PLANT LIFE

AMARYLLIS
YEAR BOOK

1972

Pamianthe cardenasii Traub, sp. nov.
An epiphyte collected at Km. 105, near Rio Kellu Mayu, Province of Chapare, Bolivia, in 1970

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.

NOTE FOR PLANT LIFE AND HERBERTIA CONTRIBUTORS

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

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

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

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

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

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

PLANT LIFE

VOLUME 28

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

1972

EDITED BY
HAMILTON P. TRAUB
HAROLD N. MOLDENKE

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

Printed in the United States of America

Address correspondence and send membership dues to:

Dr. Thomas W. Whitaker, Executive Secretary,

The American Plant Life Society,

Box 150, La Jolla, California 92037

TABLE OF CONTENTS

The cover design by Prof. Penrith B. Goff is based on photographs of **Pamianthe cardenasii** provided by Dr. Martin Cardenas. The species is named in honor of Dr. Cardenas, the dean of South American plant scientists.

PLANT LIFE, VOLUME 28, NO. 1, 1972—AMARYLLIS YEAR BOOK
GENERAL AMARYLLID EDITION

PLANT LIFE, VOLUME 28, NOS. 2—4, INCL., 1972
GENERAL EDITION

ILLUSTRATIONS

CORRIGENDA—PLANT LIFE Vol. 27, 1971

Page 97, under "Literature Cited", 4th line, change "88." to "~~44—~~46."

Page 133, under "*Nothoscordum* Kunth, Nom. Cons., etc." the 5th line. paragraph beginning with "*Nothoscordum bonariense,* etc." and ending with "Goett. Abhandl. 24: 319. 1879." it to be inserted between the first and second lines from the bottom, under "*Nothoscordum* bonariense (Pers.) Beauverd."

Page 134, under "*Tristagma* Poepp. etc., 3rd line, paragraph beginning with "*Tristagma ameghionii,* etc." and ending with "Agronom. La Plata 7: 575. 1897", is to be inserted between the 10 and 11th lines from the bottom under "*Tristagma ameghinoii* (Speg.) Spegazzini."

Page 140, under "Flora Neotropica", 11th line, change "ananomic" to "anatomic".

PLANT LIFE LIBRARY—continued from page 140.

PHOTOSYNTHESIS, PART A, edited by Anthony San Pietro. In Colowick & Kaplan, Methods in Enzymology, Vol. XXIII Photosynthesis. Academic Press, 111 5th Av., New York, N. Y. 10008. 1971. Pp. xix+743. Illus. $29.50. The present volume, and in a succeeding volume of Methods in Enzymology, the subject of photosynthesis is considered from the standpoint of a concerted enzymological attack on the mechanisms of photosynthesis. The present volume XXIII includes contributions from a large number of outstanding authorities on the isolation and culture techniques of algae, bacteria and diatoms; plant tissue culture; the preparation and properties of mutants; cellular and subcellular preparations from algae, bacteria and plants; and the purification and properties of components of the photosynthetic systems. Very highly recommended.

HOW TO ENJOY YOUR WEEDS, by Audrey Wynne Hatfield. Sterling Publ. Co., 419 Park Av. S., New York, N. Y. 10016. 1971. Pp. 192. Illus. $3.95. According to the author uprooted weeds are an important element in the improvement of soil fertility when composted, and are also suitable for other uses. A weed herbal includes chickweed, chicory, clovers, dandelion, daylily and many others. An identifying guide and index complete the volume.

PLANT LIFE LIBRARY—continued on page 4.

PLANT LIFE, VOL. 28, NO. 1, January, 1972

AMARYLLIS
YEAR BOOK
1972

Year Book of

The American Amaryllis Society

39th 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.

I. THE AMERICAN AMARYLLIS SOCIETY

A Committee of the American Plant Life Society

W. M. JAMES, *President* WYNDHAM HAYWARD, *Secretary*

DR. THOMAS W. WHITAKER, Executive Secretary

Box 150, La Jolla, Calif.

AUXILIARY SOCIETIES

Correspondence about auxiliary membership of regional and local societies in the Society should be addressed to: Dr. Thomas W. Whitaker, Executive Secretary, Box 150, La Jolla, Calif.

Auxiliary LOCAL AMARYLLIS SOCIETIES

Garden Circle of New Orleans, Mrs. W. J. Perrin, **Pres.,** 4753 Press Drive, New Orleans 26, La.

Amaryllis Society of Mobile, Mrs. Hunter P. Kilpatrick, **Secy.,** 279 Park Terrace, Mobile, Ala.

The Dallas Amaryllis Society, Mrs. E. P. Carpenter, **Pres.,** 6224 Tremont St., Dallas, Texas.

The Shasta Garden Club, Mrs. Oran H. Anglin, **Pres.,** 8434 Hidden Meadow Lane, San Antonio, Texas 78230.

The Houston Amaryllis Society, Mrs. A. C. Pickard, **Pres.,** 1702 N. Blvd., Houston 6, Texas.

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

Men's Amaryllis Club of New Orleans, Mr. Edw. F. Authement, **Corr. Sec. & Treas.,** 2214 Gallier St., New Orleans, La. 70117.

The Coastal Bend Amaryllis Society, Mr. Fred B. Jones, **Pres.,** 521 Vaky St., Corpus Christi, Texas.

The Greater Houston Amaryllis Club, Mrs. Sally Fox, **Corr. Secy.,** 1527 Castle Court, Houston, Texas 77006.

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

The Amaryllis Society of Baton Rouge, Louisiana, Mr. Fred Buchmann, **Show Chairman,** 1766 Avobdale Dr., Baton Rouge, La. 70808.

(a) WILLIAM HERBERT MEDALISTS

*Mr. Henry H. Nehrling, **Fla.**
*Theodore L. Mead, **Fla.**
*Mr. Arthington Worsley, **Eng.**
*Mr. Ernst H. Krelage, **Holland**
*Mr. Cecil Houdyshel, **Calif.**
*Maj. Albert Pam, **Eng.**
*Mr. Pierre S. duPont, **Del.**
Mr. Jan de Graaff, **Oregon**
*Mr. Fred H. Howard, **Calif.**
Mr. Sydney Percy-Lancaster, **India**
Dr. J. Hutchinson, **Eng.**
*Mr. Carl Purdy, **Calif.**
*Dr. A. B. Stout, **N. Y.**
*Mr. H. W. Pugsley, **Eng.**
Mr. W. M. James, **Calif.**
Prof. Dr. A. Fernandes, **Portugal**
Miss Elizabeth Lawrence, **N. C.**
Dr. Henry A. Jones, **Md.**
Mr. R. G. Huey, **Ky.**
*Mr. Guy L. Wilson, **Northern Ireland**
*Mr. R. W. Wheeler, **Fla.**
Dr. R. A. Dyer, **South Africa**
Capt. C. O. Fairbairn, **Australia**
*Mrs. Mary G. Henry, **Penna.**
Mr. Mulford B. Foster, **Fla.**
Dr. J. C. Th. Uphof, **Fla.**
*Mr. E. A. Bowles, **Eng.**
Mr. Thomas R. Manley, **Penna.**
Dr. Robt. F. Hoover, **Calif.**
*Mr. E. O. Orpet, **Calif.**
Mrs. Morris W. Clint, **Texas**
*Mr. Wyndham Hayward, **Fla.**
*Dr. Robt. F. Hoover, **Calif.**
*Prof. Ira S. Nelson, **La.**
Mr. Frederick B. Jones, **Texas**
Dr. Floyd F. Smith, **Maryland**
Mr. W. D. Morton, Jr., **La.**
Mr. S. Y. Caldwell, **Tenn.**
Mr. Robt. D. Goedert, **Fla.**
Mr. Leon Boshoff-Mostert, **S. Afr.**
Dr. Martin Cardenas Hermosa, **Bolivia**
Dr. Robert P. Kahn, **Md.**
Mr. W. Quinn Buck, **Calif.**
Dr. Thad M. Howard, **Texas**
Dr. C. G. Ruppel, **Argentina**
Mr. J. L. Doran, **Calif.**

*Deceased.

(b) CORRESPONDING FELLOWS

Australia—Mr. Wm. Morris, **Warners Bay, New South Wales**
India—Mr. Sydney Percy-Lancaster, **Lucknow**
South Africa—Mr. Leon Boshoff-Mostert, **Balfour**
Chile—Prof. Pedro F. Ravenna, **Santiago**

PREFACE

We are indebted to Prof. Penrith B. Goff of Wayne State University, Detroit, Michigan, for the fine cover design based on the new epithytic species *Pamianthe cardenasii* which was discovered in 1970 in Bolivia. This species is described in the present issue and is named in honor of Dr. Martin Cardenas, the Dean of South American plant scientists.

This 39th edition of AMARYLLIS YEAR BOOK is dedicated to Mr. John Leonard Doran, Chairman of the Amaryllis Committee, who received the 1972 WILLIAM HERBERT MEDAL in recognition of his outstanding contributions toward the advancement of the amaryllids. His exploration trips for *Amaryllis* species and other amaryllids in South America have added many new species to the plant collections in the United States and other lands.

Mr. Doran contributes an interesting autobiography; a short biography of his mother who accompanied him on some of his exploration trips, a report on his 1969-1970 explorations, an article on some cultural requirements of *Amaryllis* species, and details for obtaining good black-and-white reproductions from color slides.

Articles on Amaryllis in the present edition include a number of important contributions. Dr. Cardenas describes some new Bolivian *Amaryllis* species; Dr. Cage writes about Amaryllis breeding with special reference to inbreeding; Dr. Mertzweiller contributes an article on Amaryllis breeding; Dr. Bell gives directions for culturing immature Amaryllis embryos; and Mr. Beckham writes about amaryllis culture.

Dr. Schulze contributes a most interesting article on a new aquatic *Crinum* species from Thailand. *Crinum thaianum* Schulze is apparently a fine aquarium plant.

Dr. Sterling and Miss Huang present a most important contribution concerning the presence of laticifers in *Allium, Caloscordum, Nothoscordum, Tristagma* and *Tulbaghia.* The wide spread presence of laticifers in the *Allieae* to which these genera belong make it necessary to reconsider the status of the *Alliaceae,* and warrant that it be raised to ordinal level as indicated toward the end of the present volume.

Prof. Ravenna proposes a new genus, *Famatina,* and contributes an article on Latin American amaryllids. Dr. Cage writes about the chromosomes and growth habit of *Sprekanthus cagei;* Mr. Caldwell contributes a most important article on *Lycoris* and describes a possible new *Lycoris* species. Mrs. Wilson writes about the cultural requirements of Rain Lilies in Galveston, Texas. Mr. Hardman contributes an article on *Leucocoryne odorata* and his annual *Nerine* report.

Mr. Tisch writes about his experiences with amaryllids. Mr. Buck presents his annual Daylily report. Mr. Bauml summarizes the Dr. Howard 1971 Mexican explorations trips.

There are reports on the 1971 Amaryllis shows, and other important contributions as shown in the table of contents.

Contributors to the 1973 issue of the AMARYLLIS YEAR BOOK are requested to send in their articles by August 1, 1972, 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.* See PLANT LIFE 28: 110. 1972 (color slide prints).

December 15, 1971
2678 Prestwick Court,
La Jolla, California 92037

Hamilton P. Traub
Harold N. Moldenke

PLANT LIFE LIBRARY—continued from page vi.

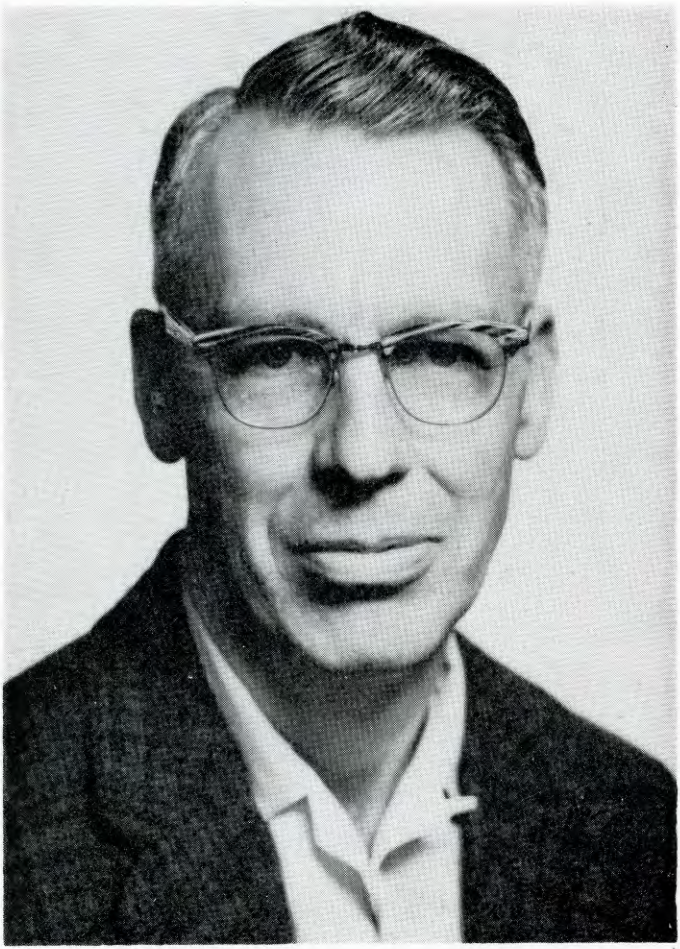
A FERN IS BORN, by J. M. Guilcher and R. H. Noailles. Sterling Publ. Co., 419 Park Av. S., New York, N. Y. 10016. 1971. Pp. 96. Illus. $3.50. This is No. 1. in the Sterling Nature Series. This little book is designed to introduce youngsters and their parents to the fascinating study of the life processes as revealed in the life history of the ferns. The text is profusely illustrated with excellent close-up illustrations which alone are worth more than the price of the book. Very highly recommended to parents and others who are looking for appropriate gifts for the youngsters.

THE HIDDEN LIFE OF FLOWERS, by J. M. Guilcher and R. H. Noailles. Sterling Publ. Co., 419 Park Av. S., New York, N. Y. 10016. 1971. Pp. 96. Illus. $3.50. This companion book to the preceding one, and again profusely illustrated with close-up photographic reproductions, showing how plants are born, is designed for youngsters and their parents. The ordinary corn poppy as well as other examples are explored, and the action of the wind and insects in pollination are detailed. Very highly recommended to parents and others who are looking for appropriate gifts for the youngsters.

A CLASSIFICATION OF THE EUCALYPTS, by L. D. Pryor and L. A. S. Johnson. The Australian National University, Canberra. 1971. International Scholarly Book Services, P. O. Box 4347, Portland, Oregon 97208. Pp. 1x+102. $3.95. "Abstract: A new classification is presented of all taxa of **Eucalyptus** (and **Angophora**) (Myrtaceae—Leptospermoideae), on the basis of studies from many disciplines and extensive field experience. This is not in the traditional revisionary form and formal nomenclatural innovations at the species and subspecies level will follow later. Infrageneric classification into subgenera, sections, series and subseries follow a rationalized plan explicitly divorced from the traditional system embodied in the International Code of Nomenclature. This is accompanied by an equivalent and flexible system using 1- to 6- letter coded designations for taxa of the various ranks, which embodies the whole classificatory structure. There is a comprehensive index to specific and infraspecific names. Discussion covers the kinds of evidence used, the inflorescence, the operculum, the ovule, and the seed, as well as genetic behavior, the range of variation-patterns found, and the case for recognition of segregate genera. Recognition of two (only) such genera (**Eucalyptus** s. str. and **Symphyomyrtus**) as proposed by some recent authors is considered oversimplified and contrary to the evidence. Although division into a number of genera may perhaps be desirable in the future, it seems best at present to consider all the eucalypts as constituting a single genus with eight subgenera. **Angophora** would logically be included as one of these but, to avoid possible future reversals, its generic status is not formally reduced at this stage."

PLANT LIFE LIBRARY—continued on page 32.

Dedicated to
John Leonard Doran



HERBERT MEDALIST—JOHN LEONARD DORAN

JOHN LEONARD DORAN

An Autobiography

My mother and father were interested in all the marvels of nature and during my childhood I was exposed to these interests. My mother grew many kinds of plants and had a special interest in *Amaryllis*. My interest in *Amaryllis* was aroused early in life but did not reach the "disease point" until about 1960.

My parents sold the Utah farm and moved to California a few days before I was born on December 8, 1914 in San Bernardino, California. My father Junius H. Doran was a civil engineer engaged in the construction of railroads, highways, pipe-lines, etc. My mother Corabelle Whiting Doran was a nurse before her marriage. I grew up in the San Bernardino area.

Although my interest in plants was never submerged for long, I did "stray away" at times. In the late 1920's I built and operated W6BNL, an amateur radio station. I worked on a game bird farm where we raised quail, chuckar, and pheasants. I worked as an analytical chemist for Griffin Laboratories about a year then went to Kincannon Mines as a chemist for a few months. The next job was William Barnhill Laboratories, whose business was soil problems of citrus groves in San Diego, Riverside, and San Bernardino counties. A year later I joined the McKinney Optical Co. who designed and manufactured a diverse line of precision instruments. Here my interests were diverted to applying instrumentation of all types to industrial uses. In 1939 I joined one of the airplane manufacturers in the research laboratory where I was associated in developing the first concepts of the fatigue of material that could be applied to design; a new method, still used, of measuring forces developed by high speed wind tunnel models; microminiature probes for automatic recording of effects of abnormal environments on animals and humans. After the age of missiles began, I became engaged in development of such things as ultra high speed cameras, underwater firing mechanisms for missles, squib whistles to induce talking amongst porpoises, high temperature lubricants, and many classified programs. Concurrently we were working on the effects of smog and toxic materials on animals and plants. Because of the need for large quantities of tissue with the same genetic properties in some of the cancer research programs, we developed nutrient solutions and mechanisms suitable for producing great quantities of tissue from a small piece of plant. I became interested in embryo culture of seeds and did development work with medias to complete the growth of incomplete embryos and with auxins and other growth substances to increase the rate of growth and give better development. An important phase of this process is the study of endosperm and

embryo contained growth inhibitors and their destruction or removal. In the development of medias, I introduced the Tyndallization process which minimizes the decomposition of organic materials with resulting toxic by-products. A tissue culture process was devised that enabled a small sprig of an outstanding Japanese *Chrysanthemum* given me in December 1956 to be grown to more than 2000 cuttings ready for 1957 spring planting. In 1963, I was able to visit some of the outstanding horticulture establishments in Europe. Carters had an "eye opening" exhibit in the Chelsea show. Michael Hoog of Van Tubergen conducted me through Holland and showed me the methods used by the Dutch to grow and propagate many plants. While in Germany I was guided by Dr. Werkmeister, the geneticist in West Germany's famous University of Geisenheim. I spent several days in the laboratory of K. Stormly Hansen at Hvidovre, Denmark under the tutelage of Dr. Aagard and Mrs. Christensen. The Hansens have led the world in their work of high heat culture and subsequent meristem culture of carnations and by this process nearly freeing the plant of virus diseases. In 1964 I made the first collection trip for amaryllids in the wild, these activities have been recorded in Plant Life (Doran, 1969, 1970, 1971).

I wish to thank all the people who have helped with collecting, with identification, and the American Plant Life Society for awarding me the William Herbert Medal for 1972.

BIBLIOGRAPHY

Doran, J. L. Notes by an Amateur Collector. Plant Life 25: 37-40. 1969.

——. Collecting South American Amaryllids, 1964-1968. Plant Life 26: 49-56. 1970.

——. Seeds of *Amaryllis reticulata* L'Hérit. Plant Life 27: 54. 1971.

EXPLORING FOR AMARYLLIDS IN SOUTH AMERICA, 1969—1970

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

Amaryllis parodii (Hunziker & Cocucci, 1969) had not been used in breeding experiments with the yellowish *A. evansiae* and *A. aglaiae* hybrids and in 1969, we decided to try to recollect it. *A. parodii* grows in the desert areas of Northern Argentina and into southern Bolivia. The apparent range is very narrow but about 900 miles long. Groups of the plants occur at scattered intervals in the general neighborhood of 2000 ft. altitude. My mother accompanied me on the two 1969-1970 exploration trips.

I. DECEMBER 1969—JANUARY 1970 EXPLORATIONS

We were to leave December 15, 1969 at one A.M. Monday morning but the air line called and wanted us to be in the airport early. We left home at 10 P.M. Sunday. Our flight was to stop at Mexico City, Bogatà, Lima and arrive about midnight, Monday night, in Buenos Aires. We landed at Acapulco where the temperature was 95° and waited three hours for the fog to lift in Mexico City. Because of the additional landing at Acapulco, they did not have fuel enough to go to Bogatà and had to make a "technical stop" for fuel at Panama City. I was unable to get an answer as to why the fuel was not obtained in Mexico City. We arrived in Buenos Aires eight hours late, and instead of getting some needed sleep in Buenos Aires, we had time only to exchange some mony and go from the international airport to the airport used for internal flights. We arrived at Cordoba in the late afternoon on Tuesday where the temperature was 105°F. and very windy. The hotels were full, but I got an air-conditioned room except the air-conditioner didn't work. A repair man came and changed the unit but the new one didn't cool and was very noisy but did stir the air a little. The restaurants in Argentina open at 9 P.M. After eating, I went to bed in a beastly hot room. By now, we had been over 60 hours without sleep. The next day, Wednesday, was spent talking to Dr. Hunziker and Dr. Cocucci and getting maps, information, and tickets. Our visit with Dr. Hunziker and Dr. Cocucci gave us a wealth of information on the location and taxonomy of many of the *Amaryllidaceae* of Argentina. Left Cordoba at 9 P.M. on a bus. It was raining hard, the temperature above 90°. About 50 miles from Cordoba, we got out of the rain, then it was hotter. Arrived in Ojo de Agua a little after 1 A.M. Everyone in the little town including even the smallest children were outside sitting still—was too hot to go to bed. Got a room in a motel—the only accommodation in town, and the only room. Stood around for about two hours because it was too hot to go to bed.

