within a decade after the appearance of Linnaeus' *Species Plantarum* (1753), the outlook of the first or static typological period was challenged. Linnaeus was a prisoner of the scholastic past and his static opus led into a dead-end street or cul-de-sac from which there was no return.

The beginning of the end of the static typological period was sounded with Adanson's *Histoire naturelle du Senegal* (1757), and more definitively with his *Familles des Plantes* (1763-64), when he effectively ushered in empiricism in lineagics and with it the second or Adansonian period. Adanson's multivariate method which emphasized taking into consideration all of the features of organisms in the process of linordination, was a great advance over typology, but it was without the insight of the principles of *homology, parallelism* and *convergence.*

The deficiencies inherent in the Adansonian multivariate method were gradually overcome in the third, or contemporary evolutionary period under the umbrella of Darwin's theory of bioevolution, which was first enunciated in its elemental form in 1859. This supplied a minimum basis for a workable theory. Since that date, particularly since 1937, a more comprehensive *synthetic theory* has been gradually worked out by the combined effort of many workers in genetics and population theory, resulting in a nearly complete consensus and this is the heart of contemporary lineagics. It is fortunate that this is so, and that typological thinking is now nearly absent in linordination. But workers have to be forever on guard. The recent revival of the Adansonian multivariate method under the new name, *numerical taxonomy,* at first confused the issue since some of the early advocates made wild claims indicating a reversion to the unmodified Adansonian multivariate method. They had not read the lessons of the history of the first and second periods (Traub, 1964). Fortunately the wild claims soon died down under constructive criticism, and at present the method is considered as a mathematical procedure (a branch of biometry or phylometry) which is an aid and not the sole solution of the problem of grouping lineages (Traub, 1964, Cole, 1969). Thus, it is fortunate that at least in methodology there is a near consensus with reference to procedure in lineagics.

Following the first grouping of plant genera into families together with adequate descriptions of these phylons by Adanson (1763-64), many workers

[1] Flowering Plants: Origin and Dispersal, by Armen Takhtajan, translated from the Russian by C. Jeffrey. Smithsonian Institution Press, Washington, D. C. 20560. 1969. Pp. 310. Illus. $6.95.

have had a hand in delimiting plant families, and a considerable consensus has been achieved at this level. Much progress has also been made toward grouping families into orders, but here the consensus is less in evidence. The still further synthesis toward grouping orders into superorders has only begun, and a consensus concerning these phylons is not yet in sight.

One of the most pressing problems still to be solved concerns the origin of the flowering plants. The extreme radiation of the angiosperms is relatively recent, and thus the very great diversity of living linons complicates matters. The other and older subgroups of the Phylum Tracheophyta have been decimated and more, and the living linons are fewer. Perhaps, such new tools as the determination of amino acid and nucleotide sequences (Fitch & Margoliash, 1970) for representatives of the living linons of the subgroups of the Phylum Tracheophyta could illuminate the subject. Nucleotide sequences are rather difficult and very expensive to perform, but the determination of amino acid sequences may be practicable if these should show sufficient divergences in the representative linons of the Phylum Tracheophyta.

Basing his conclusions on the accumulated fund of knowledge about higher plants, the author attempts a synthesis toward an understanding of the evolution of the flowering plants, but admits that "much is uncertain and much is in dispute." Due to space limitations, he rules out a critical review about the "many different hypotheses of the origin of flowering plants", and he has to content himself with "stating, and as far as possible substantiating, ideas and concepts that seem to . . . (him) to be correct or at least plausible."

After a brief introduction, the author asks the question whether the flowering plants are polyphyletic? His answer is that they are monophyletic in the sense that they arose from a single linon or a phylon of lower rank, which "is demonstrated above all by their multiple of common morphological characters."

The next question is directed to the ancestors of the angiosperms, and it is concluded that they arose from some very ancient phylon of gymnosperms with "primitive secondary xylem and scalariform tracheids at least in the early wood, and primitive strobili."