Thursday, got up about 6 A.M. and was going to take a shower but there was no water. Went looking for a car, some help and breakfast—all unobtainable. Finally, got an egg, a couple pieces of stale bread and a cup of something they served as coffee in a place I am hesitant to describe and was sure hesitant to eat in. Finally found a car, a shovel, and left town about 10 A.M. Dr. Hunziker had told me that *A. parodii* no longer existed in Serrania de San Miguel because the area was so over grazed. The goats had eaten all of them. We went south of Ojo de Agua and found *A. parodii* in full bloom. Km. 915 to 925. Found another group 10 Km. east of Ojo de Agua on the El Simbol, Baez, Sol de Julio road. Again between Km. 934 and 937.

Plants are usually not close together but rather scattered. Although some grow in a bush or near another plant, most grow in the open. They were not seen in areas of high brush but always in areas of low growth. Soil was granitic and very rocky. They were difficult to dig.

Getting the rock out often damaged the bulb. Biggest bulbs found were 3½ inches in diameter. Smallest bloom size bulb was 2½ inches in diameter. Soil was barely moist, dark grey, sandy, low in organic content. Top of the necks were from flush with the surface to one inch below surface. No insect damage was seen except in one area, a small curculio ate all the seeds in the pods. Root systems were huge. Leaves were fully developed before flowering.

Went back to town where I cleaned, washed and packed the bulbs, then caught a bus a 5 P.M. Arrived in Santiago del Estero about 10 P.M. My mother was exhausted so we "loafed" Friday morning. We were going to look the town over that afternoon, but about noon, it started to rain and the wind blew a gale. It blew people off their feet, blew a door out of the hotel, blew two light fixtures out of the bus station.

We caught a bus that evening for Tucuman. In five days, we had traveled from Los Angeles to Buenos Aires, then 750 miles north collecting pollen, seed and bulbs of *A. parodii* in three locations spread over an area 350 miles long.

The next three days were spent visiting friends, going over the herbarium at Instituto Lillo, and having discussions with Sr. Alejo Moris, Dr. Golback, Dr. Vervoorst and others. Dr. Vervoorst told me of a possible new species occuring in Cumbres de Taficillo. I spent the next day (Tuesday), getting a trip arranged to go after these plants. Horses were obtained. Wednesday morning, Sr. Lucio Chocobar, a *composino* familiar with the area, and I left Cuidad Universitario climbing quickly from 3000 feet elevation to over 5000 feet, crossing a shallow canyon up over another mountain and down into Quebrado de Cainfo where we found some *Amaryllis* under *Podocarpus,* but the ones we had been told about were supposed to be located in the *Podocarpus* forest growing on the east side of the 10,000 foot high peak ahead of us. We spent several hours searching the *Podocarpus* forest without finding a single plant. We returned to Quebrado de Cainfo. The plant was growing on the slopes near the bottom of the canyon in very wet, black clay soil under *Podocarpus* at an elevation near 6500 feet. Some were found within a few inches of pools of water fed by springs. Seed pods were numerous but no flowers were found. Blooming size bulbs were from 2.5 to 3 cm. in diameter, 3 cm. high with a 1.5 cm. neck. The root plates were 1 cm. thick by 1 cm. in diameter. Plants were usually 2 flowered but an occasional 3 flowered one was found. Leaves were 46 cm. long by 3 cm. wide. In viewing a couple hundred plants, most had 3 leaves, a few with 2 and one with four was found. Scapes were 9 x12 mm. at top of bulb and 50 to 65 cm. high above the ground. Bulbs had only a few roots (21 to 35), 2.5 to 3.5 mm. in diameter. Bulbs averaged 11 cm. from top of neck to surface of soil. The area had many ferns and mosses. There was considerable moss on the trees and *Tillandsia recurvata* was very common. Seeds of the *Amaryllis* species were gathered and distributed as D-117.

Arrived in Tucumán late Christmas Eve—most restaurants were closed. The ones that were open were reserved for p where they drank champagne and exchanged presents. On the stree skyrockets and firecrackers were fired. Christmas day was very quiet. The weather was hot, no decorations were seen on the streets did not seem like Christmas. We did hear an occasional C carol on the radio in the morning.

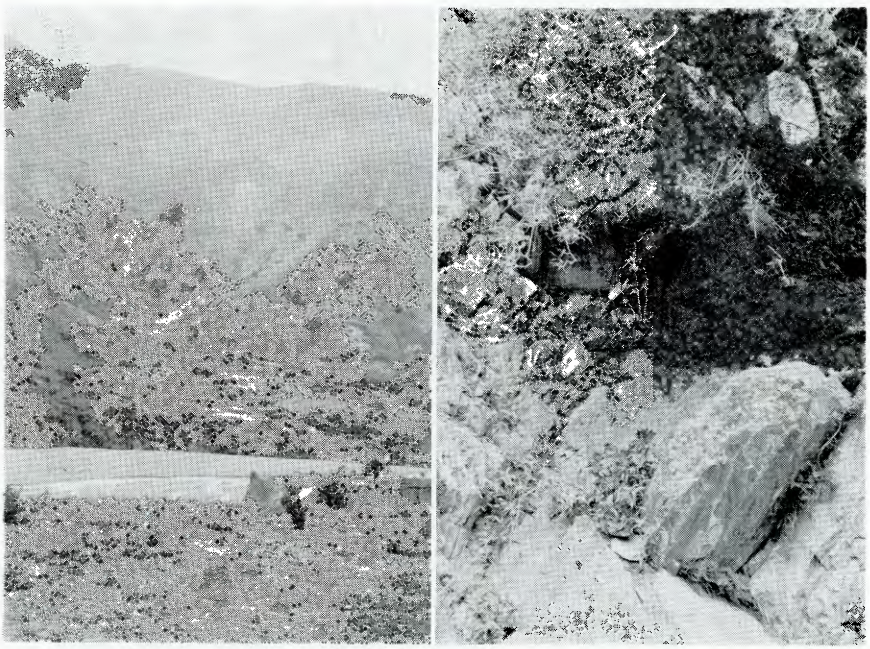


Fig 2. Argentina: **left,** wall of Quebrada de Toro can deep, altitude 6500—7000 ft; **Amaryllis argentina** is n of this canyon, above El Elisal, Prov. of Salta. **Right,** o canyon Quebrada de Toro, elev. 7000, collecting **Amaryll** barely visible in center. Photos by J. L. Doran.

We left Tucumán for Salta on Friday, Decembe 26 b the way, the engine quit and not far from where we were observed at Km. 1387 and altitude 3300 feet. south of General Guermes. (See Fig. 2.) On the w saw *A. argentina* (Pax) between Km. 14 and 18, (see Hunziker, 1967). We returned here the nex three types of flowers. One had a deep maroon tube ovary with plain petals and a yellow throat. An was maroon for 5 cm. from ovary with slightly ruffled petals green throat. The third type had a green tube, green throat and q ruffled petals. All flowers were essentially the same size and sha the tube was about 10 cm. long.

Harry Blossfeld told me he collected *A. argentina* (Pax) in Quebrada de Toro at El Alisal. Quebrada de Toro is a deep narrow canyon appearing to be 4000 to 5000 feet deep at El Alisal alt. 6500 ft. (*Amaryllis argentina* D-118, Quebrada de Toro). See Fig. 2. The canyon is so steep here that the railroad to Chile stops, they throw a switch at the back of the train and back up-hill, stop, throw a switch in front of the train and go forward up-hill, stop and repeat again, to gain altitude fast enough to continue up the canyon. I tried to find Blossfeld's guide, Sr. Pacifico Serapio. I was told he was a very old man and now lived in Salta but his niece lived by the railroad station. She told us that the plant grew on the north wall of the canyon but was at least two weeks too early for flowers. We went up the canyon several miles and couldn't find anything, turned around and came back, stopped to examine bromeliads on the cliff and there was the *Amaryllis* on the cliff. The leaves were only a few inches long. The bulbs were growing in cracks in the rock along with cactus and tillandsia. We tried digging a bulb, one of us held the other to the cliff while he dug. About every half hour, you could break away enough rock to extract a bulb. Each bulb was by itself in a crack about 1 to 1½ inches wide and filled with a silty soil full of organic material. (*Amaryllis argentina* D-119, 14 km. east of Salta.) Every place you tried to hold on to the cliff, there was a cactus growing. One place I could reach five genera of cactus: *Opuntia, Cleistocactus, Rebutia, Trichocereus* and *Parodia.* The *Rebutia* was in bloom.

The next day, Sunday, we left early to try to collect at Tumbaya. When we arrived at Jujuy, it was pouring rain. When we reached Yala, they told us the bridge was out at Rio Leon. Returning, we found at Km. 1443 (about 8 Km. north of General Guermes) a Zephyranthes (?) D-120, white; perigone 5 cm. long, a rosy blush on outside center section of petal 2½ cm. long, rosy keel 1/3 of the way from ovary; filaments, 1/3 length of petal; stigma trifid, style 2/3 length of petal; scape single flowered; pedicel 3 cm. at anthesis, elongating to 3.5 to 5.5 cm. in seed. Undeveloped leaves 1 cm. wide. Bulbs were 2½ cm. in diameter by 3.5 cm. high with a 2 cm. neck. This area has many *Synandrospadix vermitoxicus (Araceae),* the common name in Argentina is Puki. The nice green leaves grow from a 5 inch diameter rhizome with all the roots coming out of top of rhizome to be near the surface in order to better utilize the scant rainfall in the area. These were in bloom with 8 inch deep purple flowers.

I had been sick for several days but by the time we got back to Salta, I just couldn't go any further. I went to the Hospital San Bernardo where the doctor thought I was getting pneumonia. Massive doses of antibiotics for two days got me to where I could go on. Checking with the airline office, I was told the weekly flight to Bolivia was canceled for the next two weeks and only way to get to Bolivia was to go to the border, walk across and find some mode of transportation for continuing in Bolivia. We left Salta at 6 A.M. on December

Fig. 3. Upper left, town of Sorata, in right foreground, elev. 9,000 ft. Location of **Amaryllis mandonii** is in canyon to left, about ¾-inch down from top center. **Upper, right, Amaryllis cybister** in bloom at Paracaya, Bolivia in front of cacti and between bromeliads. **Lower left, Amaryllis paradii** in native habitat south of Ojo de Agua. **Lower right,** two forms of **Amaryllis escobaruriae**. Photos by J. L. Doran.

31 and after a miserably hot, dusty ride, arrived in Pocitos about 3 P.M. The bus was met by a number of boys pushing wheelbarrows each of which had a license plate. We secured the services of a wheelbarrow for our luggage and went about a half kilometer to Argentine customs and immigration where we went through the usual formalities, loaded our luggage on the wheelbarrow, went through a gate in the barb wire fence, crossed a dry river bottom and we were in Bolivia. We obtained a car to take us to Yacuiba 3 or 4 kilometers away. This town had no paved streets, no sewer system, no piped water, no restaurants, no hotels and very few cars. A commercial airline came in once a week—I had a 6 day wait. There was a Bolivian army transport due that afternoon that would go to La Paz the next day but they did not know if space was available. I waited two hours until the plane came and was able to get tickets to Cochabamba, a 800 kilometer trip, for 145,000 bolivianos ($12) each. We left Yacuiba without even a cup of coffee at 7 A.M. New Year's Day, 1970. The plane was a paratrooper's DC-3 with metal benches along the sides to sit on. We made six stops between Yacuiba and Cochabamba. At each stop, some freight was left and more was added, some people got off and new ones got on. Each batch of passengers were air-sick and vomited on the floor. The plane was piled to the ceiling with freight and only enough room to stick your foot in a hole amongst the freight when you sat down. We arrived in Cochabamba at 6 P.M.

I went to see Dr. Martín Cárdenas and found he was very ill. My mother became ill and nothing seemed to help. I decided it was best to return home—eight days later we arrived home.

II. SEPTEMBER—OCTOBER 1970 EXPLORATIONS

My intention had been to collect a quantity of *A. aglaiae* for distribution in the United States but had been unable to do this. A notion persisted that the Matto Grosso should be considered for the possible existence of new species. Correspondence with Hugh Bush of Kansas City, Missouri. indicated a possibility he might go to South America. Ultimately, the trip became a reality. Bush was to meet me at Cuibá on October 2. My mother and I left Los Angeles on September 25 and arrived in Cochabamba on the 26th. Took the weekly plane for Corumbá on the 29th. Travel through the Paconé and San Luiz de Caceres area revealed only *A. belladonna* in huge quantity, all in bloom, some in patches of a quarter acre. On another trip to Diamontino and west of Alta Paraguey, found only *A. belladonna*. From conversations with Peace Corps people and local botanists it would seem that only *A. belladonna* occurs in this area.

Bush and I had intended to get a canoe and go down the Itenez River to Principe de Beira, then up the Itonamas River to Magdalena or up the Machupo River to San Joaquin but the river was very low, they thought it would take three weeks. Bush did not come on the scheduled day. I waited two days and decided to go to Cochabamba

on the only flight per week to Santa Cruz. When I got on the plane, the stewardess gave me a newspaper. The headlines were that President Ovanda says he has control. When I arriveed in Santa Cruz, several hundred camposinos were parading in the streets and everyone was afraid. The radio announced that Ovanda had resigned to prevent bloodshed. I got a ticket and reservation for Cochabamba for the next morning. In a couple of hours, the airline called and said the flight was canceled. I spent the next day collecting 50 kilometers south of town. When I returned, the radio said Miranda had been president for a few hours but the air force bombed the presidential palace and he had left. The following day, Torres took over. The airline said they would fly soon and to check with them every hour or two. Two days later I reached Cochamamba where my mother was staying. The U.S. Information Service representative had been taken as a hostage and the building burned. Sixty were killed and 300 wounded at Oruro.

I had a chance to get a flight out of the country to São Paulo. We went to Buenos Aires, then to Tucumán. Collected the *A. aglaiae* I wanted. I wanted to go into the Rio Cachuna area but the weekly airplane to Bolivia would be in Salta the next day. I decided I did not want to wait another week. We caught a bus for Salta which arrived at 4 P.M. I went immediately to the airline office. They had only one seat available but would call me at 7 o'clock and tell us if they had a cancellation. When I got to the hotel, they gave me a two day old telegram from Hugh Bush saying he would be on the plane from Santa Cruz. A coincidence like this is just a miracle. I thought he had not come to South America. With a few million square miles to be in, he accidentally ran into me. When he arrived, we checked the airline office, they did not have a seat for him but advised checking at 5 a.m. We went to the airline office at 5 a.m. He got a seat, we went to Cochabamba. Although the political situation was still unstable, Dr. Cárdenas thought we might get permission now to enter the Yungas de La Paz. We finally were granted permission to go into Sud Yungas for only three days but not Nor Yungas. Dr. Cárdenas took us on a conducted tour where we obtained some bulbs in five locations. Only one was in bloom, a new species *A. lapasensis*, found at Km. 70 on the Unduavi—Chulumani Road. *A. lapasensis* is similar to *A. pardina* in stature and conformation of flower but the bower is green with a near solid red interior. It grows on very steep rocky slopes in low vegetation.

Upon returning to La Paz, we made arrangements to leave at 6 a.m. the next morning for Sorata, but because of difficulty on obtaining gasoline, did not leave La Paz till 7:30. We stopped in a village for breakfast, a cup of coffee and two *panadita tierno* (biscuits). We arrived in Sorata about 10. Sorata has an altitude of 9000 feet. Progress up the side of the mountain was difficult because of bad footing and very steep terrain. In three hours, we were at 10,300

altitude and had found only a few *Urceolina*. Meneces wanted to swing to the South towards the river but I decided to go into a small canyon to the north. The slopes of the canyon proved to be covered with a small plant similar to *Puya*. I came out of the little canyon above 10,500 ft. heading west on the north wall of the main canyon. To skirt some vertical places, I crossed some patches of corn where the

Fig. 4. Mrs. Corabelle Whiting Doran

slope was so steep that by shuffling your feet, you slide down hill at a good pace. I went about a quarter mile along the bottom of these cliffs and found *A. mandonii* with bulbs almost "upside down" growing on the near vertical cliff. The bulb held itself and some soil to the

rock by its roots. Apparently, they slide off but being held by the roots, they remain on the cliff but are nearly "upside down". *A. mandonii* has a long neck which curves upwardly holding the leaves in a near normal position. The largest bulbs were about two inches in diameter. Collecting these proved to be hazardous and slow but by holding on to bushes and testing each move I could get one here and there. I seldom found a place where I could put any weight with a foot. It was necessary to support one's self almost completely with ones hands. I arrived at the road of Sorata about 3:30. Meneces arrived a few minutes later. He had found bulbs near the river at 9400 ft. elevation. We went to Sorata for lunch at 4:30. We arrived at La Paz at 9 p.m. so covered with dust, Meneces' black hair was white. I went quickly to the hotel for a desired shower. The water ran but did not get warm. In fact, it seemed to get colder. When I finished, Hugh Bush was ready to step in, expecting warm water. I got a good laugh at the howls from the ice cold water.

Arrangements were made for Hugh to return to the U.S. I went back to Cochabamba to make a trip into the Chapre river area but my mother became ill and six days later, we were home.

BIBLIOGRAPHY

Hunziker, A. T. and Cocucci, A.E. Estudios sobre amaryllidaceae. Boletín de la Academia Nacional de Ciencios (Córdoba, Argentina) Vol. 41:5-16. December 1969.

Hunziker, A. T., Kurtziana 4:13. December 1967.

CORABELLE WHITING DORAN

A Brief Biography

Just turned 86 and is planting seeds of Nerine. The breeding of Nerines is one of her newer projects. She will plant all the seeds of the *Amaryllis* if I don't keep telling her there is no place for so many seedlings. She has always been interested in ornamental plants and has constantly encouraged me.

Born November 10, 1885 on a farm near San Bernardino. Her parents were Delevan Gerry, and Adelaide Janette Mossman Whiting from near Boston. Graduated from Pacific Hospital in Los Angeles as a nurse. Married Junius H. Doran, a civil engineer. Always lived in Southern California and has always gardened. Enjoys traveling and has accompanied me on some of my collecting trips.

The beautiful species, *Amaryllis doraniae* Traub (see description in PLANT LIFE 27: 43—44. 1971) was named in her honor (see also Fig. 5-A). The outstanding feature of this species is the clear rose color of the flowers. It is probably unique in this respect.—*J. L. Doran*

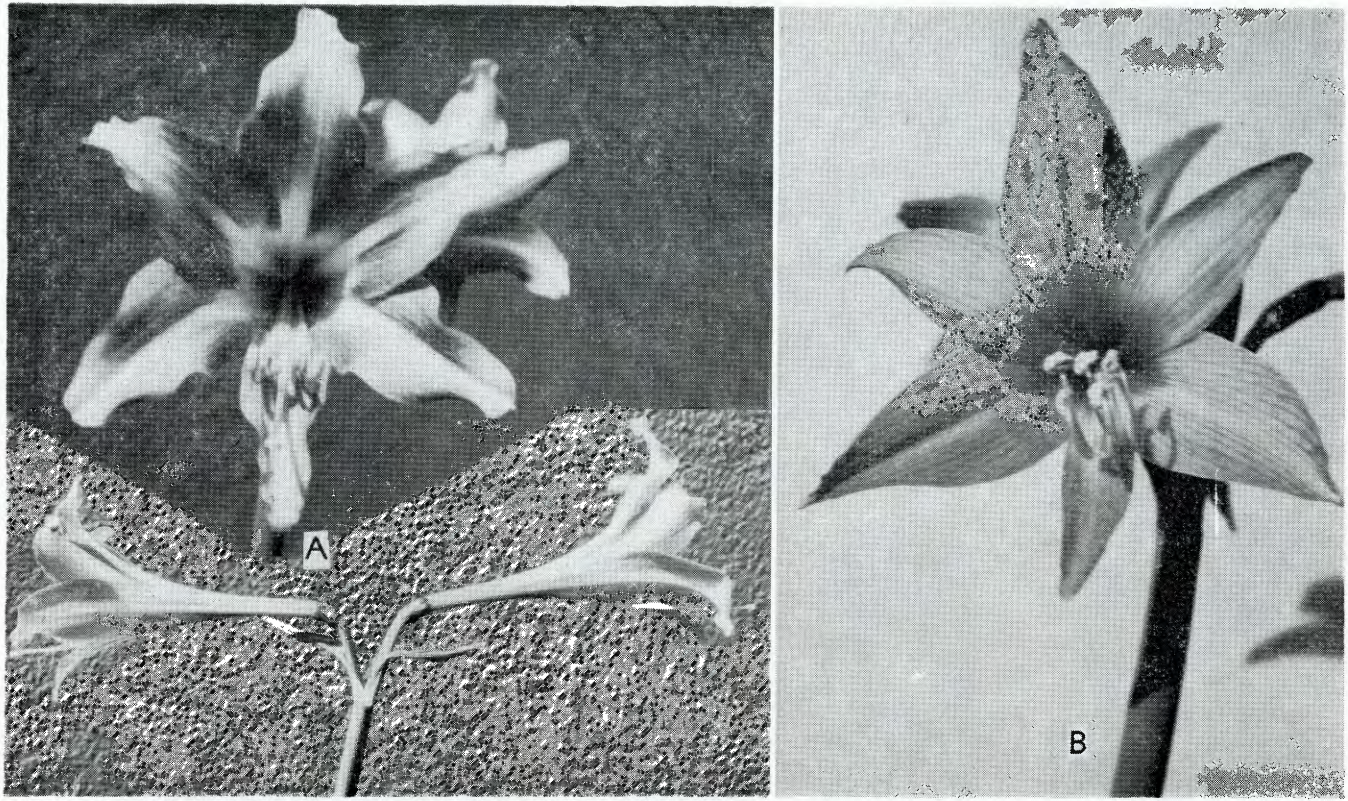


Fig. 5. **A, Amaryllis doraniae,** Traub, native to the estuary of the Rio Orinoco, Venezuela; **B, Amaryllis blossfeldiae** Traub & Doran, native to Brasil. See top of page 19.

AMARYLLIS BLOSSFELDIAE TRAUB & DORAN

Amaryllis blossfeldiae Traub & Doran was published in PLANT LIFE 27: 44—46. 1971. In Fig 5-B, the flower of this species is illustrated. This differs from that of *Amaryllis striata* Lamarck to which it is related.—*Hamilton P. Traub*

IN MEMORIAM—FRED J. BUCHMANN, 1913-1971

Those of us interested in horticulture and conservation lost a loyal friend and fellow worker when Dr. Fred J. Buchmann passed away on January 22, 1971. He was born July 3, 1913, in Cullman, Alabama, and had resided in Baton Rouge, Louisiana for nearly 30 years. He received the Bachelor's degree in Chemistry (B. S.) Alabama Polytechnic Institute, June 1935; the Master's degree in Organic Chemistry (M. S.) in June 1937 at the same college; and the Doctor of Philosophy degree (Ph.D.) also in organic chemistry, in 1941 at the University of Nebraska. He was employed by the Esso Research Laboratories (Humble Oil Company) as a research chemist. It was my privilege to have known him both as an outstandingly capable professional chemist and as an Amaryllis and Hemerocallis enthusiast.

Always a lover of nature and the outdoors, he had great respect for the ecology and was an ardent supporter of conservation. My first association with Fred in horticultural pursuits was about 1955 when we shared activities in collecting and later in hybridizing Louisiana native irises. This beautiful plant is now disappearing from its natural habitat. Fred expanded his interests to include the Amaryllis species about 1960; this resulted largely from his close friendship and association with the late Professor Claude Davis. Fred accumulated what is probably one of the most extensive personal collections of Amaryllis species in this country. He grew the species exceptionally well and he described his activities in several interesting articles in PLANT LIFE. In more recent years he became interested in tetraploid Hemerocallis and had already obtained quite a collection and began a hybridizing program.

Fred Buchmann was the founder of the Baton Rouge Amaryllis Society and the first president of this organization. He was serving on the Board of Directors of the Louisiana Society for Horticulture Research at the time of his death. He was also a member of The American Plant Life Society, the Mens Amaryllis Club of New Orleans, the Louisiana and American Hemerocallis Societies and the Louisiana Ornithological Society. Fred is survived by his wife, the former Cordelia Atkeson, and two sons, Fred J. Buchmann, III and Tom A. Buchmann.—*Joseph K. Mertzweiller*

1971 HERBERT MEDAL PRESENTATION TO DR. A. GOMEZ RUPPEL

PEDRO F. RAVENNA

THE WILLIAM HEBERT MEDAL for 1971 was awarded to Dr. Carlos A. Gomez Ruppel for his outstanding contributions toward the advancement of the amaryllids. The award ceremony took place on June 20, 1971 (Argentina's Flag Day) in the patio of the Hall of Agriculture, the National University of Mendoza, Argentina. The Medal was presented to Dr. Ruppel (Fig. 6) on behalf of the American Plant Life Society by Pedro Felix Ravenna before an audience of fellow professors, students of Dr. Ruppel, and many guests.

Fig. 6. Sr. Pedro F. Ravenna (right) is shown presenting the 1971 Herbert Medal to Dr. Carlos A. Gomez Ruppel in award ceremonies held in the patio of the Hall of Agriculture, the National University of Mendoza, Argentina, before an audience of fellow professors, students of Dr. Ruppel, and many guests, on June 20, 1971.

The reader is referred to the 1971 issue of PLANT LIFE for the autobiography of Dr. Ruppel.

EDITOR'S MAIL BAG

We are sad to have to announce the death of Mr. Elmore W. Menninger, July 2, 1971, 1030 North Old Ranch Road, Arcadia, Calif. 91006. Mr. Menninger was injured in an automobile accident and never recovered. His many friends will miss him very much.

Mr. James A. Bauml, 130 Melba, San Antonio, Texas 78216, who contributes the most interesting report on the recent plant collecting trip into Mexico with Dr. Howard, writes that he is a sophomore botany major at Texas A & M University, College Station, Texas, and that he is much interested in the Iridaceae and Amaryllidaceae, and that "By trading plants which I have collected or have been given by Dr. Howard, I have built up a small collection of things which continually expands." We wish him all success in his plant activities. It is lucky when one can become interested in plants early in life.

Under date of August 27, 1971, Dr. W. T. Stearn, British Museum (Natural History), Cromwell Road, London, S. W. 7, writes "You may be interested to know that I called at Spofforth this year while on my way to lecture at Harrogate. The Old Rectory in which Herbert lived still stands and, as the whole garden area is walled, it is evident from this that he had ample space for his horticultural enterprises."

Mr. Lindsay J. Forbes, 59 Union Road, Surrey Hills, Victoria, 3127, Australia, is interested in obtaining seeds of *Zephyranthes, Habranthus* and other smaller amaryllids. Seeds of native Australian plants will be sent in exchange.

Mr. V. T. Vail, 93 South Terrace, Como, Western Australia 6152, wishes to obtain seeds of *Amaryllis* species. It is hoped that those who have such seeds will share some of these with Mr. Vail.

It is with sadness that I have to report the death of Dr. Robert F. Hoover, May 1970, due to cancer. Dr. Hoover was the authority on *Brodiaea* and allied genera, and received the William Herbert Medal in 1955 (see PLANT LIFE Vol. 11. 1955), for his outstanding contributions to science.

When Mr. J. L. Doran returned from a September 1971 South American plant collecting trip, he brought back examples of three Bolivian postage stamps in full color, depicting *Amaryllis pseudopardina* (=*A. leopoldii*) $b. 1.20 Air Mail; *Amaryllis escobaruriae,* 30 cts., and *Amaryllis yungacensis,* 50 cts. All species native to Bolivia. These are very colorful, and we are grateful to Mr. Doran for presenting the set to the Society.

Mr. B. York, 24 Mulgowie St., Sunnybank, Brisbane, Queensland, Australia, writes under date of April 4, 1971, that he has been growing *Amaryllis* for several years and that he has a fine collection of hybrids. The quarantine laws are so very strict that he has had to grow his plants from seeds obtained from Ludwig & Co., and other breeders in foreign lands.

Mr. Emile P. J. Flauss, 13131 Cherbourg St., New Orleans, La. 70129, is interested in obtaining seeds of *Amaryllis* species, also *Brunsvigia, Clivia, Crinum, Habranthus,* etc. He has seeds of *Crinum americanum* that he can send in exchange.

EDITOR'S MAIL BAG—continued on page 31.

1. REGIONAL ACTIVITY AND EXHIBITIONS

THE 1971 AMARYLLIS SHOWS

On account of very unusual weather conditions, three of the Amaryllis societies in the South Midland could not stage their usual exhibitions. However, a brief report from each has been received, and these are reproduced below.

The 1971 Greater New Orleans Official All-Horticulture Amaryllis Show was held on April 17. Then followed the 1971 Corpus Christi Amaryllis Show on April 17-18, and the 1971 Greater Gulf Amaryllis Show at Mobile, Alabama, on April 18.

The 1971 Southern California Official Amaryllis Show was held on April 24-25, and the 1971 Baton Rouge, Louisiana, Amaryllis Show on April 25.

HOUSTON AMARYLLIS SOCIETY

Mrs. A. C. Pickard,

Official Show Chairman, 1702 North Blvd., Houston, Texas 77006

The Amaryllis bulb is a hardy vigorous and wonderful adaptable perennial but it cannot perform any miracles. The winter of 1971 did queer things to many plants in the Gulf Coast area.

Early spring in February, followed by late winter in March, is a frustrating time for any Amaryllidiarian. Knowing the vagaries of Texas weather, we also know there will be sunny and warm days between the cool frosty nights. We waited expectantly for that first glorious bloom in the garden, a foretaste of the splendor sometime by mid-April, which is usually the ideal time for the Amaryllis show. However, we were disappointed this past April to have had to cancel the show due to climatic conditions and lack of available showroom space on a seasonable date.

In the weeks following, there were garden tours, program meetings and evaluating of Amaryllis growing in pots and gardens. It offered a potential field from which new members were recruited.

The Houston Amaryllis Society gardens will be supplemented by many new outstanding varieties for 1972.

HATTIESBURG AMARYLLIS SOCIETY, 1971

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

In place of an Official Show in the spring of 1971, the Hattiesburg Amaryllis Society exhibited Amaryllis blooms in the local banks and department stores. Also during Library Week, potted Amaryllis were

exhibited in various rooms of the Hattiesburg Public Library. We feel that in exhibiting Amaryllis in this way, we reach people who might not attend the regular flower shows.

THE GREATER HOUSTON AMARYLLIS CLUB

Mrs. Sally Fox, *Corresponding Sec'y., 1527 Castle Court, Houston, Texas, 77006*

The Houston, Texas, Chamber of Commerce was delighted to report 80 degree weather during January and February, 1971. On the other hand, the local gardeners were disgusted to find buds popping each day they made a tour of their yards. Then, March which is usually mild in the Gulf Coast Area, decided to make up for January and February. The combination of hot weather in the Winter months arousing the bulbs to put up buds, then an extremely cool March gave us very poor quality blooms. Although it was a difficult decision, our Show Chairman suggested we cancel our show since our aim is to promote interest in growing amaryllis, and we would not want to display blossoms of inferior quality to the visitors, even though they would understand the unusual growing conditions which we experienced in our area.

Needless to say, we can't control the weather so the preparatory work to put on our show went for naught, and we will just have to wait and hope for show quality blooms next Spring.

1971 GREATER NEW ORLEANS OFFICIAL ALL-HORTICULTURE AMARYLLIS SHOW

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

The Men's Amaryllis Club of New Orleans sponsored their twelfth annual all-horticulture Amaryllis Show over the week-end of April 17 and 18, 1971 at the Lakeside Shopping Center Mall in Metairie, La. The Show attracted well over one thousand visitors, most of whom seemed very favorably impressed by the quality as well as the number of entries.

Mr. Milo Virgin, a perennial winner, again won top honors in the Show. He won the "Best in Show" ribbon, the Walter Latapie Award, and the Ludwig Challenge Cup for a nearly perfect specimen of "Picotee Petticoat." He also won the Robert Goedert Award for an outstanding *A. pardina*, the Southern Seed and Popcorn Co., Inc. Award for the runner-up specimen in the Breeder's Class, and the President's Trophy for winning the most blue ribbons overall. Mr. Walter Latapie won the James Mahan Award for a 'Beautiful Lady', the runner-up entry in the named and registered section. Mr. Lester Laine received the Robert Diermayer Memorial Award for the best specimen in the Breeder's Section. Mrs. Sam Norwood was awarded the T.A.C. Construction

Co. Award for the best unnamed and unregistered potted specimen with Mr. Al Diermayer receiving the Edward F. Authement Memorial Award for the runner-up entry in that section. Dr. Tim Calamari, Jr. won the Sweepstakes Ribbon for the most blue ribbons in the registered and named sections. Mr. Al Diermayer received a similar Sweepstakes Ribbon in the unregistered and unnamed sections. Mr. Jerome Peuler, the Club's president for 1970-71, won a Special Trophy for the Best Single Floret, a magnificent 'Golden Triumphator'. Mr. Emile Flauss won the Lloyd Donahoe Award for the best two-floret specimen in a special class of the show.

Fig. 7. Mr. Milo Virgin, with prize-winning nearly perfect specimen of 'Picotee Petticoat'.

As can be seen by even a casual glance at the list of winners and awards, there were more and better trophies awarded in the 1971 Official Show than in any past show. This was quite fitting as there seemed to be more and better flowers exhibited at this Show than at any previous show. The Chairman of this memorable 1971 Show was Mr. Lloyd Donahoe. Dr. William N. Palmer, Jr. was Co-Chairman.

CORPUS CHRISTI AMARYLLIS SHOW, 1971

MRS. CARL C. HENRY, *P. O. Box 3054, Corpus Christi, Texas 78404*

Our Coastal Bend Amaryllis Society held it's annual Amaryllis Exhibit in conjunction with the "Festival of Flowers", held by the Corpus Christi Council of Garden Clubs on April 17th and 18th, 1971, at our Richard King High School this year. We were fortunate to even be able to stage a flower show this year, as Hurricane Celia really caused much damage to our many gardens and flowers—this past August 3rd. Also, our winter season was very mild, which caused many of our Amaryllis and other flowers to bloom during March instead of April. However, we were fortunate in having 39 entries in our Amaryllis Exhibit.

Fig. 8. Mrs. R. A. Hornberger, winner of Ludwig Challenge Cup at the Corpus Christi Amaryllis Show, 1971.

Those entered in the Registered and named Ludwig varieties were: 'Apple Blossom', 'Bouquet', 'Ludwig's Goliath', 'Royal Dutch', and 'Winter Carnival'. Gracilis type blooms entered were 'Carina', Firefly', and 'Little Sweetheart'.

The Ludwig Challenge Trophy was awarded to Mrs. R. A. Hornberger for receiving the greatest number of "blue ribbons" in the Ludwig Registered and Named Amaryllis Section. Mrs. Hornberger has been awarded this Challenge Trophy three times now and will be entitled to keep it permanently.

A *"Special Trophy"* to a non-member was awarded to Mrs. Bill

M. Miller, for her entry of 'Royal Dutch', which scored 95 points.

A *"Special Trophy"* to a Club Member was awarded to Mr. R. L. Retallack, for receiving the greatest number of blue ribbons in the "Breeder's Class".

An *"Achievement Trophy"—Club Member*—was awarded to Mrs. Levi Materne, for entries in the Registered and Named Leopoldii Amaryllis classes, which were blue ribbon winners.

An *"Award of Merit"* was given to Mrs. Bill M. Miller, by the American Amaryllis Society, for her entry of 'Royal Dutch', which scored 95 points.

Preliminary Commendation Awards given by the American Amaryllis Society, affiliated with the American Plant Life Society, were awarded an unnamed Reginae Hybrid which scored 95 points; Mrs. Phelps entered an unnamed African Hybrid which scored 96 points.

We were unable to secure National Accredited Amaryllis Judges for our show this year, due to a number of other flower shows being held on the same date as ours. Mrs. Walter H. Anderson and Mrs. C. E. Weeks, National Flower Show Judges, served as judges for our exhibit.

1971 GREATER GULF AMARYLLIS SHOW

W. A. McCollum, *President, Amaryllis Society of Mobile, 57 Hillside Lane, Springhill, Mobile, Alabama*

The Amaryllis Society of Mobile presented its 18th Annual Greater Gulf Amaryllis Show in the Mini Mall of Bel Air Mall on Airport Boulevard, Mobile on Sunday, April 18, 1971, from 9 a.m. to 5 p.m. after having been judged by accredited flower judges.

Theme of the show this year was AMARYLLIS TIME IN HISTORICAL MOBILE. Classes in the artistic arrangements carried out this theme.

Two Mobilians took top honors in the show. Mrs. Lois Koontz walked away with nine trophies, and W. A. McCollum, president of the sponsoring Amaryllis Society of Mobile, won five awards.

Mrs. Koontz won the following trophies: Most Blue Ribbons in Show; Most Blue Ribbons in Horticultural Division; Swetman Amaryllis Garden Trophy; Claude H. Moore Memorial Trophy; Wesley J. Marshall Sr. Memorial Trophy; T. J. Swetman Trophy; Inez Scheuermann Trophy and two Amaryllis Society of Mobile trophies.

Mr. McCollum won the John A. Lamey Memorial Trophy; the Robert Hiram Swetman Memorial Trophy; the John J. Mason Memorial Trophy; the Ludwig Trophy and the Amaryllis Society of Mobile Challenge Cup.

Mr. & Mrs. E. A. Wiggins took the Amaryllis Society of Mobile Silver Cup for best potted miniature, the Amaryllis Society of Mobile Trophy awarded for most blue ribbons in unnamed potted seedlings

and the Men's Garden Club of Mobile Certificate of Honor.

The First Federal Savings & Loan Association Trophy went to Mrs. C. E. Adams. Mrs. N. K. Bunch of Selma, Alabama took the Amaryllis Society of Mobile Trophy for the most outstanding horticultural cut specimen of American hybrid amaryllis in show, and Mrs. G. R. Montgomery won the Lucy Whitworth Memorial Trophy.

Mr. John Clark was Show Chairman and Mrs. H. O. Hackmeyer was Chairman of awards and trophies. Mr. W. O. Cobb, a former member, acted as Master of Ceremonies.

The show had approximately 350 entries. Many complimentary remarks were made by those visiting the show and it was estimated that several thousand attended from Mobile and the surrounding areas.

1971 SOUTHERN CALIFORNIA OFFICIAL AMARYLLIS SHOW

Mrs. Dorothy Rose. *Show Chairman*
10300 Rosewood Avenue, South Gate, California 90280

The Southern California Hemerocallis and Amaryllis Society sponsored the Seventh Annual Amaryllis Show April 24 and 25, 1971 at the Los Angeles State and County Arboretum, 301 North Baldwin Avenue, Arcadia, California. The show title "NATURE'S JEWELS" aptly described the beautiful displays of Amaryllis and other members of the Amaryllidaceae. There were 17 competing exhibitors with 105 potted and cut specimens.

THE AWARDS WERE AS FOLLOWS: SWEEPSTAKES—Cecil Houdyshel Memorial Trophy—S. S. Harshbarger; SWEEPSTAKES RUNNER-UP—So. Calif. Hemerocallis and Amaryllis Society Award—Leonard Doran; BEST REGISTERED LUDWIG VARIETY—Ludwig Challenge Cup—S. S. Harshbarger with 'Loves Desire'; The following received So. Calif. Hemerocallis and Amaryllis Society Awards: BEST REGISTERED LUDWIG VARIETY RUNNER-UP—S. S. Harshbarger with 'Nostalgia'; BEST REGISTERED OTHER THAN LUDWIG, LARGE FLOWERED HYBRID—not given this year; BEST REGISTERED OTHER THAN LUDWIG, LARGE FLOWERED HYBRID RUNNER-UPS—Indoor grown—S. S. Harshbarger with 'Rilona'; Outdoor grown—Dr. Spearman with 'La Paloma'; BEST SEEDLINGS LARGE FLOWERED, REGINAE & LEOPOLDII TYPES—Outdoor, cut scapes—Leonard Doran; Outdoor potted—C. D. Cothran; RUNNER-UPS TO THE ABOVE—Indoor grown—S. S. Harshbarger; Outdoor grown—Leonard Doran; BEST REGISTERED GRACILIS—I. K. Rosoff with 'Pretty Pal'; BEST GRACILIS MINIATURE SEEDLING, 1″ to 4″—Indoor grown—S. S. Harshbarger with "Sparkling Gem X Voodoo"; Outdoor grown—Roger Fesmire with "Mini Skirt X Tangerine"; BEST BELLADONNA TYPE SEEDLING, 4″ to 6″—Quinn Buck with 'Calyptrata hybrid'; NEW SMALL LEOPOLDII, 4½″ to 6″—S. S. Harshbarger; HAYES AWARD—S. S. Harshbarger;

BEST FLOWER IN SHOW, FROM JUDGES VIEWPOINT—Judges Award—Tom Humphreys with 'Fire Flame'; POPULARITY POLL WINNER—So. Calif. Hemerocallis and Amaryllis Award—S. S. Harshbarger with 'Nostalgia'; HARSHBARGER AWARD FOR 1971, Highest number of points awarded any flower (99 points).—Tom Humphreys with 'Fire Flame'.

AMERICAN AMARYLLIS SOCIETY AWARDS OF MERIT—Dr. Kelly Spearman with 'La Paloma', S. S. Harshbarger with 'Loves Desire', and Tom Humphreys with one species *Amaryllis petiolata* bulb having three flower spikes with a total of twelve flowers.

AMERICAN AMARYLLIS SOCIETY AWARDS OF PRELIMINARY COMMENDATION: Ed Pencall, a lovely rose-red seedling, S. S. Harshbarger, a blushing pink which scored 93 points and Leonard Doran, a large picotee of Pardina parentage.

Special Ribbons were awarded to Dr. Kohl, Tom Humphrey, Dr. Spearman, S. S. Harshbarger, and Ed Pencall.