The unsolved problem of the absence of fossil remains of the earliest flowering plants is considered. It is postulated by a number of workers that this absence is due to the evolution of these plants in mountain habitats where the possibilities for the preservation of fossils is unfavorable. In such habitats smaller isolated populations are usually found and in these there is a tendency for speedy evolutionary radiation. This may be further accelerated by the change from the "primitive haphazard pollen transfer to pollination exclusively by a particular insect (or other pollinator)."

With the background of the probable "evolutionary pathways of angiosperms", the author extrapolates a hypothetical reconstruction of the first flowering plants based on a study of the present day "primitive" angiosperms, mainly in the Order Magnoliales. Here there appears to be greater diversity of opinion, particularly with reference to the origin of such organs as the stamens. Meeuse (1966), and his followers, consider such an approach as too simplistic, and bordering on typology, and using the same data come to directly opposite conclusions. Thus a consensus is not yet in sight.

With reference to the apetalous dicotyledons, which were misinterpreted by the Englerians lineagicists, it is concluded, in harmony with most other recent workers (Braun, 1875; Bessey, 1897, 1915; Hallier, 1912, and others), that the so-called "Amentiferae" are "a very heterogeneous and artificial assemblage in which taxa of different origins have been included." Here a near consensus has been reached.

Theophrastus (ca. 322 B. C.) noted the difference between the seedlings of the dicotyledonous legumes and the monocotyledonous grains. This theme was further elaborated by Albertus Magnus (ca. 1256) and Ray (1682, 1703), and there appears to be a virtual consensus about the nature of these groups today. The author agrees with the hypothesis that the monocots arose from

the dicots. The concluding chapters are devoted to the fossil remains of the angiosperms; the tropical origin of the flowering plants; the origin of the temperate flora, and the Cretaceous and Tertiary floras.

Appendix I is in the nature of a brief summary of the author's linordination of the flowering plants. For further details the author directs the reader to his text, *"A System and Phylogeny of the Flowering Plants"* (Russian), Leningrad. 1967. Appendix II is devoted to the floristic regions of the world. A bibliography and index complete the volume.

Appendix I, grouping of the flowering plants, deserves further attention. Under each of the two classes—dicots and monocots—the author recognizes subclasses, superorders, orders and families. Under dicots there are 7 subclasses, 15 superorders, and 74 orders. Under monocots there are 4 subclasses, 5 superorders and 20 orders. Such a grouping of subclasses and superorders can be only preliminary since a consensus has not as yet been achieved at these levels.

Figure 31 may be misleading. The branching appears all too simplistic. It is hardly possible that all other angiosperms branch from the Magnoliales as recognized today. If the time factor were recognized, the branching could be shown as originating from primitive ancestors which might have differed markedly from the present day Magnoliales. Such a gap could then be filled in later if, and when, fossil remains of early angiosperms should be discovered. This also points up the danger of changing names of the classes dicots and monocots to ones with generic basis—Magnoliatae and Liliatae. At that high level generic bases are better left out in favor of age-old names.

The author is to be congratulated on a concise and clearly written text which the reviewer enjoyed reading. American workers will be grateful to Dr. Takhtajan for clearly indicating his outlook on the grouping of the flowering plants. It is only by the exchange of such detailed viewpoints of various workers that a consensus will eventually be reached about the linordination of the flowering plants.

In closing, may the hope be expressed that Dr. Takhtajan's *"A System and Phylogeny of the Flowering Plants"* (Russian), Leningrad, 1967, will also soon be published in an English Edition.