A new division for junior growers was added this year to encourage their participation in Society activities. Brian Pencall was the winner of a first and special ribbon.

Rosettes were awarded to Mr. E. A. Angell of Loma Linda and Mr. Bruce Claflin of Upland for supplying a multitude of outdoor grown Amaryllis spikes that aided greatly in making the show a blaze of color and beauty.

Mr. Leonard Doran's educational exhibit explained the growing of Amaryllis from ripened seed pod to clone. The Amaryllis seed sprouted in sealed jars of water excited much comment. Featured was a large map of South America showing the habitat of many Amaryllis species. Leonard Doran and fellow member, Henry Myers, were kept busy answering the numerous questions of the visitors.

The flower arrangements with Amaryllis predominant were noncompetitive this year and awards were not given. Artificial plant material was not allowed, otherwise the members were given free rein to express their skill. The results were placed in vantage points throughout the show and were thoroughly enjoyed by both guests and members. Those participating were Mrs. Ruth Fesmire, Marian Harshbarger, Gladys Williams, C. H. Welborn, and Dorothy Rose.

This year the Society was very fortunate in having two horticultural displays that created an extensive amount of excitement and enthusiasm in both the members and the crowds passing through the show. The displays were a joint venture by Alice Gans of "Oakhurst Gardens" and Roger Boddaert "Landscape Horticulturist". They were designed by Roger Boddaert to create an educational atmosphere at the show and explore for its viewers the marvels of the Amaryllis family with its complimenting genera and species.

Their largest display 24 feet long was backed by appropriate botanical prints and potted shrubs. Handmade stoneware contained and enhanced the bouquets and living plants of *Agapanthus, Clivia,* and

Fig. 9. Southern California Amaryllis Show, 1971. **Top,** partial view of exhibits; **Center,** partial view of Mr. Doran's educational exhibit; and **Bottom,** center section of 24 ft. long display by Alice Gans and Roger Boddaert. Photos by I. K. Rosoff.

Haemanthus featured. The *Agapanthus* section included evergreen types with large flower umbels typified by *Agapanthus africanus* and *A. orientalis,* while three deciduous species were *Agapanthus caulescens, A. inapertus,* and "A. natalensis". One *Agapanthus africanus* form had over 160 florets to its umbel. This exciting genus offers a wide palette of traits for the hybridizer and his camel hair brush to explore. A very representative collection of *Haemanthus* had *Haemanthus katherinae, H. puniceus, H. coccineus, H. albiflos,* and *H. magnificus.* Clivias were *Clivia caulescens, C. nobilis,* both with pendulous florets, *C. Miniata,* and a hybrid between one of the *C. miniata* selections and *C. nobilis* called "Eto" which blooms two to three times a year. The "Yellow Clivia" was featured and excited favorable comment.

With their second display Alice and Roger created a living Amaryllidaceae bouquet composed of many other members in this great family of plants. Living plants and fresh cut flowers with ornamental foliage intermingled were used to create this 7 foot high by 16 feet in length centerpiece. The following were used: *Allium coryi, A. neapolitanum, A. triquetrum, Manfreda maculosa, Sprekelia formosissima, Worsleya rayneri* "The Blue Amaryllis", *Eucharis amazonica, E. fosteri, E. Moorei, Crinum* "Cecil Houdyshel", *Anigozanthos flavida,* and *Narcissus.* The focal point was *Beschorneria yuccoides* with its rosettes of glaucous, blue-green leaves and 6 foot flower spikes of green and blue flowers with bright pink bracts. Both exhibitors received Rosettes and the sincere appreciation of the Society members.

Two blooming Amaryllis plants were given as door prizes. One by the Society and the other donated by Ed Pencall.

The certified judges were Mrs. Bert Williams, Mrs. Kenneth Anderson, Mr. Roger Fesmire, Mr. Quinn Buck, and Mr. Hugh Bush of Kansas City, Mo.

Clerks were Leonard Doran, Charles Hardman, S. S. Harshbarger, Henry Myers, and Joe Werling.

Sincere thanks are given to Mr. I. K. Rosoff, photographer and Mr. Joe Werling for printing the Show Schedules, cards, and signs.

More than 3640 attended the show and the congratulations and enthusiasm of the visitors gave ample evidence that our Society is accomplishing its objective—to stimulate a greater interest in and knowledge of Amaryllids.

1971 BATON ROUGE AMARYLLIS SHOW

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

The Baton Rouge Amaryllis Society held its 1971 official show on April 25 at the Downtown Recreation Center. The show chairman was Mr. De Lee Crum, with Mr. Ken Campbell as assistant chairman. Staging of the show was done in conjunction with the Baton Rouge Men's Garden Club Spring Flower Show. Considering the somewhate late date and a very dry spring which adversely affected the outdoor-grown

Amaryllis the show was quite gratifying to all our members. Approximately 100 potted Amaryllis, covering the principal classes, were shown by more than a dozen exhibitors. A pleasing and eye-catching exhibit of single florets was limited to society members only. Most of these were outdoor grown. Eight prizes in silver adorned the awards table. We estimate some 300-400 people saw the show during the one afternoon it was open to the public.

The judges awarded the Ludwig Challenge Cup to Mr. Al Diermayer for a very good bloom of 'Carousel'. Al also won another silver award for the Best Small Flower, a mist green miniature of unknown origin and only about 2 inches in diameter. The award for the Best Registered Flower went to Mr. Ed Beckham for a fine specimen of 'Eastern Dream'. The award for the Best Intermediate Flower also went to Ed for a nice pure white seedling. Ed Beckham also won the Potted Plant Sweepstakes. The Hybridizers Award for the best Leopoldii Class seedling was won by Mr. Ted Tower for a beautiful salmon pink seedling. Mr. De Lee Crum won the award for the Best Single Floret while Mr. Jake Schmidt took the honors for the Cut Scape Sweepstakes.

The Baton Rouge Amaryllis Society instituted a new award in 1971: the Fred J. Buchmann Memorial Award. This award is given for the best hybrid having an Amaryllis species as a parent and is to recognize the great interest and accomplishments of the late Dr. Buchmann in growing and hybridizing with the Amaryllis species. The inaugural award went to Mrs. Fred J. Buchmann for a beautiful pink hybrid.

Our organization wishes to express its appreciation to the Men's Amaryllis Club of New Orleans for the many kindnesses and help given us during the year of 1971 and on occasion of the show. We all look forward to a bigger and better show in 1972.

EDITOR'S MAIL BAG—continued from page 21.

Ir. C. Vonk Noordegaaf, Research Station for Floriculture, Linnaeuslaan 2a, Holland, writes that he is collecting *Alstroemeria* species for research work on response to length of day, temperature, and so on, and also for breeding work. He has 20 species and is trying to obtain more. He would be interested in exchanging species with others having species that he lacks.

Mr. Claude A. Barr, Prairie Gem Ranch, Smithwick, South Dakota 57782, writes under date of Nov. 26, 1971, "We regret that the current issue of our catalog is exhausted. Our long-time book project, treating of the remarkable, varied and beautiful native flora of the Great Plains of garden interest, under the name of "Jewels of the Plains", must be completed within a year, and announcement of publication will be duly made. No. catalog of plants or seeds is planned for the fall of 1971 or the spring of 1972."

EDITOR'S MAIL BAG—continued on page 67.

PLANT LIFE LIBRARY—continued from page 4.

HOW TO GROW AFRICAN VIOLETS, by the Sunset Editors. Lane Books, Menlo Park, Calif. 1971. This edition of a standard text has been completely revised to include many new hybrids and variations. The sections are devoted to the natural beauty of African Violets, guidelines for healthy growth, versatile plants for indoor decoration, propagating methods, African Violet cousins, grooming and exhibiting African Violets, and catalog of African Violet varieties. Highly recommended.

TIME-LIFE ENCYCLOPEDIA OF GARDENING SERIES, edited by James Underwood Crockett and editors of Time-Life Books. In every case the volumes are profusely illustrated in color. The individual volumes are distributed by Little, Brown & Co., Boston, Mass. Library and school edition, by Silver Burdett Co., Morristown, N. J. 07960.

1. ANNUALS, with water color illustrations by Allianora Rosse. 1971. Pp. 176. Illus. $6.75. The subject is considered under (1) living color the summer long, (2) how to grow annuals, (3) bringing outdoor beauty indoors, (4) a head start for the flower garden, and (5) an illustrated encyclopedia of annuals. Highly recommended.

2. ROSES, with water color illustrations by Allianora Rosse. 1971. Pp. 160. Illus. $6.95. The subject matter is grouped under (1) the Queen of Flowers, (2) planting, pruning and protection, (3) creating better blooms, and (4) an illustrated encyclopedia of roses. Highly recommended.

3. FLOWERING HOUSE PLANTS, with water color illustrations by Allianora Rosse. 1971. Pp. 160. Illus. $6.95. The text has been confined to those plants that are in flower over long periods or are recurrent blooming. The sections are devoted to (1) the pleasures of gardening indoors, (2) providing light and water, (3) soils, pots and potting, (4) the basics of day-to-day care, (5) propagation, and (6) an encyclopedia of flowering plants. Highly recommended.

4. LAWNS AND GROUND COVERS, with water color illustrations by Allianora Rosse. 1971. Pp. 159. Illus. $6.95. The subject is treated under the following headings: (1) the lore of lawns, (2) how to take care of your lawn, (3) repairing old lawns and building new ones, (4) choosing and growing ground covers, and (5) an illustrated encyclopedia of grasses and ground covers. Highly recommended.

5. LANDSCAPE GARDENING, with water color illustrations by Rebecca A. Merrilees and Barbara Wolff. 1971. Pp. 160. Illus. $6.95. The subject is developed under the following headings: (1) what landscaping can do, (2) the outdoor family room, (3) a welcoming fruit yard, (4) places for work and play, and (5) an encyclopedia of selected plants for landscaping. Highly recommended.

PLANT SPECIATION, by Verne Grant. Columbia Univ. Press., 440 West 110th St., New York, N. Y. 10025. 1971. Pp. x+435. Illus. $15.00. This stimulating book is complementary to Dr. Grant's previously published contributions in this field. It is concerned with evolution at the species level, and species groups in higher plants. After a discussion of the nature of the species, the divergence of species, refusion and its consequences, derived genetic systems, and evolution of hybrid complexes, are considered in detail. A bibiography, and organism, author, and subject indices complete the volume. This excellent text by an outstanding authority in this field cannot be too highly recommended to all who are interested in biology.

PLANT LIFE LIBRARY—continued on page 68.

2. LINEAGICS

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

CRINUM THAIANUM J. SCHULZE, A NEW AQUATIC SPECIES FROM SOUTHEAST ASIA

JOACHIM SCHULZE,
Technical University of Berlin, West Germany

This article was completed and transmitted to the Editor of PLANT LIFE in March 1971 when the 1971 issue of that publication was in the page-proof stage. Since the next issue would not appear for another year the Editor kindly "squeezed-in" a technical description of the species in Latin in the 1971 edition of PLANT LIFE (Schulze, 1971) so as to avoid any possible question about priority. The complete article is reproduced here.

Crinum thaianum Joachim Schulze

in PLANT LIFE 27: 127. 1971. Holonomenifer: No. 1007(TRA), J. Schulze, Apr. 18, 1970; isonomenifer: No. 1010, J. Schulze, Apr. 18, 1970, deposited in the U. S. National Herbarium (US); Figures 10, 11, 12, and 13, of the present article

Distribution: South Thailand, western coastal region from Taku Pa to the vicinity of Kapoe (see Fig. 11).

I. INTRODUCTION

In September 1966 I recognized in the tank farm of Mr. Kor Song Heng, of the Chao Phraya Aquarium, Bangkok, Thailand, amongst a comprehensive collection of indigenous water plants from Thailand, a member of the genus *Crinum* with long strap-like leaves and the typical bulb, growing in good condition completely submerged in the water. This was surprising to me, because I knew according to Wendt (1958) that within the whole genus of *Crinum* only three species were reported as true aquatic plants. These had been stated to be *Crinum aquaticum* Burchell, which perhaps might be identical with *C. campanulatum* Herb. de Wit (1971) and *C. natans* Baker, both from tropical Africa, and *C. purpurascens* Herb. from Brazil and the West Indies. Prof. de Wit, a famous contemporary authority on water plants, mentions as an additional aquatic species *C. capense* Herb., known also under the synonym of *C. longifolium* Thunb. [According to Dr. Traub, these names are synonyms of *Crinum bulbispermum* (Burm.) Milne-Redhead & Schweickerdt, a terrestrial plant.] The description of these plants in the literature did not correspond with the appearance of the plant I had found in Thailand. Moreover, the probability was not very high that the species from Africa and South America were also native to southern Thailand. Another distinction according to the ecological environments from Koshimizu (1938) registers 7 marsh or stream-side

species from a total of 164 acknowledged species of the genus, the remainder comprising 16 inland terrestrial plants and the majority of 141 littoral plants. However, within the interesting group of marsh and stream-side plants it was not clear how many of them would behave as typical and mostly submerged water plants and how many would be merely bog plants which are occasionally flooded.

Unfortunately my further literature investigations could not solve the problem. Besides the well known works of Baker (1888) and Uphof (1942) I had to consult the study on the phytogeographical distribution of the genus by Koshimizu (1938) as well as the floristic handbooks covering the immediate or surrounding areas where the plant was discovered, i.e. especially the reports on *Crinum* in the Flora of Indochina Gagnepain (1934) and in the Flora of the Malay peninsula Ridley (1924) because comprehensive treatments of the plants from Burma or from Thailand itself are not yet available. The extracted information from those sources have been condensed in Table 1.

Table 1. **Crinum** species reported from Southeast Asia, according to Koshimizu (1938), Uphof (1942), Gagnepain (1934) and Ridley (1924). The new species is included under Subgenus Platyaster in brackets [ ].

Geographical area	Subgenus			
	Stenaster	Platyaster	Codonocrinum	not specified
Burma	**asiaticum** L. var. **procerum** Carey		**latifolium** L.	**erythrophyllum** Carey
	defixum Ker-Gawl.		**stapfianum** Kraenzl.	**stenophyllum** Baker
Indochina	**serrulatum** Baker			**cochinchinensis** Roem.
	asiaticum L.			
	defixum Ker-Gawl.			
Malay Peninsula	**asiaticum** L.	**northianum** Baker		**bancanum** Kurz
	defixum Ker-Gawl.	**[thaianum** J. Schulze]		

Three species belong to the section Stenaster, including the widely distributed *C. asiaticum L.* and *C. defixum* Ker-Gawl.; two species belong to Codonocrinum and only one belongs to the section of Platyaster. Four species are not certain and could not yet be placed in a definite section. Later it was recognized that the new *Crinum* species belongs to Platyaster, so that a comparison with *C. northianum* would nearly have been sufficient. This plant, however, has a completely different appearance and is reported to be found in the Malayan provinces of Kedah and Kelantan as well as in Sarawak (North-west Borneo). There I saw *C. northianum* Baker growing to a height of over 2 meters mostly emersed as a bog plant on the banks of the Krian river near Saratok.

II. COLLECTING HERBARIUM SPECIMENS

On my first trip to southern Thailand in 1966 I found the new plant in the (shaded area) as indicated on the map (Fig. 11) flowering in abundance. Merely by means of my description and a few photographs Dr. Hamilton P. Traub immediately expressed his opinion that the plant was not yet known to science in a letter of Dec. 1968, but in order to be certain I had to provide him with an herbrarium specimen, including flowering material. My attempts to procure this through my Thailand friends were not successful and so I had to travel to southern Thailand a second time myself in April 1970. But then I missed the flowering season and after searching over quite an extended area I found only two specimens with flowers, which were collected and pressed. When Dr. Traub had received this material he confirmed his original statement in a letter of Jan. 1971 that apparently it could not be with any other known species of the genus.

III. THE PLANT IN ITS NATIVE HABITAT

Description.—Crinum thaianum is a true aquatic plant growing mostly submerged and only seldom are there slightly discernible characters of amphibic behaviour which is typical for most water plants. It lives in running waters. The shape of the long strap-like leaves excellently fits it for these conditions causing only little resistance to the water current. There are 20 or more leaves, light green in color, sheathing below the bulb neck. The maximum width of the older, outer leaves of the whorl is around 2,5 cm, but mostly the width is only between 1,5 and 2 cm and scarcely changing on the whole length of up to 2 or even 3 meters. One can discern 22 to 26 longitudinal veins, the distance between them diminishing towards the margin. Irregular interconnecting cross veins are distinctly visible only along the central section of the leaf.

The structure of the leaves is tenacious, soft and flexible, which is in contrast to the more stiff and brittle leaves of *Vallisneria gigantea* Graebner, a water plant from the family *Hydrocharitaceae* with only superficial resemblance in respect to the long ribbon shaped leaves. While the leaves of the latter "Giant Vallis" ascend straight from the roots, one can often observe that the leaves of *Crinum thaianum* J. Schulze bend towards the horizontal direction shortly above the bulb-neck (Fig. 13). The leaf blades of the *Vallisneria* are plain, those of *Crinum thaianum* are often slightly curved in cross-section and are twisted with respect to the young, central leaves. Small teeth appear on the margins of the leaf blades. When during extremely dry periods some plants in very shallow river sites have to expose the leaves to emersed, dry conditions, the size is reduced considerably.

The bulbs are up to about 7 cm in diameter and 15 cm in height together with the lower basal plate bearing the roots. The upper part

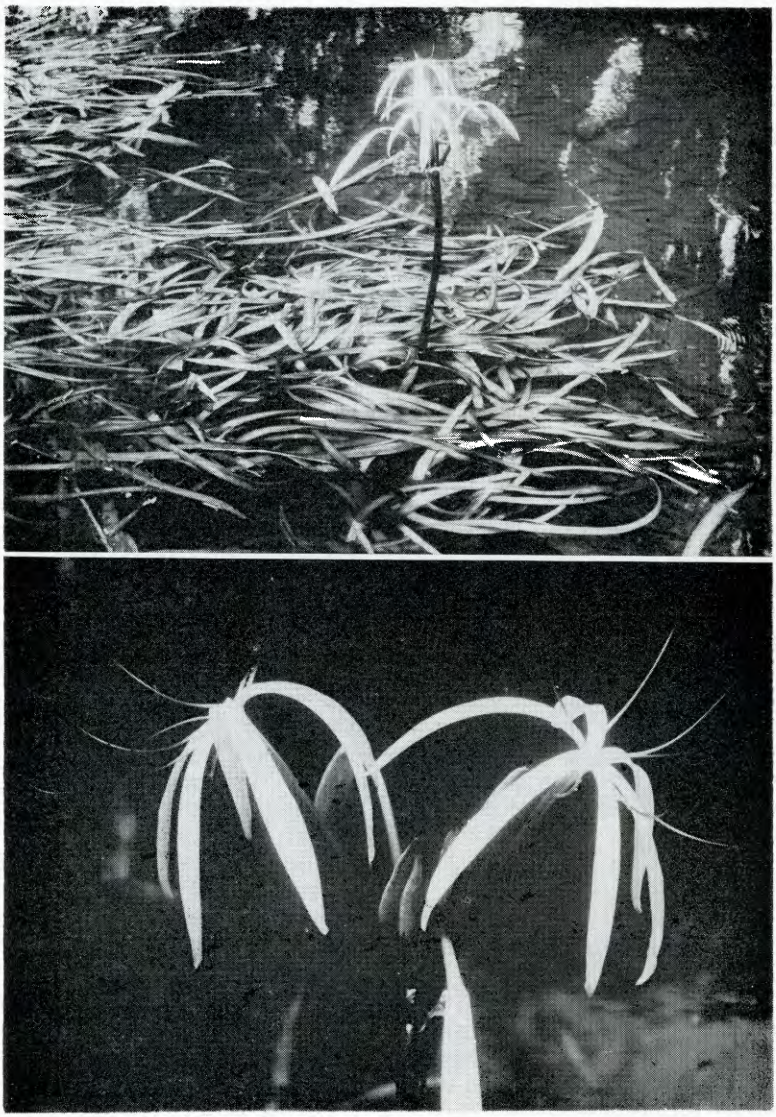


Fig. 10. **Crinum thaianum** J. Schulze, **Upper,** in native habitat, showing leaves and flower scape. **Lower,** close-up of flower scape. Nomenifer illustration. Photos by J. Schulze.

is elongated into a neck, both parts measuring from 3 to 6 cm in length, sometimes more. I found a plant with a neck and stem measuring 8 cm in length, then widening to a second smaller upper swollen region with a neck above it, so that the distance between the origin of the roots and the leaf sheaths totaled 23 cm. Numerous strong primary roots spread from the bulb; these are up to 3 mm thick and 30 cm long, branching freely into secondary roots (Fig. 13). Consequently the plants are rooted deeply in the ground of the rivers. To remove a plant from a depth of half a meter under the bottom is extremely difficult and laborious so that many attempts at digging it out end with the tearing off of the leaves. Occasionally one can find one or two small baby bulbs connected as offsprings with the mother bulb indicating also asexual, vegetative propagation, which seems to be important for cultivation and propagation under artificial conditions, under which the chances of flowering the plant are very low.

When the plants are exposed to the current in the middle of the river beds or generally during the time of high water one can see a huge mass of leaves floating near the surface of the water performing a steady winding movement. When the water level is low and in the quiet boundary zones of the rivers the leaves are curled and packed irregularly in the water (Figs. 10 & 12). Scattered green patches in the water indicate numerous plants clustering densely together, which may result from vegetative propagation and even more from the sticking of seeds to the dense foliage of already existing crowded plants.