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ESSAYS IN EVOLUTION AND GENETICS IN HONOR OF THEODOSIUS DOBZHANSKY, edited by Max K. Hecht and William C. Steere. Appleton-Century-Crofts, New York. 1970. 594 pp., illus. $16.00. This book comprises a collection of sixteen essays on evolution and genetics by friends, colleagues and students of Professor Theodosius Dobzhansky, honoring him on the occasion of his 70th birthday. The list of contributors is formidable. Among the best known are: Ayala, Carson, Florkin, Ford, Gustafsson, Rensch, Simpson, Stebbins, Wallace, and White. There is a Foreword by a longtime colleague, Professor L. C. Dunn, and author and subject indexes.

For more than half a century Professor Dobzhansky has contributed brilliantly, steadily and significantly to biological progress, particularly to a synthesis of evolutionary concepts through the clever and ingenious use of genetics and cytology. Dobzhansky is no ivory tower scientist. His teaching credentials are of the best, and through his writings he has lucidly explained man's status in the biological world to his fellow scientists and the well-read layman, if not to the man in the street.

The first chapter by Levene, Ehrman, and Richmond is biographical, and devotes space to an entertaining account of a collecting trip by Dobzhansky and his students to Latin America, specifically the Amazon Basin of Colombia. It is comforting to learn that Prof. Dobzhansky puts on his trousers one leg at a time, in the manner of ordinary biologists, even though some of his more avid followers would have us believe otherwise. There is also a summary of Prof. Dobzhansky's scientific work, a career summary and a bibliography (1918-1969) of approximately 480 titles including at least six books, truly a prodigious output for one man.

The collection of essays under review is of high quality, and some are outstanding. Unhappily for those interested in plants, only two of the 16 essays are concerned with plant material. One of them, however, ("Variation and Evolution in Plants: Progress during the past twenty years" by Prof. G. Ledyard Stebbins) is probably worth the price of the book. The remainder of my remarks will be concerned with Professor Stebbins' contribution since the interests of readers of Plant Life are likely to be oriented in this direction as are my own.

In its field Prof. Stebbins' book, "Variation and Evolution in Plants," published in 1950 has proved to be one of the most stimulating, widely cited and quoted books of the present century. Stebbins' essay is essentially an updating of his book, and a self-assessment of his skill as a prognosticator in predicting the course of progress in the study of variation and evolution of plants over the past 20 years. Stebbins is fully competent in this do-it-yourself role. His grasp of current and past literature of evolution, genetics (classical and molecular), cytology and systematics is shared by few scholars, and he excels in articulation.

Not unexpectedly, Prof. Stebbins comes out with high marks when the results of his foresight are totaled. I can find only one instance where he has been forced to retract a statement made in 1950. In a discussion of "Rates of Mutation" Stebbins severely underestimated the vast reserve of hidden, genetic variability in populations of self-pollinated species of plants. Lack of appreciation of the significant amount of variation in self-pollinated species of plants was a pardonable mistake in 1950, considering the amount of information available. The recent studies of Allard, however, have shown that self-pollinated species have an enormous amount of latent variability, although this variability may not lead to the differentiation of higher categories in the plant kingdom as Prof. Stebbins has pointed out.

Of the approximately 14 main topics discussed by Stebbins there is only one with which I would mildly disagree. He takes a rather dim view of the usefulness of numerical taxonomy in tracing the pattern of relationships in higher organisms as opposed to traditional taxonomic methods. At

least for insects and cultivated plants the techniques associated with numerical taxonomy have been used with some success. In **Cucurbita,** mango, avocado and perhaps others, Rhodes and Carmer have uncovered relationships not likely to have been brought to light by alternate means. Numerical taxonomy has the added bonus that researchers are apt to study their material more critically and more thoroughly in an attempt to uncover quantitative, meaningful relationships. On the other hand, the undisciplined use of the methods of numerical taxonomy can lead to the association of species that have no biological affinity, and the separation of others which are clearly, closely related (see B. L. Burt, I. C. Hedge and P.F. Stevens. Notes R. B. G. Edinb. 30: 141-158).

It does not take a crystal ball to predict that Prof. Stebbins recent contribution will stimulate discussion and inspire investigators, much as did his book of two decades ago. As a result, we can anticipate a steady increase in our store of knowledge, and our understanding of evolution and variation in plants.—**Thomas W. Whitaker**

PLANT AGRICULTURE. Readings from Scientific American, selected and introduced by Jules Janick, Robert W. Schery, Frank W. Woods and Vernon W. Ruttan. W. H. Freeman and Company, San Francisco. 1970. 246 pp. Clothbound $10.00, paperbound $4.95. Plant Agriculture presents a selection of 25 articles from past issues of the Scientific American. They are primarily concerned with plants in relation to agriculture in its broadest sense. Each article is by a competent authority and they are well written and profusely illustrated. The articles are organized into 5 categories as follows: (1) Agricultural Beginnings; (2) Plant Growth and Development; (3) Plant Environment; (4) Production Technology; (5) Food Needs and Potentials. Each category is preceded by an Introduction that serves to set the stage for the material that follows. The book is terminated by a section called "Biographical Notes and Bibliographies." Here are found biographical notes on the authors and bibliographies that will assist the motivated student to explore a given subject more fully. There is an adequate Index.

The authors do not suggest the specific niche this anthology is presumed to fill. It should be useful, however, as a supplement for beginning undergraduate courses in botany at the college level, for courses in Economic Botany, and for background reading for all agriculturally oriented courses. For the amateur plantsman and educated layman it could be a stimulating experience just to browse through the book.—**Thomas W. Whitaker**

PRINCIPLES AND METHODS OF PLANT BIOSYSTEMATICS, by Otto T. Solbrig. Macmillan Co., 866 Third Av., New York, N. Y. 10022. 1970. Pp. 226. Illus. This concise text with a new outlook on plant lineagics is long overdue. In the past, most texts on this subject were concerned mostly with the practical problems of linordination, the grouping of plants without benefit of fundamental principles, to the near exclusion of the heart of the problem which consists of basic lineagics, the background necessary for linordination, or grouping of plants. Dr. Solbrig is to be congratulated on being among the first to clearly and unmistakably make these distinctions in plant lineagics. The text is concise and to the point. In part one, the processes of linoniation (speciation) and the forces that control these are discussed. In part two, some techniques for the study of linons (species) are considered. It is refreshingly encouraging to obtain a text which one can wholly approve. The only wish one might have is that such a text could be expanded to include even a wider range of details. Dr. Solbrig's text cannot be too highly praised, and it is recommended to all lineagicists, and all interested in plants.—**Hamilton P. Traub**

THE MICROBIAL WORLD, 3rd Edition, by R. Y. Stanier, M. Doudoroff & E. A. Adelberg. Prentice-Hall, Inc., Englewood Cliffs, N. J. 07632. 1970. Pp. 873. Illus. $15.95. All biologists will be grateful for this 3rd Edition of this classic text by Stanier, Doudoroff and Adelberg. The recent marked changes in the outlook on biology are reflected in the reappraisal of the subject matter so that practically all of the content has been reorganized and rewritten thus making it really a new book. The features of the book include the presentation of a condensed summary of bacterial metabolism covering biosynthesis; the subject of the generation, transfer and regulation of energy; setting the material dealing with microbial diseases into the broader context of symbiotic relationships that involve micro-organisms; consideration of microbial growth, and a discussion of bacterial physiology; a new treatment of bacterial metabolism which involves the important area of molecular biology; five new chapters dealing with the constituent groups of bacteria and their properties; a new chapter on methods in microbiology; and the annotated bibliography of books and reviews at the end of each chapter. The illustrations are outstanding. The authors are to be congratulated on such an excellent text. This authoritative, profusely illustrated and stimulating text cannot be too highly praised, and should be in the possession of all interested in biology for ready reference.