The marvelous flowers are quite exceptional in comparison to what is known in the water plant world, as normally water plants develop only tiny and insignificant flowers. Mainly during the monsoon rain period from August to October the waterways are studded with the big and brilliant white umbels of that *Crinum* species. From the center of the leaf whorl develops a rather stout scape, 5—8 mm thick and up to 80 cm long, the colour of which may be described to be dark green to brown. At the top it bears the flowers within an umbel surrounded by spathe-valves in changing elevations from just a few centimeters to half a meter or more above the water surface. The umbels are comprised mostly of from 5 to 8 and rarely up to 10 flowers; 1 to 3 mostly being open at the same time. The tube is 12 to 14 cm long, light green color in the lower and white color in the upper part. The tube divides into 6 limbs tepalsegs of bright white color. These are reflexed, as can be seen from Fig. 10, narrow linear to lanceolate, 8—10 cm long and up to 8 mm wide. The dry specimens reveal up to 12 mostly parallel and only rarely branched dark coloured longitudinal veins. The six slender, upright erect and spreading filaments are 6—8 cm long, red colored, bearing the linear, dorsifixed 12—14 mm long anthers. The style remains shorter than the filaments.

The seeds are irregular, rounded as well as angular in shape, about 2,5 cm long and carved with some wrinkles on the corky testa. After germination one can raise young plants with 3 or 4 leaves and 30—40 cm in length easily in the tank within about 2 months (Fig. 13).

Distribution.—My field surveys revealed the geographical distribution of the species in the western coastal region of south Thailand along the coastal road connecting Bangkok and Singapore, limited within the section of Ranong in the north (Victoria point, border line with Burma touching the sea) and Takua Pa, famous for tin mining, in the south. More exactly the localities stretch from 25 km to about 90 km northbound from Takua Pa (Fig. 11), including the villages Ban Tamnak, Ban Nang Yon, Ban Nam Phru and the southern vicinity of Kapoe. The longitude is between 98,4° and 98,5° east, the latitude between 9,1° and 9,6° north. Reference to the villages on the map should be considered on the basis that in the field one can hardly distinguish anything more than some scattered huts in the realms of the jungle, near to rubber plantations or paddy fields.

The narrow coastal plain is inserted between the sea in the west, i.e. the Indian ocean, and the mountain range of the Malayan peninsula in the east, the mountains in that area ascending as high as 1,400 m. The area is well known for receiving the heaviest rainfall from the monsoon, feeding the numerous waterways draining down from the jungle covered mountains. The new *Crinum* species lives in pure fresh water streams, varying in size from tiny creeks to rivers 20 m. wide or more (Fig. 12). The water is mostly crystal clear and extremely soft. The temperature of the water was measured to be 27° C in April at noon. The plants grow in rich loamy sand, mixed with coarse gravel to a hard ground. Other places are so rich in loam and weak mud that one sinks deeply when walking through the rivers. When the small creeks are overcrowded with trees, shrubs and the common bamboo vegetation, the plants grow mostly well shaded. However, some exposure to full light and sunshine at least temporarily seems to be received everywhere. As accompanying water plants I saw the genus of *Blyxa* from the family *Hydrocharitaceae* and the genus of *Cryptocoryne* of family *Araceae* represented with a very few species. Altogether these plants seem to have adapted themselves to rather specialized ecological conditions which the majority of other water plants are not able to share. The depth of the water where the *Crinum* is found varies between a few centimeters and two meters or more, depending on the type of river, the elevation of different river sites under the water, and the seasonal water level.

IV. **CRINUM THAIANUM** AS AN AQUARIUM PLANT

The plant is grown successfully in the tropical aquaria, in the heated garden pond and in water tanks of greenhouses. In Berlin I distributed some imported specimens to several aquarium hobbyists. After about three years some of the plants had developed to a marvelous and decorative size (Fig. 13). The "Water Lily" from Thailand grew in old sandy ground enriched in the fish tank by that time with feedingstufs of various origins. Much more abundance of growth, however, is achieved by the addition of some loam clay and peat to the ground. With respect to the size of the bulb and the large network of roots the

ground layer in the tank should exceed the minimum height of 10 cm. Fluorescent lamps should provide enough light during at least 12 hours a day. The plant is suitable and a nice decoration for the show aquaria, where it should be placed at a central point in the foreground.

Fig. 11. **Crinum thaianum** J. Schulze, map showing geographical distribution of the species; indicated by shaded area, ranging from Takua Pa to Kapoe in the coastal region of South Thailand.

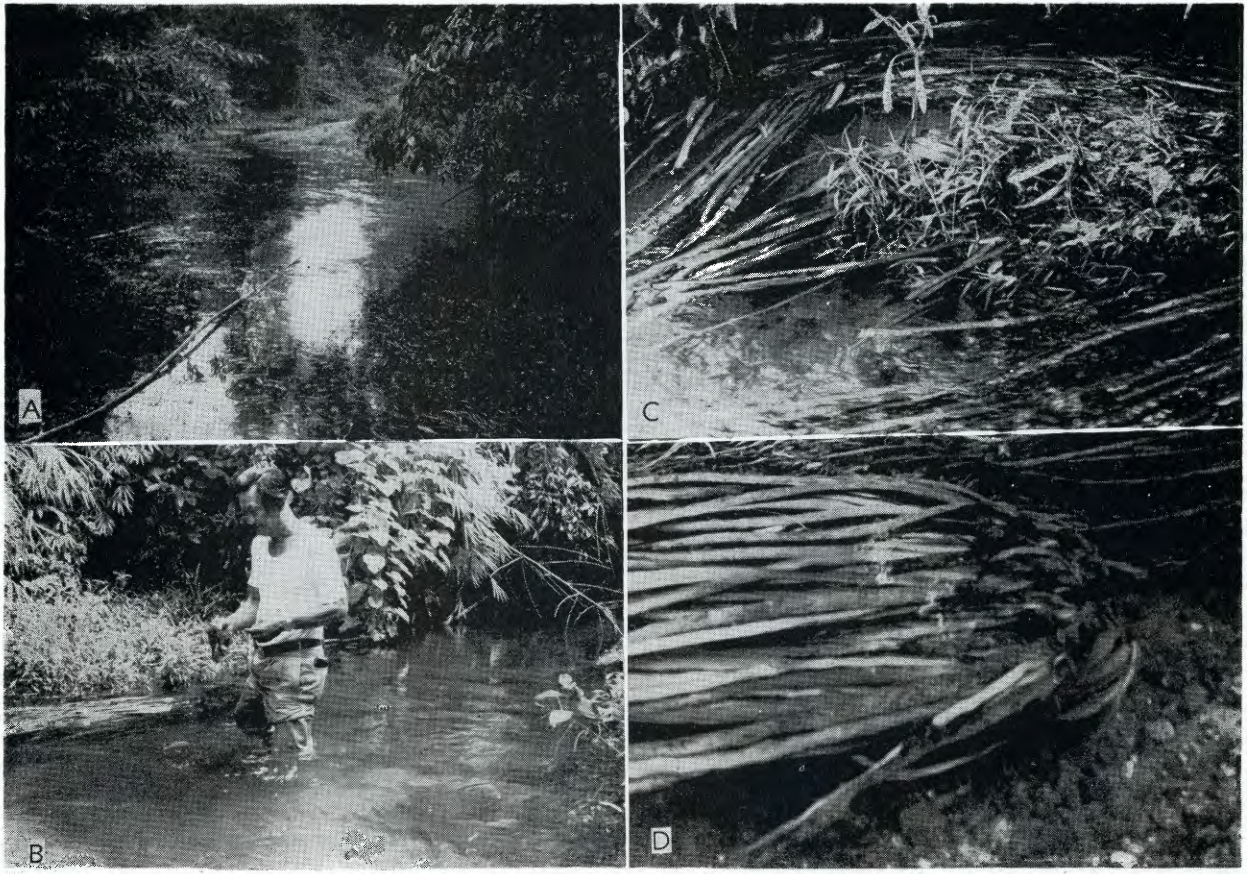


Fig. 12. **Crinum thaianum** J. Schulze in its native habitat. **A,** Broad river of the coastal plain, filled with **C. thaianum**; during the dry season; **B,** Mr. Kor Song Heng, in jungle creek, with **C. thaianum**; **C,** the long strap-shaped leaves floating in the current of a shallow creek, under 2 m. wide note flower scape; and **D,** plants rooted deeply in hard bottom, a mixture of loam and coarse gravel, securely anchored against the river current. Photos by J. Schulze.

Fig. 13. **Crinum thaianum** J. Schulze as an aquarium plant, **A,** tank with seedlings, cultivated by Chao Phraya Aquarium, Bangkok; **B,** seedlings with attached cotyledon; **C,** 3 year old seedlings; and **D,** two specimens, showing development of roots. Photos by J. Schulze.

It was observed that under artificial tank conditions, baby bulbs will grow after some time of cultivation. When I offered the plant to several botanical gardens, the caretakers would not believe the fully aquatic character of this plant due to other experience gained with *Crinum* species. Trying to keep it as a terrestrial plant in the tropical greenhouse or within special glass casings providing nearly 100% humidity in the air proved to be a failure, as the foliage was curtailed to steadily diminishing size until not much more than the bulb was left. After putting that bulb into a tank under water the wonderful bright green foliage developed anew within a short time.

In the field the plant is not easily collected on account of its deep fixation in the ground. The size and weight of full grown plants are not favorable for export by air transport. Above all in order to preserve our natural resources it is commendable that Chao Phraya Aquarium in Bangkok has introduced the commercial propagation from seeds, which are collected in the field and then raised to young plants for export (Fig. 13). Some experts of water plant nurseries, however, fear that the plant will be accepted by the public for tank use only slowly because of its resemblance to the already well known and widely used giant *Vallisneria* mentioned above.

V. ACKNOWLEDGEMENT

I should like to express my indebtedness and gratitude to Dr. Hamilton P. Traub for his invaluable help in the scientific determination of the plant.

LITERATURE CITED

Baker, J. G. Handbook of Amaryllideae. London. 1888.

de Wit, H. C. D. Aquarienpflanzen. Stuttgart. 1971, p. 52.

Gagnepain, F. Amaryllidaceae, in Leconte, H. (ed.), Flore Generale de L'Indo-Chine. Vol. 6. part 5. Paris. 1934. p. 685.

Koshimizu, T. Phytogeographical distribution of *Crinum* throughout the world. Bot. Mag. (Tokyo) 52 (1938), p. 32.

Ridley, H. N. The Flora of the Malay Peninsula. Vol. 4, London. 1924. p. 300.

Schulze, Joachim. *Crinum thaianum* J. Schulze, sp. nov. Plant Life 27 : 127. 1971.

Uphof, J. C. Th. A review of the species of *Crinum*. Herbertia 9 : 63. 1942.

Wendt, A. Die Aquarienpflanzen in Wort und Bild. Stuttgart. 1952-1958. p. 154, 258.

NOTES ON THE LATICIFERS OF **ALLIUM, CALOSCORDUM, NOTHOSCORDUM, TRISTAGMA,** AND **TULBAGHIA**

CLARENCE STERLING AND SHIU-MEI HUANG,
Department of Food Science and Technology,
University of California, Davis, California

ABSTRACT

A study of the bulbs of **Allium, Caloscordum, Nothoscordum, Tristagma,** and **Tulbaghia** shows that all are structurally similar in having subepidermal laticifers in the foliage leaves or the scale leaves. Some biochemical differences exist: starch is present in the scale leaves of **Nothoscordum, Tristagma,** and **Tulbaghia** but absent from **Allium** and **Caloscordum;** the contents of the laticifers of **Tulbaghia** have a unique, deeply-staining latex.

A comparative study of the laticifers of the bulbs of different species of *Allium* (from the northern hemisphere) has recently been published (Huang and Sterling, 1970). The summary data of that study are presented here in Table 1. Bulbs of the related plants, *Nothoscordum bivalve* (L.) Britt. from both Mexico and Chile, *Caloscordum neriniflorum* Herb. from E. Siberia to Mongolia, China, and Japan, *Tristagma uniflorum* (Lindl.) Traub from Argentina, and *Tulbaghia fragrans* examined. The findings of that examination are now reported (Table Verd. from So. Africa, all donated by Dr. H. P. Traub, have also been 1).

The bulb scales of *N. bivalve* are distinguished by amyliferous parenchyma, but no starch is present in the bulbs of *C. neriniflorum.* On this basis, Traub's (1963) maintenance of *Caloscordum* as a distinct genus is valid. (It is worthy of note that starch is also lacking in the bulbs of *Allium.*) The more or less narrow, longitudinally arranged laticifers of *Nothoscordum* and *Caloscordum* resemble those of *Allium,* subgenus Amerallium, in the small number of pits in the end wall; they resemble those of *Allium,* subgenus Allium, in their deeper position—at least 2 cells below the epidermis (Fig. 14-A and Table 1). The laticifers of the Mexican specimens of *N. bivalve* can only be found in the young foliage leaves of the bulb, not in the storage leaves. In this respect their distribution resembles that of the laticifers of *A. subhirsutum* of the section Molium (in *Allium,* subgenus Amerallium), described by Saghir (1964).

The laticifers of *Tristagma* occur in the fleshy regions of the smaller bulb scales about the young foliage leaves, where they are distributed along both adaxial and abaxial surfaces. They are located two cells below the epidermis, usually singly but sometimes in pairs, and are surrounded by amyliferous parenchyma.

Starch is also present in *Tulbaghia* (Fig. 14-B and C), in which the laticifers are recognized by their unique, deeply-staining latex, a feature already noted by Menz (1910). These laticifers occur near

both the adaxial and abaxial surfaces on the fleshy side of the concentric bulb scale but are only found at the abaxial surface along the thin side of the scale. Note that their position can be rather deep, to 5 cells below the epidermis (Fig. 14-B). They occur singly for the most part but may be found occasionally in twos.

Table 1. Laticifers in **Allium** and related genera

Genus, Subgenus (SG), Section (S)	Anatomical features of laticifers				
	Position [1]	Number [2] in contact	Callus [3] on lateral wall	Swelling [3] of cell end	Cross [3] connections
Allium					
SG: Amerallium					
S: Amerallium	1	1—2	0	0	0
S: Lophioprason	1	1—11	0,+	+,0	0
S: Ophioscordon	1	1—2	0	0	0
S: Molium [4]	1	1	— [5]	— [5]	— [5]
SG: Allium					
S: Rhizirideum	2—3	1—2	0,+	+,0	0
S: Melanocrommyum	Random	1—4	0	+	+
S: Allium	2—4	1—2	0	+	0
S: Cepa	2—6	1—3	+,0	+	0
Nothoscordum [6]					
bivalve	2—4	1	0	0	0
Caloscordum [6]					
neriniflorum	2	1—2	0	+	0
Tristagma [6]					
uniflorum	2	1—2	— [5]	— [5]	— [5]
Tulbaghia [6]					
fragrans	2—5	1—2	0	+	0

[1] Number of cell layers below epidermis
[2] Number of laticifers side by side in a row
[3] Presence: +, Absence: 0 (if both symbols shown, first is more frequent)
[4] Data from illustrations of foliage leaf cross sections in Saghir (1964): **A. roseum, A subhirsutum, A. zebdanense**
[5] Longitudinal sections not seen
[6] Listed by species

Lindley (1853) segregated *Allium*, *Caloscordum*, *Nothoscordum*, and *Tristagma* in the tribe Scilleae (Liliaceae) and put *Tulbaghia* in the tribe Anthericeae of the same family. Krause (1930) and Hutchinson (1934) also kept *Nothoscordum* and *Tristagma* in the same tribal alliance (Allieae) with *Allium* but assigned the genus *Tulbaghia* to the Agapantheae (equivalent to Lindley's 1853, Hemerocalleae), Krause keeping these two tribes in the Liliaceae and Hutchinson placing them in the Amaryllidaceae. However, Traub (1963), seeing a much closer relationship among these genera, included all of them with several other genera in the Amaryllidaceae, subfamily Allioideae, tribe Allieae, subtribe Alliinae.

Table 1 shows that there are reasonably close structural resemblances among *Allium*, *Caloscordum*, *Nothoscordum*, *Tristagma*, and *Tulbaghia*. There are biochemical differences in the stainability of the

laticifer contents and the presence or absence of starch. It is interesting to note that although *Nothoscordum bivalve* (Saghir, et al., 1966) and *Tulbaghia fragrans* are non-odorous, the leek-like odor of *T. violacea* is quite apparent (Menz, 1910; Jacobsen, et al., 1968). Wilsenach (1967) has found the basic chromosome number to be 6 in *Tulbaghia*. This may be contrasted with the basic number of 7, 8, 9 and 10 in *Allium* (Traub, 1968).

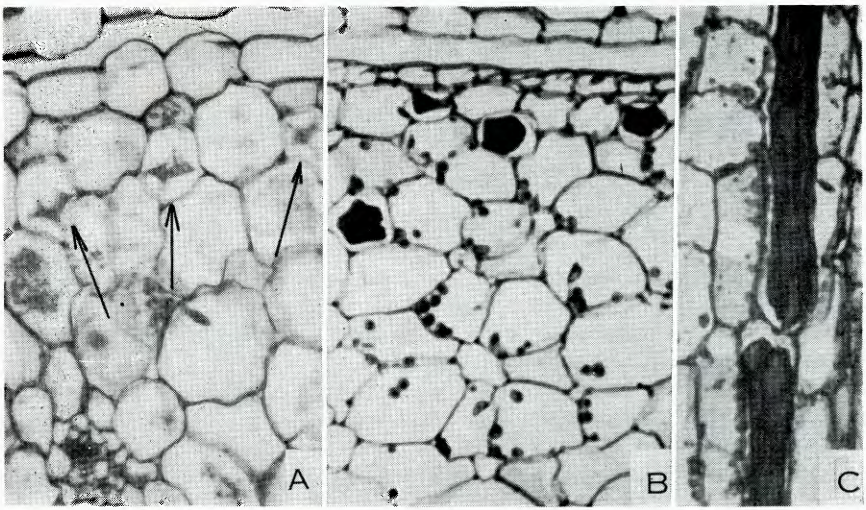


Fig. 14-A. Cross-section of bulb scale of **Caloscordum neriniflorum** showing laticifers at arrows, x306. Fig. 14-B. Cross-section of bulb scale of **Tulbaghia fragrans.** Note deeply-staining contents of laticifers. Parenchyma cells contain starch grains. x200. Fig. 14-C. Tangential section of bulb scale of **T. fragrans.** x200.

In conclusion, it may be stated that although there are apparent biochemical differences of greater or lesser degree among the 5 genera considered here, there are strong structural similarities. The morphological evidence supports their close relationship.

LITERATURE CITED

Huang, S.-M. and Sterling, C. 1970. Laticifers in the bulb scales of **Allium.** Amer. J. Bot. 57:1000-1003.

Hutchinson, J. 1934. The Families of Flowering Plants. II. Monocotyledons. Macmillan & Co., Ltd. London.

Jacobsen, J. V., M. Yamaguchi, L. K. Mann, F. D. Howard, and R. A. Bernhard. 1968. An alkyl-cysteine sulfoxide lyase in **Tulbaghia violacea** and its relation to other alliinase-like enzymes. Phytochem. 7:1099-1108.

Krause, K. 1930. Liliaceae. Natürl. Pflanzenfam. 2nd Ed. 15a. W. Englemann. Leipzig.

Lindley, J. 1853. The Vegetable Kingdom. 3rd Ed. Bradbury & Evans. London.

Menz, J. 1910. Beiträge zur vergleichenden Anatomie der Gattung **Al-**

lium nebst einigen Bemerkungen über die anatomischen Beziehungen zwischen Allioideae und Amaryllidoideae. Sitzber. K. Akad. Wiss. Wien. Math.-naturw. Kl. 119(1):475-533.

Saghir, A. R. B. 1964. Volatiles in **Allium.** Ph.D. diss. Univ. of Calif. at Davis.

Saghir, A. R. B., L. K. Mann, M. Ownbey, and R. Y. Berg. 1966. Composition of volatiles in relation to taxonomy of American Alliums. Amer. J. Bot. 53:477-484.

Traub, H. P. 1963. The Genera of Amaryllidaceae. Amer. Plant Life Soc. La Jolla, Calif.

Traub, H. P. 1968. The subgenera, sections and subsections of **Allium** L. Plant Life 24:147-163, 146.

Wilsenach, R. 1967. On the karyology and phylogeny of **Tulbaghia** Plant Life 23: 75-83.

PAMIANTHE CARDENASII SP. NOV.

Hamilton P. Traub

Up to the present, the Genus *Pamianthe* Stapf has been regarded as monotypic, with only the single species, *P. peruviana* Stapf, a terrestrial species from north central Peru, but now a second species, from Bolivia, has to be referred to this genus on the basis of the many ovules, in piles, in the elongated ovary. It is a truly epiphytic species, one of the few in this class in the *Amaryllidaceae.* The new species is appropriately named in honor of the Dean of South American plant scientists, Dr. Martin Cardenas of Cochabamba, Bolivia, who brought this plant to our attention.

Pamianthe cardenasii Traub, **sp. nov.** Fig. 15.

Planta epiphytica; rhizomate cylindrico 8 cm. longo, 2.5 cm. lato; bulbo 2—3 cm. longo, 3—6 cm. diametro, per rhizoma sustento, collo 15—20 cm. longo, 3—4 mm. lato; radicibus 12—20 cm. longis, 3—4 mm. latis; foliis numerosis, 40—60 cm. longis lanceolatis usque ad apicem acutissimum angustatis, costa alba prominenti; scapo 6—8 cm. longo complanato; umbella biflora; pedicellis 2—2.5 cm. longis; ovario 3 cm. longo; tubo tepalorum curvato 8—12 cm. longo, segmentis tepalorum 6—7 cm. longis; cupula staminorum 6—7 cm. longa; staminibus incurvatis 1.5—2 cm. longis; stylo 8 cm. longo, stigmate trilobato.

Holotypus: Bolivia, M. Cardenas s. n., No. 1018(TRA), Aug. 1970, Prop. Chapare, Dept. of Cochabamba, near The Rio Kellu Mayu, at Km. 105.

Plant epiphytic, bulbous, with roots 12—20 cm. long, 3—4 mm. in diam., intermingled in a soft cushion of decaying remains of various other epiphytic plants, up to 28 meters high in trees. *Rhizome* 8 cm. long, 2.5 cm. in diam., supporting the rather small *bulb,* 2—3 cm. long, 3—6 cm. in diam., bulb neck 15—25 cm. long. *Leaves* numerous, lanceolate, with a prominent white mid-rib, 40—60 cm. long, 3—4 cm. wide,

much narrowed toward the very pointed apex. *Scape* 6—8 cm. long, flattened, 1.5—2.5 cm. in diam. *Umbel* 2-flowered, flowers pleasingly fragrant. *Pedicels* trigonous, 2—2.5 cm. long, green. *Ovary* hexagonous, 3 cm. long, 3 mm. in diam., green, ovules many, in piles, compressed. *Perigone* white, regular, tepaltube 8—12 cm. long, 6 mm. in diam., tepalsegs 6—9.5 cm. long, outer turning yellowish; staminal cup 6—7 cm. long, white. *Stamens* incurved, 1.5—2 cm. long; anthers 4 mm. long, yellow. *Style* 8 cm. long, greenish at the base, yellow above, stigma shortly trilobate, hairy.

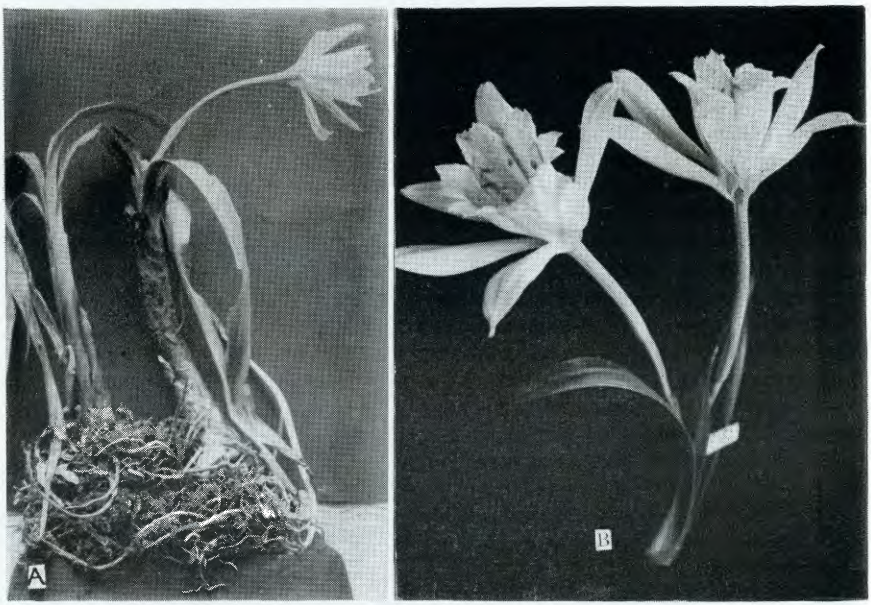


Fig. 15. **Pamianthe cardenasii** Traub, sp. nov., an epiphyte native to Bolivia. Photos by Dr. Martin Cardenas.

Range.— Known only from the type locality.

Notes.— Dr. Cardenas writes: This most interesting plant was sent to me a year ago (in 1970) by two students as an incomplete specimen. On August 4, 1971, several plants were collected for me by forest cutters of the Bartos Co., a highway building enterprise. The engineer, Sr. Jaime Rios C., sent me two complete plants, one in flower on August 10, 1971. Superficially this plant looks like another *Hymenocallis*.

I decided to go to the habitat of these plants to take photographs of the plants in their native stands. The journey from Cochabamba on August 10 was very hard indeed. They borrowed for me a camioneta, unfortunately not a 4-wheeled outfit. We arrived at the place. I

saw two trees with the Hymenocallis-like plants in bloom; more than 20 flowers were seen; but unfortunately they were inaccessible. The trees were at least 30 m. tall. However, I photographed them and came back pulled by a tractor in our camioneta for some 100 m. We arrived home finally at Cochabamba at 6 p.m.

I made this trip to the Province Chapare, near the Rio Kellu Mayu at Km. 105, about 1700 m. distant, accompanied by two assistants from the National Forest Division; from Km. 70 to Km. 105 the highway was under construction with large machinery. However, in spite of the tremendous difficulties from the interference of the machines, and the softness of the soil on a humid Andean slope, we arrived at the place where they had chopped down a big tree with the Hymenocallis-like plants in its branches days ago. I saw two giant trees, each measuring about 30 m. high. It was impossible to even guess the name of the tree species because they were not in flower. Near the top at about 28 m. from the ground, there were many Hymenocallis-like plants in flower which we could not reach.

The place was uninhabited, and the road builders were busy removing rocks and mud to level the newly opened highway. When I asked about these two giant trees which were filled at their tops with all kinds of epiphytes such as Polypodiaceae, mosses, Tillandsias, etc., the workers told me that they had to be cut down. This was saddening from the standpoint of the conservation of nature. It appears that the delightfully fragrant Hymenocallis-like plants reproduce rapidly by offsets once a seed lodges in a suitable place for germination since there were a large number of bulbs together with each main mother bulb.

NEW BOLIVIAN AMARYLLIS SPECIES

MARTIN CARDENAS, *Cochabamba, Bolivia*

Bolivia is a generously gifted country with native species of *Amaryllis*. In our present day *Amaryllis* flora, we have 21 well defined species. Out of these, 17 are native to Bolivia only. The published species of our authorship, attain to 11. No other country in America has that number of published *Amaryllis* species. We have still large unexplored areas, where more novelties are expected. In the last year, we found three more new species and one apparently known but not correctly identified. Now, we shall start diagnosing these.

Amaryllis anzaldoi Cárd. **sp. nov.**

Bulbo aliquid complanato. Folis lanceolatis inferne angustatis. Scapo subcylindrico, inferne purpureis. Umbella 2 flora. Bracteis albidis. Floribus zygomorphibus 10 cm long, 11 cm latibus. Tubo 10-12 mm long. Tepali segmentis cremeus, margine undulatus. Fructo triglobuloso.

Patria: Bolivia. Provincia Cordillera. Departamento Santa Cruz, vicinis Camiri, 800 m. Species collectori, Ing. Agron. Francisco Anzaldo

dicata.

Obs.—Species similis *A. evansiae.* Distinguo graciolier et uniformiter cremea flos coloribus.

Bulb globose 3-3.5 cm long, 4-4.5 cm thick covered by light brown tunics. Neck very short 2-3 cm long. *Leaves* not present at anthesis, 4-6, lanceolate, 24-37 cm long, 2.5-3.2 cm wide, narrowing below. *Scape* 27 cm long, subcylindric 10 mm thick at base, light green above, purplish at base. *Umbel* 2 flowered. Flowers zygomorphic as in *A. belladonna,* 10 cm long, 11 cm diam. *Spathe-valves* whitish, turning brown at its tips, lanceolate 3-4 cm long. *Pedicels* 5 cm long slender, 4 mm thick. *Ovary* fresh green, 8 mm long, 5-6 mm thick. *Tepaltube* 10-12 mm long, green outside. *Setepalsegments* lanceolate 9x2.5 cm white, creamy with a green keel without, mucronate and waved at edges. *Petepalsegments* narrower, 8x2 cm; the lowermost 8x1.5 cm, curved. All petepalsegments of the same colour as the setepalsegments. *Paraperigone* formed by scattered dark green emergencies. *Stamens* grouped on the lower petepalsegments, curved above; filaments white, greenish below, 3.5 cm long; anthers when dehiscent, 4 mm long. *Style* 4.5 cm long, curved white, greenish below. Stigma trilobate, white. Fruit trilocular 1.4 cm high, 2.5 cm broad with globular locules.

Bolivia: Province of Cordillera. Department of Santa Cruz. Yatibigua Canion, on the way from Charagua to Camiri, 800 m. No. 2863. May 1934. M. Cárdenas (Type in Herbarium Cardenasianum).

Obs.—This species was collected by me during the Bolivia-Paraguay War when I belonged to the Sanitary Corps of the Bolivian Army and when I was not yet aware of the Amaryllidaceae. A duplicate specimen was sent in 1934 to the Field Museum of Chicago, where the late Dr. Paul C. Standley identified it as *Hippeastrum petiolatum* Pax, a name obviously wrong. This past year I received from my former pupil at the School of Agriculture in the University of "San Simón", Francisco Anzaldo, bulbs of this Amaryllis which flowered. The above description is based on these living plants. The species is named after Ing. Agron. F. Anzaldo. This species is related to *A. evansiae* from an other locality by its zygomorphic cream flowers. Differs however by its gracile appearance, its uniform colour of flowers which is green below and very light cream above. Flowers of *A. evansiae* are light purple or pink-tinged.

Amaryllis divijulianus Cárd. sp. nov.

Bulbo globoso. Pseudocollo longo. Folis apice acutia, basim angustatis. Bracteis purpureis. Tubo brevissimo. Umbela 2-3 flora. Perigonio perfecto regularibus. Segmentis coccineis cum stella viridis. Fructo ignoto.

Patria: Bolivia: Provincia Chapare. Departamento Cochabamba, prope San Julian, in vicinis Tablas, 1,800 m.

Obs.—Species reminiscer *A. leopoldii* et *A. lapacensis,* tamen distinguo segmenti coloribus.

Bulb 7-8 cm long, 6 cm broad. Neck 10 cm long. *Leaves* lorate acute at tips, narrowing at base, dark green, 40-50 cm long, 4 cm wide at its middle length. *Scape* 28-33 cm long green above purplish below, 1-2 cm thick somewhat flattened below. *Spathe-valves* lanceolate 7-9 cm long, purplish. *Umbels* 2-3-flowered. *Pedicels* 6-7 cm long, light green. *Tube* only 5 mm long. *Perigone* regular 13 cm long, 16 cm wide. *Ovary* dark green 2 cm long trigonous. Setepalsegments lanceolate 11.5-12x3.5 cm dark green below with a green keel up to the tips, lateral sections vermilion red darker red streaked outside, vermilion red with a light green star with short or long rays inside. *Paraperigone* haired very light green. *Stamens* 6.5-7.5 cm long; filaments light green at base, light purple red above; anthers yellow 5 mm long. *Style* 10 cm long of the same colour with stamens. Stigma yellowish slightly trilobate.

Bolivia. Province of Chapare. Department of Cochabamba. Peñón de San Julian near Tablas, 1,800 m. M. Cárdenas, No. 6321, August 1970 (Type in Herbarium Cardenasianum).

Obs.—This species was brought from Peñón de San Julian by muleteer Amerindians and delivered to an Amerindian gardener in whose house several flowering plants were examined by the author. Later on, bulbs were collected from that locality, where it grows as a wild species. *A. fragrantissima* also. The flowers of this new taxon are the most regular we know and its vermilion red color, makes it a valuable germplasm source for breeders.

Amaryllis caupolicanensis Cárd. **sp. nov.** Fig. 17-A

Geophyta vigorosa. Folis striatis luxurians, atro viridis. Scapo longissimo. Umbela 2-3 flora. Bracteis diluto viridis. Perigonio zigomorpho 11-12 cm long. Segmentis extus viridibus, intus rubis flavo virgatis. Omnia segmenta apice albo lineata. Fructo conico aplanato, 4.5 cm lato.

Patria: Bolivia, Provincia Caupolican. Departamento La Paz, Prope hortus Apolo Coenobium, 1,400 m.

Geophyte, vigorous. *Bulbs* 7 cm long, 7.5 cm broad, green. *Leaves* about 12, lorate 52-58 cm long, 2.5-5 cm wide, fresh green, striate with darker parallel grooves. *Scape* 50-73 cm long, 2.5 cm thick at its base 1 cm thick above, glaucous, pruinose, flattened below, cylindric above. *Spathe-valves* 6-7 cm. light green, brownish when drying. Bracteoles filiform 5 cm long. *Umbel* 2-3-flowered. *Pedicels* 4.5 cm long fresh green, darker above. *Ovary* 2 cm long, hexagonous, dark green. *Perigone* 11-12 cm long. 12 cm wide. Setepalsegments lanceolate 10x3 cm acute, greenish outside, red inside with yellow bars and stripes. Petepalsegments lanceolate, acute of the same colour as the setepalsegments. All segments white striped at the edges. Tube short, 8 mm long, dark green. *Paraperigone* light green. *Stamens* 10 cm long curved upwards, yellow greenish below, light red above. Anthers 5 mm long. *Style* 11 cm long, light green, yellowish below, purplish above. *Stigma* trilobate dark lilac-pur-

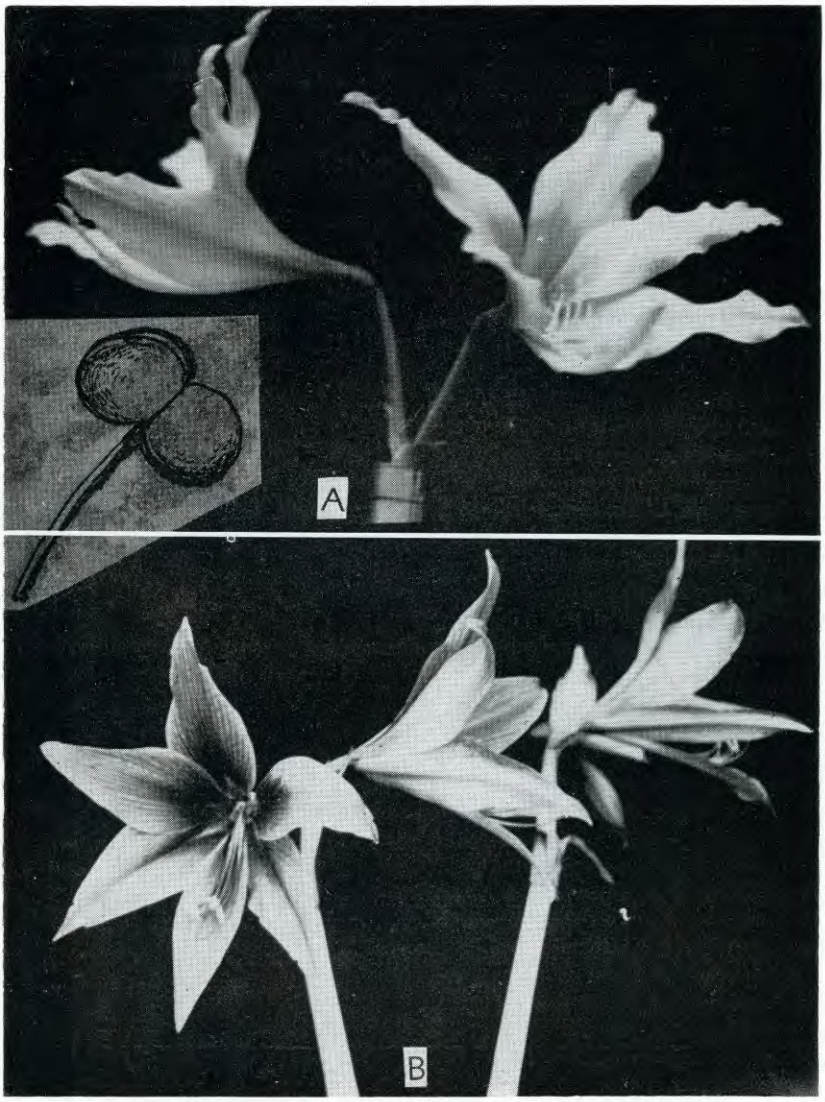


Fig. 16. **A, Amaryllis anzaldoi** Cardenas **sp. nov.; B, Amaryllis divijulianus** Cardenas, **sp. nov.** Photos by Dr. Martin Cardenas.

ple. *Fruit* flattened conic 2.2 cm high, 4.5 cm wide.

Bolivia. Province of Caupolican. Department of La Paz. Growing at the Convent of Apolo, 1,400 m. M. Cárdenas, August 1971, No. 3623 (Type in Herbarium Cardenasianum).

Obs.—This vigorous plant with peculiar leaves and flowers was growing at the Apolo Convent garden. It was brought from the wild, probably from nearby Huarutumo River by a native Amerindian.

Amaryllis neoleopoldii Cárd. sp. nov.

Bulbo globoso 7 cm diam. Scapo subtereto. Umbella 2 flora. Bracteis flavo viridiscentibus. Floribus superbus 14 cm long. 15-18 cm latibus. Tepalsegmentis rhomboide-ellipticis 11-12 cm long. 5 cm latis extus cremea viridiscentibus, intus sanguineo rubis, margine albidis.

Patria: Bolivia. Provincia Caupolican. Departamento La Paz, vicinis Fluvis Tumo, 1,200 m.

Obs.—Species valde similiter vel ejusdem *Amaryllis leopoldii,* jam pridem deperdo.

Bulb globose 7 cm diam. Neck short, 5 cm long. *Scape* 20 cm long, subterete 18 mm thick at base, two ribed, tapering. *Umbel* 2-flowered. *Spathe-valves* lanceolate 8 cm long, straw yellow greenish. *Pedicels* 3-3.5 cm long dark green. Flowers 14 cm long, 15-18 cm wide. *Ovary* 2 cm long, trigonous, dark green. *Perigone* the most regular known among Amaryllis species. Tepaltube very short, 5 mm long. Tepalsegments rhomboid-elliptic 11-12 cm long, 5 cm wide except the lower tepalseg which is only 3.5 cm wide. The tepals are cream light greenish, green at base outside, solid red at the longitudinal middle section inside, fading laterally to red stripes and dots. The borders are white cream. All tepals very finely picotee. Floral throat greenish with bifid and trifid lighter bars at the base of each tepal. *Paraperigone* white greenish, hairy. *Stamens* curved upward, uneven 6-7 cm long; filaments light green at base, white at its middle section, purple above; anthers yellow 7-8 mm long when shedding pollen. *Style* slightly longer than stamens and of the same colour. Stigma remotely trilobate, purple.

Bolivia. Province of Caupolican. Department of La Paz. Tumo River basin, 1,200 m.

Obs.—This superb species bears the most regular and showy flowers known up to now in the genus. This might be the plant discovered together with *A. pardina* by R. W. Pearce (sent to South America by the British nursery, Veitch & Son on his second journey). It is said that he sent to England in 1865 from Peru these two species. However, in spite of the extensive botanical explorations made in Perú, by Ruiz and Pavon, Raimondi, Weberbauer, Velarde, Ferreyra, Vargas and many others, neither of these two species were collected. It is to be presumed that Pearce purposely avoided giving the true locality of his extraordinary discovery in order to hide it from others.