CONTROL MECHANISMS IN PLANT DEVELOPMENT, by Arthur W. Galston and Peter J. Davies. Prentice-Hall, Inc., Englewood Cliffs, N. J. 07632. 1970. Pp. 184. Illus. Cloth bound, $6.95; paper bound, $3.95. This up-to-date new book presents a critical assessment of the complex control mechanisms in plant development. It is addressed to advanced students in botany or plant physiology, students of animal development who are interested in morphogenesis in all organisms, and molecular biologists. The subject matter presented under sections includes—phytochrome and flowering; ethylene; auxin and tropisms; gibberellins; cytokinins; abscissic acid, dormancy and germination; reactions to injury; and senescence and abscission. The illustrations are first rate. This stimulating new text is very highly recommended.

ORGANIZATION AND CONTROL IN PROKARYOTIC AND EUCARYOTIC CELLS, edited by H. P. Charles and B. C. J. G. Knight. Cambridge University Press, 32 E. 57th St., New York, N. Y. 10022. 1970. Pp. 457. Illus. $16.00. This stimulating volume contains the research papers by outstanding authorities presented at the 20th Symposium of the Society for General Microbiology held at Imperial College London in 1970. The specific objective of this symposium is to attempt an answer to the question of the significance of the differences between pro- and eu-karyotic cells so as to place this problem in connection with these organisms in perspective and chart the future course. Seventeen research papers beginning with the stimulating introductory article by R. Y. Stanier, and including the article by H. J. Vogel, J. S. Thompson and G. D. Shockman, on the DAP and AAA lycine synthesis paths, are only examples of the important researches which are reported by these and other authorities in this volume. The reader will want to obtain this volume at the first opportunity so that he may read for himself. This stimulating volume cannot be too highly praised, and is very highly recommended.

SUPPLEMENT TO R. H. S. DICTIONARY OF GARDENING, 2nd Edition, edited by P. M. Synge et al. Oxford University Press, 200 Madison Av., New York, N. Y. 10016. 1969. Pp. 556. Illus. $15.50. The 1st edition of the R. H. S. Dictionary of Gardening appeared in 1951, and the 2nd edition in 1956 in 4 volumes. Also in 1956, a Supplement was published in two parts. The first containing lists of recommended varieties of the principal kinds of cultivated plants; and the second, including such new revisions of genera, new species improved technical methods of disease and pest control, and corrections shown to be desirable, since the publication of the main volumes.

The 2nd Edition of the Supplement (1969) has now appeared to supersede the previous 1956 Supplement, and incorporates all material still

valid in it. The number of pages has increased from 334 to 556 pages. Part I, includes lists of selected cultivars (varieties) of flowers, fruits and vegetables contributed by a large number of experts. Part II, additions and corrections to the four main volumes, pp. 154—556, contains one notable feature in that the **Gramineae** have been revised by the late D. C. E. Hubbard.

Users of the four main volumes of the Dictionary will find this new Supplement necessary as a working reference to bring the work up-to-date. This important new volume is very highly recommended to gardeners the World over.

THE PLANT KINGDOM, 3rd Edition, by Harold C. Bold. Prentice-Hall, Inc., Englewood Cliffs, N. J. 07632. 1970. Pp. 190. Illus. Cloth bound, $6.95; paper bound $3.50.

This third edition of a standard text is notable for the expansion of information about illustrative genera; the greater attention accorded to relationships between plants and human affairs; the greater emphasis on certain biological concepts; the inclusion of results of recent research, and an increase and improvement of the illustrations. The subject matter is developed under sections on unity and diversity of plants; algae; bacteria; slime molds and fungi; non-vascular plants; organization of vascular plants; gymnosperms; and angiosperms. This attractive and informative text is very highly recommended.

PLANT CELL PHYSIOLOGY, by Park S. Nobel. W. H. Freeman & Co., 660 Market St., San Francisco, Calif. 94104. 1970. Pp. 267. Illus. $7.75. This concise, and attractive text was written for advanced undergraduate and beginning graduate students. It represents the first physiochemical treatment of the cellular and sub-cellular aspects of important topics in plant physiology. The sections of the book are concerned with cells, water relations in cells, cell solutes, light, photosynthesis, bioenergetics. Four appendices, answers to problems, and an index complete the volume. This excellent text with a new outlook is highly recommended.

TREE PATHOLOGY: A SHORT INTRODUCTION, by William H. Smith. Academic Press, 111 5th Av., New York, N. Y. 10003. 1970. Pp. 309. Illus. $100.00. This attractive new book is concerned with all agents capable of causing pathological conditions in forest trees. The author describes the agents and mechanisms by which such damage is caused. The first part is concerned with abiotic stress agents such as moisture and temperature extremes, and such stress agents as wind, snow, ice, lightning, mineral deficiencies and excesses, air pollution, and various other stresses. The second part is devoted to biological stress agents, such as nematodes, viruses, bacteria, fungi, etc. Part three is concerned with climate and tree diseases, and the fourth part is devoted to disease control. This stimulating text with a new outlook, is highly recommended.

NUMERICAL TAXONOMY, edited by A. J. Cole. Academic Press, 111 5th Av., New York, N. Y. 10003. 1969. Pp. 324. $9.00. The present volume contains eighteen papers given at an international colloquium at St. Andrews University by outstanding authorities in this field. The papers are concerned with the theory and application of the methods of numerical taxonomy. That this subject has come of age is evidenced by the fact that the early controversy about this subject has subsided, and the wild claims for the method are gone; and that many studies in widely varying groups of organisms are now based on numerical methods. Most important however is the fact that mathematicians are beginning to consider the subject seriously so that considerable improvement and validation of methods may be expected in the future. Highly recommended to all taxonomists, biologists, botanists and zoologists.

POPULATIONS, SPECIES, AND EVOLUTION, by Ernst Mayr. Harvard University Press, 145 N. Harvard St., Boston, Mass. 02134. 1970. Pp. 453. Illus. $10.00. This concise abridgement of Dr. Mayr's larger standard text,

"Animal Species and Evolution" (1963) will be welcomed by the college student and the general reader. Again three dominant themes are emphasized—the species as the most important unit in evolution; the individuals and not genes as the target in natural selection, and the most important genetic phenomena in species as species-specific regulatory systems which give species internal cohesion. The text is adequately illustrated. A glossary, bibliography and an index complete the volume. Most highly recommended to all biologists.

THE BIOCHEMISTRY OF ALKALOIDS, by Trevor Robinson. Springer-Verlag. 175 5th Av., New York, N. Y. 10010. 1968. Pp. 149. Illus. $9.75. This concisely written text on alkaloids will be welcomed by all who are interested in these compounds. After a general introduction, and the consideration of general theories of alkaloid biosynthesis, the author summarizes the information on simple amino acid derivatives and protoalkaloids; the various alkaloids; the metabolism of alkaloids by bacteria and animals; and the biochemical pharmocology of alkaloids. Very highly recommended to all who are interested in alkaloids, including biosystematists.

LIFE AS REVEALED BY THE MICROSCOPE, by J. LeRoy Conel. Philosophical Library, 15 E. 40th St., New York, N. Y. 10016. 1969. Pp. 93 + 204 figures and 5 tables. $7.95.

Subtitled, "An Interpretation of Evolution", this profusely illustrated book by an eminent authority, is concerned with the evolution of living things, particularly animal life. Sections are devoted to biogenesis; phylogeny of the nervous system; microscopical structures of the cerebral cortex, and deductions—biology and religion. This stimulating book is highly recommended to those interested in biology. The illustrations alone are worth more than the price of the book.