As there is not a type specimen of *Amaryllis leopoldii* nor a colour illustration published, we are diagnosing it as a different species. Our

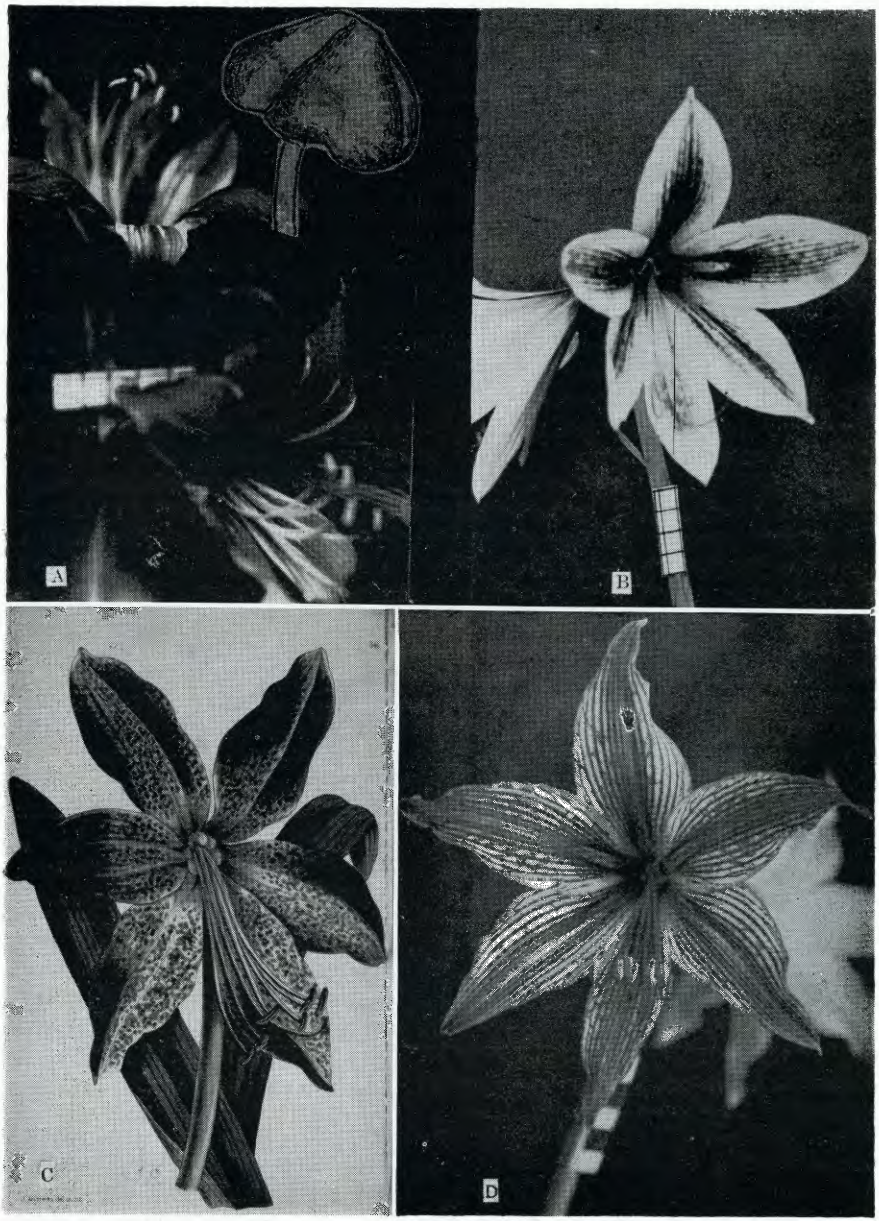


Fig. 17. **A, Amaryllis caupolicanensis** Cardenas, **sp. nov.**; **B, Amaryllis neoleopoldii** Cardenas, **sp. nov.**; **C, Amaryllis pardina** Hook f. (from color plate in Floral Magazine 6: plate 344.); and **D, Amaryllis neopardina** Cardenas, **nom. nov.**

Amaryllis pseudopardina, published in Plant Life (1965) seemed close to the lost species of Pearce. However, *A. neoleopoldii,* differs from *A. pseudopardina,* by its much larger flowers, wider tepals, longer ovary, colour of floral parts and its geographical origin.

Amaryllis lapacensis Cárd. **sp. nov.**

Geophyta. Bulbo globoso. Folis espatho-lanceolatis. Umbela 2 flora. Bracteis diluto bruneis. Floribus regularis actinomorphis. Segmentis lanceolatis albidis intus rubro lineatis.

Patria: Bolivia. Provincia Sud Yungas. Departamento La Paz, prope Hacienda Chocana 1,700 m.

Obs.—Species *A. leopoldii* similis. Differe manifestus tepali rubro-lineata et non a basim solido coloribus.

Geophyte. *Bulbs* globous, covered by brown scales, 3-7 cm long, 5-7 cm thick, somewhat flattened at base. *Leaves* spathulo-lanceolate 30-60 cm long, 3-4 cm wide, slightly grooved, acute. *Scape* 30-60 cm long, 1-2 cm thick at base, whitish below, green above. *Spathe-valves* lanceolate 5 cm long brownish at anthesis. Bractlets whitish 4 cm long. *Umbel* two-flowered. *Pedicels* 3.5-4 cm long, 5 mm thick, green. Flowers actinomorphic. *Ovary* obconic 1 cm long, dark green, trigonous. *Perigone:* tube short, 3mm long. Setepalsegments lanceolate 10x3.7 cm. Petepalsegments lanceolate 9.5x3-3.5 cm. All segments white, green at base with a green keel fading in colour toward tips, outside white greenish at base and crimson streaked inside. *Paraperigone* hairy, white. *Stamens* 5.5 cm long; filaments light green at base, white at its middle section and light purple above. Anthers 4 mm long, yellow above, dark gray beneath. *Style* longer than stamens, 9.5 cm long of the same colour as stamens. Stigma trilobed, dark purple.

Bolivia. Province of Sud Yungas. Department of La Paz. Hacienda Chocana, near Puente Villa 1,700 m. July 1958. M. Cárdenas No. 6325 (Type in Herbarium Cardenasianum).

Obs.—We collected this taxon for the first time at the above mentioned locality in July, 1958. Professor Nelson found this same species at Santa Cruz, Bolivia, 550 m. in 1954 and identified it as *Amaryllis pardina* Hook. f. When we collected flowering material in July 1958 and bulbs in November of the same year at Chocana, we followed Prof. Nelson in his identification. Later on, we have read the original description of *H. pardinum* with a colour illustration in Floral Magazine 6: Plate 344 and came to the conclusion that we were wrong identifying our Hacienda Chocana plant which has crimson *striped* tepals. In the description of *Hippeastrum pardinum,* we read: "The marking of the flowers is also very peculiar, *not striped* (non vittata) and dashed". The true *H. pardinum* was probably collected by Pearce not in Peru, but in the Apolo area in Bolivia, where we have seen it. On the other hand what was passing as *A. pardina,* is a new species. There are in Bolivia three related species: one closely related to *A. leopoldii,* lastly collected by one of our assistants at the Apolo district, *A. pseudopardina* Cárd. from Yungas de Corani, Chapare, Cochabamba and the present

new species, *A. lapacensis*. To make clear this taxonomic situation we shall substitute the name *A. pseudopardina* for *A. pseudoleopoldi* (Cárd.) nom. nov. The more closely resembling *A. leopoldii* of our last year's collection, should be named *A. neoleopoldii* Cárd.

AMARYLLID GENERA AND SPECIES

HAROLD N. MOLDENKE

[In this department the descriptions of amaryllid genera and species, particularly recent ones, translated from foreign languages, will be published from time to time so that these will be available to the readers.]

Ugernia flava Boiss. & Hausskn. in Boiss. Fl. Or. 5: 149. 1882; Wendelbo, Amaryll. in Rechinger, Fl. Iranica No. 67/3. 1. p. 4. 1970.

Bulb large, the tunics shiny, purple-black, prolonged into a long neck; leaves vernal, marcescent at time of flowering, about 20 cm. long and 1.5-2 cm. wide, flexuous; scape 10—25 cm. long; spathe valves up to 7 cm. long; umbels 5—10-flowered; pedicels unequal, 1.5—5 cm. long; perigonium becoming yellowish, with a rose-colored median band, the tube about 6 mm. long, the segments about 22 mm. long and 4 mm wide. It flowers from July to August.

Hemerocallis darrowiana Shiu-ying Hu, Hemerocallis Journal 23(4): 42, Fig. p. 43. 1969 (1970).

Low perennial herb, 10—14 cm. tall; exterior leaves plicate and recurved, the interior ones linear or ensiform, 5—8 cm. long, 2—8 mm. wide; peduncle very short; pedicels 1—4 cm. long; flowers 2, the perianth 6 cm. long (the tube 2 cm. long, the segments 4 cm. long); capsule unknown.

FAMATINA GEN. NOV., AMARYLLIDACEAE

PEDRO FELIX RAVENNA, *Departamento de Biologia, Facultad de Ciencias, Universidad de Chile*

Since 1961, the discovery of an interesting plant in the mountains of Catamarca (Argentina), suggested the presence of an undescribed genus. At that time, when examining the flower, my attention was attracted by the peculiar placement of stamens and style, which resulted in an inverted zygomorphism. This kind of structure did not fit the usual flower types in the family. In fact, although resembling a *Rhodophiala,* the flower had much of the aspect of a *Gladiolus,* or more precisely of a *Homoglossum.*

During the necessary inquiries, a close affinity between this and *Phycella herbertiana* was found. Therefore, it was provisionally considered with some doubt, as pertaining to *Phycella.* Recently however, I had the opportunity to investigate, in their living condition, the flowers of two genuine *Phycella* species, such as *Ph. ignea* and *Ph. brevituba.* It then became clear that the critical plant above mentioned, along with the so called *Phycella herbertiana*, and another unnamed species, should

belong to a natural group of generic rank. The distinctive structure and position of the different parts of the flower, including the perigone, androecium, paraperigone and style, are, in my opinion, solid arguments for proposing a new genus.

FAMATINA GEN. NOV. (TRIBE HABRANTHEAE)

Flores plus minusve zygomorphi. Perigonii tubus brevis. Tepala in duis tertiis inferioribus vel ultra convoluto-contiguis deinde oblique vel recurve patentia. Stamina fasciculata ascendentia vel subrecta; filamenta quadriseriata; antherae reniformes versatiles. Paraperigonium in annullo valde fimbriato-lacerato ad basin veram tepalorum situm reductum. Stylus filiformis ascendens prominens supra fasciculum staminorum situs; stigma capitatus. Capsula globoso-tricocca; semina complanata nigra ad margines membranacea.—Bulbus tunicatus. Folia lineria modice canaliculata serotina vel synanthia. Scapus fistulosus teres. Spatha bivalvata; valvae liberae vel ad basin leviter connatae subaequales.

Flowers more or less zygomorphic. Perigone tube short. Tepals convolute-contiguous for two thirds or more, spreading obliquely or recurved. Stamens fasciculate, ascending or almost straight; filaments of four different lengths; anthers reniform, versatile. Paraperigone reduced to a fimbriate-lacerate ring at the base of tepals. Style filiform, ascending, prominent, placed above the stamen fascicle; stigma capitate. Capsule globose-tricoccous; seeds flat, black, with membranous margins.—Rootstock a tunicated bulb. Leaves linear moderately channeled, serotine or present at flowering time. Scape hollow, cylindric. Spathe bivalved; valves almost equal, free or slightly connate at the base.—Type-species: *Famatina saxatilis* Rav.

Three species from the Andes of Argentina and Chile. *F. saxatilis* Rav., inhabits the mountains of Catamarca and La Rioja, in Northwestern Argentina; *F. herbertiana* (Lindl.) Rav., a native of San Juan and Mendoza (Arg.), and of the province of Aconcagua, near the border, in Chile; *F. maulensis* Rav. grows in Talca, in the latter country. The generic name commemorates the Famatina mountain system, in the province of La Rioja, where the type-species is found.

1a. Flowers ascending.
1. *F. saxatilis*

1b. Flowers horizontal to declined.
2a. Perigone about 3 cm long, the stamens not protruding from it.
2. *F. maulensis*

2b. Perigone 4.5—5.8 cm long, the stamens protruding from it.
3. *F. herbertiana*

1. *Famatina saxatilis sp. nov.*
(Fig. 18-B)

A *Famatina maulensi* et *herbertiana* floribus erecto-patentibus magis expansis scapo perbrevi differt.

Plant about 8.8-15 cm high. *Bulb* ovoid ca. 5 cm long, 3.5-4 cm in diameter, produced into a 8-9 cm long pseudo-neck, profusely covered with dark brown membranous coats. *Leaves* linear, a dark green, mod-

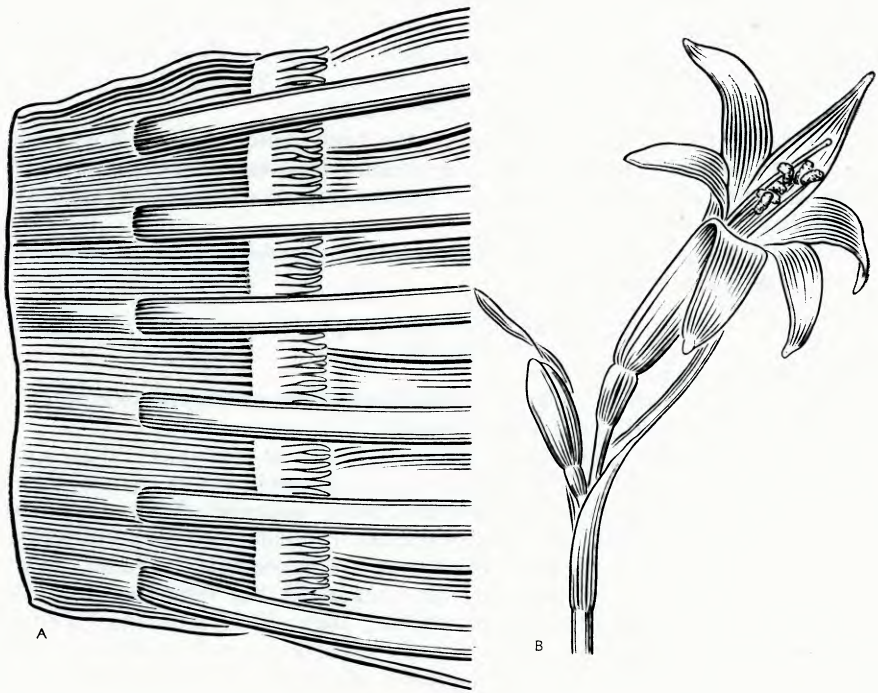


Fig. 18. **A, Famatina herbertiana** (Lindl.) Rav., detail of paraperigone and stamen insertian, x4.5; **B, Famatina saxatilis** Rav., inflorescence x0.6; P. F. Ravenna del.

erately channelled, absent at anthesis, to 20-40 cm long, 6-7 mm broad. *Scape* reddish about 1-6.8 cm long, 3.1-3.5 mm in transverse section. *Umbel* two-flowered; *Spathe-valves* narrowly lanceolate or linear-lanceolate, reddish, membranous, marcescent, connated for 2-3.5 mm, ca 33-51 mm long. *Pedicels* 8-27 mm long. *Flowers* ascending, bright red, about 3.8-4.2 cm long, 30-40 mm in diam. Tepals narrowly oblanceolate, connate for 5-6 mm, to 38 mm long, 5-7 mm broad, the inner often slightly narrower. *Stamens:* filiform, fascicled, shorter ca. 22-25 long,

longer pair to 31 mm long; anthers oblong-reniform, about 2.1-2.7 mm long; pollen yellow. *Ovary* obovoid, obtusely trigonous, a reddish brown, ca. 4.9-6 mm long, 3-3.2 mm broad. Style slightly curved, prominent, surpassing the stamens, to 36-40 mm long; stigma capitate, slightly trilobed.

Hab.—In a high valley called Pastos Largos, at 3500 m. over the sea level, above Fiambalá, in the province of Catamarca, Argentina; it grows among stones on arid, nude slopes, in the west side of the valley. It is also found on the Famatina mountain branch, of La Rioja (Arg.).

Specimens: In convalle Pastos Largos dicto provinciae Catamarcae Argentinae; leg. Ravenna 109, XII-1961 (typus in Herb. Ravennae). Prov. La Rioja, Sierra de Famatina, Cueva del Tocino; leg. A. Krapovickas & J. Hunziker 5379, 15-I-1949 (BAB).

This pretty plant is endemic in the high mountains of North La Rioja and South Catamarca, in Argentina. It is easily distinguishable from the rest of the species by the contrasting characters that appear in the key.

The flower shape much is reminiscent of *Homoglossum watsonium*, a South African Irid.

2. *Famatina maulensis sp. nov.*
(Fig. 19.)

A *Famatina saxatili* et *herbertiana* floribus parvis perangustis staminibus perigonio haud excedentibus recedit.

Plant about 34-36 cm high. *Bulb* ovoid ca. 32 mm long, 20-22 mm in diam., prolonged for 35-60 mm into a pseudo-neck; outer coats a dark brown. *Leaves* 3-4, present at anthesis, linear, somewhat fleshy, to 20-30 cm long, 2-3 mm broad. *Scape* cylindrical, reddish, ca. 30-32 cm long. *Umbel* two-flowered, reddish. *Spathe-valves* lanceolate, reddish, subequal, membranous, to 22-24 mm long, connate at the very base for 1.5 mm; inner bracts linear-lanceolate, whitish, about 10-17 mm long. *Pedicels* ca. 28-31 mm long. *Flowers* red, slightly curved, horizontal to declined, very narrow. *Ovary* narrowly ellyptic. *Perigone* about 30 mm long, 7-9 mm in diam. at the apex. Tepals connate for 4-4.5 mm then 25-25.5 mm long. Imbricate-contiguous for ¾ of its length, the upper fourth slightly spreading; outer series ca. 2.5 mm broad, apiculate; apiculum 0.7-0.8 mm long; inner series 2.6-2.8 mm broad. *Stamens* rather shorter than the perigone. *Paraperigone* very minute, less than 1 mm long, lacerate. *Style* 33-34 mm long; stigma capitate.

Hab.—Sandy places not far from the shores of the Laguna del Maule, in the province of Talca, Chile. It grows in the same places where also *Rhodophiala montana* (syn. *Rh. bakerii*) is found, but in this region the latter flowers much earlier.

Specimens: Chile, prov. of Talca, near Laguna del Maule; leg. Zoellner, XII-1969 (type in Herb. Ravenna, isotype Herb. Zoellner).

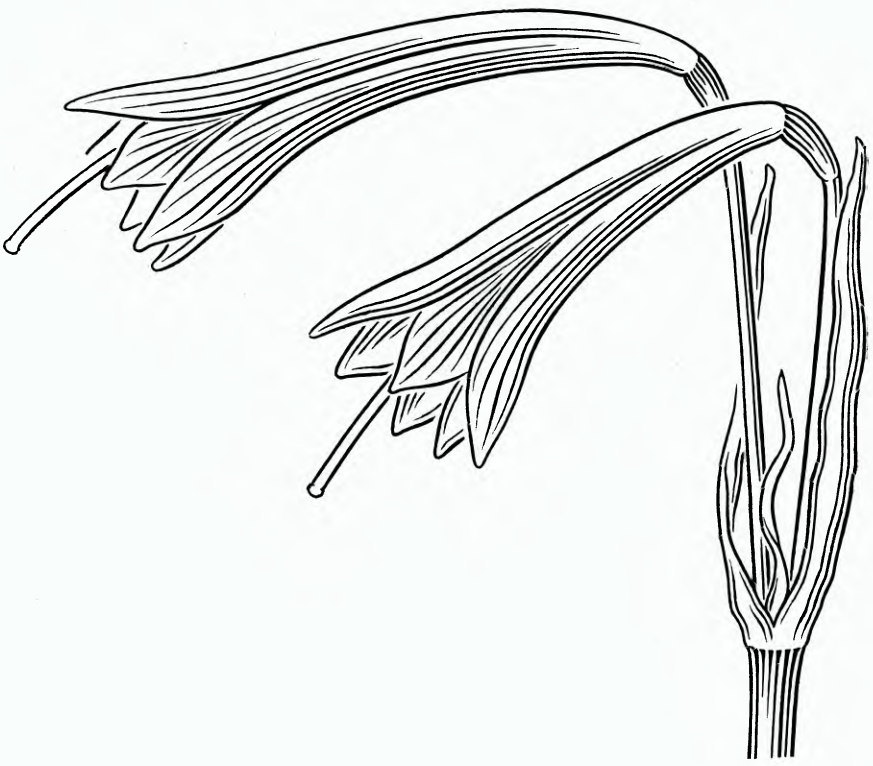


Fig. 19. **Famatina maulensis** Rav., inflorescence. P. F. Ravenna del x2.25.

Although related to *F. herbertiana* this small-flowered species cannot be mistaken for it. The very minute paraperigone and the stamens shorter than the perigone are distinctive features.

3. *Famatina herbertiana* (Lindl.) comb. nov.
(Figs. 18-A and 20.)

Phycella herbertiana Lindley, Edwards' Bot. Reg. 16: tab. 1341. 1830.—*Hippeastrum herbertiana* (Lindl.) Baker, Handb. Amaryll.: 45. 1888.—*Amaryllis herbertiana* (Lindl.) Traub et Uphof, Herbertia 5: 121. 1938.

Bulb ovoid or widely ovoid, about 39-60 mm long, 35-40 mm in diam., produced into a 8-19 cm long pseudo-neck, outer coats many, a dark brown, sphacelate. *Leaves* contemporaneous with the flowers or

Fig. 20. **Famatina herbertiana** (Lindl.) Rav., reproduced from Bot. Reg. 16: tab. 1341, 1830. Retouched photo by P. F. Ravenna.

rarely serotine, linear, moderately channelled, somewhat fleshy, often prostrate and falcate, about the scape length, 6-13.5 mm broad. *Scape* subcylindrical, rufescent, ca. 10-28 cm long, 4-7 mm in transverse section. *Spathe-valves* membranous, marcescent, reddish, its valves subequal, lanceolate, often slightly connate at the base, about 34-64 mm long; inner bracts very thin, filiform, as much as flowers shorter than the pedicels. *Umbel* 3-6-flowered. *Pedicels* 14-40 mm long, becoming longer and stouter with fructification. *Flowers* fire-red or crimson, narrowly infundibulate, often somewhat curved (resembling the genus *Anigozanthos*), horizontal or declinate. *Ovary* obovoid, obtusely trigonous, a brown green, ca. 2.8-4 mm long, 1.5-1.8 mm broad. *Perigone* somewhat bilabiate, ca. 30-40 mm long, expanding 13-17 mm toward the apex. Perigone-tube ca. 2.5-3 mm. Tepals narrowly oblanceolate, permanently contiguous for 15-17 mm, then spreading moderately, to 28-30 mm long; outer series ca. 4.5-6.5 mm broad, apiculate; apiculum 1.2 mm long, densely glandular-pilose on the inner face; inner series slightly narrower, acute. *Stamens:* filaments filiform, inserted all at the same level on the inner half of the perigone tube, upper episepal ca. 16.8 mm long, lateral episepal about 20.7 mm long, lower epipetal to 26.2 mm long, lateral epipetal 28.5-28.8 mm long; anthers yellow, 2.8-2.9 mm long. *Paraperigone* annullar, whitish, lacerated for almost two thirds, placed at the base of segments. *Style* longer than the stamens, to 32-36 mm long, filiform, red in the upper fourth; stigma capitate. *Capsule* globose-tricoccous. Seeds compressed, subovate, black, with membranous margins.