A MANUAL OF PLANT NAMES, by C. Chicheley Plowden. Philosophical Library, 15 E. 40th St., New York, N. Y. 10016. 1969. Pp. 260. Illus. $10.00. This excellent manual on the subject of plant names has much to recommend it. The brief introduction to the history and rules for naming plants is followed by alphabetical dictionaries of generic names, specific epithets, common names, and botanical terms. The flower and inflorescence, the leaf, and the grouping of cryptogams and phanerogams or spermophyta—extended to some representative genera—are examined in some detail. An index to botanical and common family names completes the volume. Highly recommended to all gardeners.

THE PHYSIOLOGY OF FLOWERING PLANTS: THEIR GROWTH AND DEVELOPMENT, by H. E. Street and Helgi Oepik, American Elsivier Publ. Co., 52 Vanderbilt Av., New York, N. Y. 10017. 1970. Pp. 263. Illus. Paper covers, $5.95. This modern, up-to-date introduction to the flowering plants fills a definite need. After a brief introduction, the subject matter is adequately treated under germination, energy economy, water relations, mineral nutrition, transport of metabolites, resistence to desiccation and frost, growth—progress and pattern, cell growth and differentiation, growth movements, morphogenesis and development. Highly recommended to students of biology, and to those concerned with the teaching of biology.

THE BIOLOGY OF LICHENS, by Mason E. Hale, Jr. American Elsivier Publ. Co., 52 Vanderbilt Av., New York, N. Y. 10017. 1970. Those interested in biology have undoubtedly wanted a book that details in concise, easily readable English the biology of the lichens. The present book satisfies that need. The sections detail the morphology of the thallus and reproductive structures; reproduction and dispersal; physiology and nutrition; symbiosis and synthesis; growth and longevity; ecology and succession; chemistry; classification and taxonomy; economic uses and applications. This excellent book should be in the hands of all interested in biology. Highly recommended.

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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[AMERICAN AMARYLLIS SOCIETY, continued from page 2.]

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III. PUBLICATIONS OF THE AMERICAN PLANT LIFE SOCIETY

BOOKS

1. AMARYLLIDACEAE: TRIBE AMARYLLEAE, by Traub & Moldenke (including the genera Amaryllis, Lycoris, Worsleya, Lepidopharynx, Placea, Griffinia, and Ungernia; Manila covers; 194 pages, incl. 18 illustrations. $5.00 postpaid.

This is required reading for every amaryllid enthusiast.

2. DESCRIPTIVE CATALOG OF HEMEROCALLIS CLONES, 1893—1948, by Norton, Stuntz, and Ballard. A total of 2695 Hemerocallis clones are included and also an interesting foreword, and explanatory section about naming daylilies. Manila

covers; 100 pages (1—X; 1—90), includes a portrait of George Yeld. $5.00 postpaid.

3. THE GENERA OF AMARYLLIDACEAE, by Hamilton P. Traub. Includes a general introduction, a key to the subfamilies, infrafamilies, tribes, subtribes and genera of the Amaryllidaceae, and descriptions of all the genera. Every member of the Society should have this book for constant reference. Manila covers; publ. 1963; 85 pages. $5.00 postpaid.

4. LINEAGICS, by Hamilton P. Traub. This is the first outline text for the undergraduate student on the grouping of organisms into lineages. The text is divided into four parts: (a) the history of lineagics and lineagics as an integrated science; (b) basic lineagics, principles and procedures; (c) applied lineagics, principles and procedures; and (d) research methods in lineagics. Recommended for the student in biology. Publ. 1964. Manila covers, 163 pages, incl. 8 illus. $5.00 postpaid.

PERIODICALS

(A) HERBERTIA, or AMARYLLIS YEAR BOOK [First series, 1934 to 1948, incl.], devoted exclusively to the amaryllids (Amaryllidaceae), and the workers concerned in their advancement. A complete set of these volumes is indispensable to all who are interested in the amaryllids. Libraries should note that this may be the last opportunity for complete sets.

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Vols. 1—25, 1945-1969, $120.00 postpaid

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