Hab.—Andes of Mendoza and San Juan (Arg.), and in the province of Aconcagua, Chile.

Specimens: Argentina, Prov. of Mendoza, Tunuyán, Bella Vista; leg. G. Covas 18014, XII-1946 (SI). Idem, environs de Mendoza: (?); leg. Carette, XII-1906 (BA 36642). Idem, Precordillera de San Ignacio; leg. R. Sanzin 144 (BA 25/1871). Idem, Dept. Las Heras, Quebrada del Toro; leg. G. Covas 618, 5-XI-1942 (SI). Idem, between Villavicencio and Paramillo leg. J. Hunziker & A. Calantramé 3295, I-1948 (BAB). Idem, Villavicencio, Los Hornillos, 2850 m; leg. W. Partridge 21-XII-1963 (BA 59609). Idem, Paramillos de Uspallata; leg. Castellanos, 6-I-1941 (BA 36642). Idem, between Cajón de la Pampa and Cerro Bayo; leg. Bodenbender, X-1896 (BAF). Idem, in a valley between Villavicencio and Paramillo; leg. Gillies (photo from the type of *Phycella graciliflora* from K, Herb. Hooker). Prov. of San Juan, Paramillos; leg. Echegaray (photo 9975 from the type of *Habranthus gladioloides*, Field Mus. series). Chile, prov. of Aconcagua, Portillo; leg. Castellanos, 1-I-1938 (BA 23019). Idem, Portillo, side of Mendoza; leg. W. Díaz, 1861-62 (SGO 47170); Cumbre Andium Claustrum; leg. Macrae, 1825 (photo nr. 434 at SGO, the specimen det. *Habranthus phycelloides* Herb. at K).

From 1830, when Lindley described it, this plant had its origin misassigned. This author says: "A native of Cumbre, a mountain pass between Valparaíso and Santiago". The plant had passed, until

our days, exclusively as Chilean, and its native area referred by successive authors, beginning by Baker, as "Cordilleras de Santiago". The latter designation was taken from the type-sheet of *Rhodophiala andina* Phil., a species treated by Baker as a synonym of *Hippeastrum herbertianum* (Lindl.) Bak. (=*Famatina herbertiana*), but which I consider as a distinct *Rhodophiala.*

One of the almost classic itineraries of the botanists and explorers of Chile in the last century, was the route eastwards, along the valley of the river Aconcagua, on the way of the high elevations of the Andes which finally reaches Mendoza. In his "Reise in Chile . . .", Poeppig gives a vivid narrative of his own experience (Chapter 4): "Passing by El Portillo, a place where the porphiry walls approximate in such manner that they scarcely permit the mule to pass, I finally reached the upper part of the valley where I traveled from Santa Rosa downwards to the fertile fields of Aconcagua and Quillota. A stony and sterile slope extends, and when the fastidious and rugged path disappears to the eye, here is found the point near to the anxiously desired goal: La Cumbre, which is reached from here less than an hour later". La Cumbre is the old name of the Uspallata pass, which is the access to the wide valley of Uspallata in the territory of Argentina. It is not a coincidence that the latter is the region where *Famatina herbertiana* is almost abundant. Portillo is apparently the only place in Chile where the plant is found.

The confusion probably originated during the introduction of the bulbs into cultivation. Some one could have interpreted the place where they had been gathered, as the higher point between Valparaiso and Santiago, which is also sometimes called Cumbre. Otherwise it is unquestionable that the species is not there.

The plant was reclassified by Herbert (1837) as *Phycella graciliflora,* on the basis of a specimen collected by Gillies in Mendoza; and by Hieronymus (1881) as *Habranthus gladioloides.* The type-specimen of the latter was gathered at Paramillos, in the province of San Juan; this place should be referred to the northernmost part of the high valley of Uspallata, in San Juan, which is also called "Paramillos de Uspallata".

Among the photographs of herbarium sheets deposited at the Museum of Santiago, there is one (nr. 434) which bears the following notation: "Habranthus phycelloides—Cumbre Andium Claustrum; Macrae 1825 (Herb. Soc. Hort. Lond.)". The specimen is identifiable as *Famatina herbertiana* (Lindl.) Rav. Therefore, it seems quite likely that Macrae had been the collector who first sent bulbs of this species to Great Britain. Plants in flower where described five years later, in 1830, by Lindley.

LITERATURE CITED

Baker, J. G., 1888, Handbook of the Amaryllideae, 216 pgs., London.
Herbert, W., 1837, Amaryllidaceae, 428 pgs., 48 pls., London.
Hieronymus, G., 1881, Bol. Acad. Cienc. Cordoba (Argentina) 4: 70.
Lindley, J., 1830, **Phycella herbertiana,** Edwards' Bot. Reg. 16: tab. 1341.
Pöppig, E., 1835, Reise in Chile, Peru und auf dem Amazonenstrome wärend der Jahre 1827-1832, 2 vls., Leipzig 1835-1836.

ALLIUM SPECIES AND VARIETIES *

Allium membranaceum Ownbey, *sp. nov.;* in Munz & Keck, Calif. Flora, p. 1371. 1959, *anglice.* Indumentis interioribus bulbi reticulis quadratis per lineas verticalia arcte sinuosas ornatis; foliis 2 complanatis scapum aequantibus; scapo complanato 1.5—3.5 dm. alto; umbella 15—35-flora; floribus albidis usque ad rubellis; staminibus tepalis dimidio brevioribus; stigmate capitato; cristis capsulae 6 brevibus triangularibus. CALIFORNIA. BUTTE CO.: just east of Brush Creek Ranger Station, S. 8, T. 21 N., R. 6 E., June 25, 1946, *M. & G. B. Ownbey 2945* (WS, *Type*).

Allium siskiyouense Ownbey, *sp. nov.;* in Munz & Keck, Calif. Flora, p. 1372. 1959, *anglice.* Indumentis interioribus bulbi sine reticulis definitis; foliis 2 subfalcatis 2—3 mm. latis; scapo 3—7 cm. alto leviter compresso; umbella 10—20-flora; floribus roseis, costa atrorosea; staminibus tepalis 1/3 brevioribus; capsulis tricristatis, cristis integris centralibus. OREGON. JACKSON CO.: grown at Pullman, Washington, from bulbs of *Ownbey & Preece 3336,* from Siskiyou Mts., 1.0 miles south of summit, *Type* (WS).

Allium hoffmanii Ownbey, *sp. nov.;* in Munz & Keck, Calif. Flora, p. 1374. 1959, *anglice.* Indumentis exterioribus bulbi sine reticulis definitis; folio singulo complanato 4—8 mm. lato scapum superanti; scapo 5—10 cm. alto; umbella 10—40-flora; floribus purpureo-rubellis, costis viridibus; cristis capsulae 6 demissis. CALIFORNIA. Type, *F. W. Hoffman 2890* (WS), on serpentine, at a small lake, north side of Red Lassic, headwaters of Little and Big Van Duzen Rivers, 5,500 ft. alt., near the boundary line between Humboldt and Trinity counties, July 14, 1949.

Allium sanbornii var. *jepsonii* Ownbey & Aase, *var. nov.; Allium sanbornii* var. *jepsonii* Ownbey & Aase, in Munz & Keck, Calif. Flora, p. 1375. 1959, *anglice.* Foliis scapum subaequantibus; tepalis 7—8 mm. longis; staminibus bene inclusis; stigmate distincte trifido. CALIFORNIA. TUOLUMNE CO.: Table Mountain, above Rawhide, 2000 ft. alt., May 23, 30, 1919, *Mrs. W. J. Williamson 157* (CAS, DS *TYPE,* POM, RM, UC, US, WS).

Allium sanbornii var. *tuolumnense* Ownbey & Aase, *var. nov.; Allium sanbornii* var. *tuolumnense* Ownbey & Aase, in Munz & Keck, Calif. Flora, p. 1375. 1959, *anglice.* Foliis scapo brevioribus; tepalis 6—8 mm. longis; staminibus perigonio quarta pars brevioribus; stigmate trifido. CALIFORNIA. TUOLUMNE CO.: canyon of Spring Gulch on Rawhide Hill, 1200 ft. alt., May 12, 1919, *Mrs. W. J. Williamson 64* (DS *TYPE,* UC, US, WS).

Allium howellii var. *clokeyi* Ownbey & Aase, *var. nov.; Allium howellii* var. *clokeyi* Ownbey & Aase, in Munz & Keck, Calif. Flora, p. 1376. 1959, *anglice.* Scapo 1.5—3 dm. alto crasso; staminibus peri-

---

* **Editorial Note.**—These taxa were invalidly published. Dr. Marion Ownbey has kindly furnished the holotype citations which makes it possible to validate the names of the taxa.—**Hamilton P. Traub**

gonium subaequantibus. CALIFORNIA. VENTURA CO.: Lockwood Valley, 1500 m. alt., May 22, 1935, *I. W. Clokey & E. G. Anderson 6554* (CAS, MO, NEB, NY, POM, UC *TYPE*, US, UTC, WS).

Allium fimbriatum var. *munzii* Ownbey & Aase, *var. nov.; Allium fimbriatum* var. *munzii* Ownbey & Aase, in Munz & Keck, Calif. Flora, p. 1377. 1959, *anglice*. Scapo 1—2.5 dm. alto; tepalis rubellis 7—9 mm. longis; cristis ca. 1 mm. altis triangulari-lanceolatis integris vel grosse dentatis. CALIFORNIA. RIVERSIDE CO.: 3 miles s. of Glen Ivy, Apr. 29, 1922, *P. A. Munz 5051* (DS, POM *TYPE*).

Allium fimbriatum var. *sharsmithae* Ownbey & Aase, *var. nov.; Allium fimbriatum* var. *sharsmithae* Ownbey & Aase, in Munz & Keck, Calif. Flora, p. 1377. 1959, *anglice*. Scapo 5—10 cm. alto foliis dimidio brevioribus; tepalis 10—15 mm. longis roseo-rubellis; cristis integris vel subintegris. CALIFORNIA. STANISLAUS CO.: near head of Arroyo del Puerto, Red Mts., 1300 ft. alt., May 19, 1935, *H. K. Sharsmith 3143* (WS *TYPE*).

Allium fimbriatum var. *diabolense* Ownbey & Aase, *var. nov.; Allium fimbriatum* var. *diabolense* Ownbey & Aase, in Munz & Keck, Calif. Flora. p. 1377. 1959, *anglice*. Scapo 7—25 cm. alto; foliis scapum aequantibus vel duplo longis; tepalis 7—9 mm. longis; cristis grosse dentato-laciniatis. CALIFORNIA. STANISLAUS CO.: near head of Arroyo del Puerto, Red Mts., Mt. Hamilton Range, 1750 ft. alt., May 18, 1935, *H. K. Sharsmith 3117* (WS *TYPE*).

Allium fimbriatum var. *denticulatum* Ownbey & Aase, *var. nov.; Allium fimbriatum* var. *denticulatum* Ownbey & Aase, in Munz & Keck, Calif. Flora, p. 1376. 1959, *anglice*. Tepalis interioribus minute denticulatis; cristis integris vel dentatis. CALIFORNIA. KERN CO.: sandy open flats, 9 mi. n. of Ricardo, May 5, 1932, *P. A. Munz 12461* (MO. POM *TYPE*, UC).

Allium fimbriatum var. *abramsii* Ownbey & Aase, *var. nov.; Allium fimbriatum* var. *abramsii* Ownbey & Aase, in Munz & Keck, Calif. Flora, p. 1376. 1959, *anglice*. Squamis bulbi interioribus albidis vel subrubellis, squamis exterioribus cinereis; tepalis angustis recurvatis intense roseo-purpureis; cristis integris vel subintegris. CALIFORNIA. FRESNO CO.: Pine Ridge, 5,300 ft. alt., June 15-25, 1900, *H. M. Hall & H. P. Chandler 201* (DS *TYPE*, MO, NY, UC, US).

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

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

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

Correspondence regarding registration of all amaryllids such as **Amaryllis, Lycoris, Brunsvigia, Clivia, Crinum, Hymenocallis,** and so on should be addressed to 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, 1971

Registered by John M. Cage, 740 Arroyo Road, Los Altos, Calif. 94022:

'Great Pumpkin' (Cage, 1971), R; A-919; D-5b; U—4-fld; 28″ h; 9½″ diam.; 3″ deep; burnt orange (Hcc-714); win.; dec.; ¼ *A. aulica* parentage; solid color; lanceolate leaves.

'Rojo Alto' (Cage, 1971) R; A-290; D-5a; U—4-fld, in late win.; 24″ high; fls 8″ diam.; oxblood red (HCC-820), throat shiny; cross of selfed 'Fire Dance' and selfed 'Athos'.

AMARYLLID NOTES, 1972

Hamilton P. Traub

Cyrtanthus speciosus (L. f.) Traub, *comb. nov.* Syn.—***Crinum*** *speciosum* L. f., Suppl. 195. 1781.

Cyrtanthus capensis Traub, *nom. nov.* Syn.—*Cyrtanthus speciosus* Dyer, Fl. Pl. S. Afr. 22: pl. 868. 1942; Herbertia 15: 17, pl. 216, f. 2. 1948 (1949), non *Crinum speciosum* L. f. Suppl. 195. 1781.

Cyrthanthus speciosus forma *magnificus* (Bak.) Traub, *comb. nov.* Syn.—*Vallota purpurea* var. *magnificus* Bak., Amaryll. 54. 1888; Fl. Cap. 6: 218. 1896; *Cyrtanthus purpureus* forma *magnificus* (Bak.) Traub, Plant Life 25: 48. 1969.

Cyrtanthus speciosus forma *albus* (Bak. ex Traub) Traub, *comb. nov.* Syn.—*Cyrtanthus purpureus* forma *albus* Bak. ex Traub, in Plant Life 25: 48. 1969, cf. Bak. Amaryll. 54. 1888; Fl. Cap. 6: 218. 1896.

Subgenus *Anoiganthus* (Bak.) Traub, *subg. nov.* Genus *Cyrtanthus* Ait. Syn.— Genus *Anoiganthus* Bak., in Jour. Bot. 16: 76. 1878.

Pyrolirion xiphopetalum (Baker) Sealy, emend. As indicated by Cardenas in PLANT LIFE 27: 38. 1971, the leaves of this species were unknown up to 1971. Under date of July 6, 1971, Dr. Cardenas furnished the first data about the leaves of this species—leaves 1 or 2, linear, up to 15 cm. long, up to 4 mm. wide, apex acute.

Allium atrorubens subsp. *inyonis* (Jones) Traub, *comb. nov.,* Syn.—*Allium inyonis* M. E. Jones, Contr. West Bot. 10: 86. 1902; *Allium atrorubens* var. *inyonis* (M. E. Jones) Ownbey & Aase, in Munz & Keck, Calif. Flora, 1377. 1959, *without lit. cit.*

Allium fimbriatum subsp. *mohavense* (Jepson) Traub & Ownbey, *comb. nov. emend.* Syn.—*Allium fimbriatum* var. *mohavense* Jepson, Fl. Calif. 1: 273. 1922; Munz & Keck, Calif. Flora, 1376. 1959; *Allium mohavense* (Jepson) Tidstr., Proc. Biol. Soc. Wash. 48: 39. 1935; *Allium fimbriatum* subsp. *mohavense* (Tidestr.) Traub & Ownbey, Plant Life 23: 110. 1967, with *incorrect basionym.*

Allium howellii subsp. *sanbenitense* (Traub) Traub and Ownbey, *comb. nov.* Syn.—*Allium sanbenitense* Traub Herbertia 12: 68. 1945 (1947); *Allium howellii* var. *sanbetinense* (Traub) Ownbey & Aase, in Munz & Keck, Calif. Flora, p. 1376. 1959, *with inadequate lit. cit.*

Allium sanbornii subsp. *inactum* (Jeps.) Traub, *comb. nov.* Syn.—*Allium inactum* Jeps. Fl. Calif. 1: 273. 1921: *A. sanbornii* var. *congdonii* Jeps., in Fl. Calif. 1: 275. 1921; Munz & Keck, Calif. Flora, 1375. 1959.

Allium melliferum Traub, *sp. nov.* Section *Rhophetoprason,* Subgenus *Amarallium,* Genus *Allium* (Alliaceae).

Bulbis novis ad apicem rhizomatum brevium efferentibus, bulbo veto plerumque non persistenti; foliis 3 vel 4 canaliculatis usque ad 30 cm. longis; scapo 35 cm. longo; spatha 1.6 cm. longa; umbella multiflora; pedicellis 2 cm. longis; ovario 1.5 mm. longo, 1.5 mm. lato, brevissime tricristato; floribus albidis, tepalis lavendulo-carinatis, introrsum ad centrum ut videtur lavendulo-vittatis; staminibus tepalis paulo

brevioribus; stylo stamina subaequanti; stigmate acuto; floribus suffimento melloideo praecipue in tempore tarde pomeridiano usque ad primum mane efferentibus.

Holotypus No. 1017 (TRA), August 10, 1971, grown at La Jolla, Calif. from stock obtained from Dr. Marion Ownbey, Washington State University, under his No. 947. This stock was originally collected by Rogers McVaugh, No. 13710, Oct. 23, 1952, in western Jalisco, "in shallow soil pockets on high bare rocky knobs in pine forest, summit, 7 miles west of Los Volcanes, road to Mascota, 1900—2000 m."

Paratype No. 1016 (TRA) with a similar history, August 15, 1968, specimen without bulb.

Caloscordum tubiflorum (Rendle) Traub, *comb. nov.*, Syn.—*Allium tubiflorum* Rendle, in J. Bot. Lond. xliv: 44-45, pl 476, figs. C, 8—11. 1906.

Alstroemeria x *racinae* Traub *hybr. nov.*, Traub, Plant Life 8: 85. 1952, *anglice*. Plantae inter parentes (*A. caryophyllaea et A. pulchella*) in cruce reciproca intermediae. Holotypus: B. M. Foster, s. n. (No. 472 TRA), cult. Orlando, Florida, 11-3-51; Paratype, same history (No. 473 TRA). Plate 13, Plant Life 6: 84. 1950, type illustration.

Alstroemeria x *orpetiae* Traub, *hybr. nov.* Plantae inter parentes (A. violacea Phil. x A. pelegrina f. alba) in cruce reciproca intermediae, floribus in generatione primo purpureis, in generationibus secundis sequentibusque plantas purpureofloras et plantas albifloras procreantibus. Holotypus: No. 868-TRA, 5-1-58, H. P. Traub, Cult. La Jolla, Calif.

CHROMOSOME STUDIES IN **AMARYLLIS** L. CULTIVARS

The following reprints have been received:

(a) Aneusomatsy in an Amaryllis Hybrid, by T. N. Khoshoo & Prakash Narin, National Botanic Gardens, Lucknow, India (in Jour. Genetics & Plant Breeding 27: 322-333, 1967).

(b) Cytogenetic Survey of Amaryllis Cultivars, by Prakash Narin and T. N. Khoshoo, National Botanic Gardens, Lucknow, India. (in Jour. Cytology & Genetics 3: 41-45, 1968).

EDITOR'S MAIL BAG—continued from page 31.

It is with great sadness that we have to report the death of Wyndham Hayward at Orlando, Florida on October 1, 1971. Mr. Hayward received the 1958 William Herbert Medal. See PLANT LIFE 14: 7—8. 1958 for brief autobiography.

PLANT LIFE LIBRARY—continued from page 32.

EXPERIMENTAL BIOLOGY, 2nd ed. by Richard W. Van Norman. Prentice-Hall, Englewood Cliffs. N. J. 07632. 1971. Pp. xiii+269. Illus. $9.95. This is the revised second edition of a standard text on experimental biology by an outstanding authority in the field. The subject is discussed under the headings science, research in biology, biological literature, selection of techniques, selection and preparation of organisms, centrifuges, microscopy, colorimetry—spectrophotometry, measurements of gas exchange, chromatography, isotopic tracers, electrical measurements, other physical methods, calculation of data, statistical treatments, experimental design, and the manuscript. This valuable text is very highly recommended to the beginning student in experimental biology.

PROCEEDINGS OF THE XI INTERNATIONAL GRASSLAND CONGRESS; held at Surfers Paradise, Queensland, Australia, 13—23 April 1970. Edited by M. J. T. Norman, University of Queensland Press. Distributed by International Scholarly Book Service, P. O. Box 4347, Portland, Oregon. 1970. Pp. xxxi+A-143+956. $33.75. In this volume, the plenary and section papers of the Congress by outstanding authorities from various parts of the World are preserved for ready reference. Section papers are grouped under natural grasslands, woodlands and shrublands, sown pastures for animal production, plant improvement and seed production, plant nutrition and soil fertility, physiology of pasture and forage plants, pasture and forage production and ecology, pastures and forages in animal nutrition, and management and use of pastures and forage crops. Very highly recommended to all interested in grasslands management.

THE ENDEMIC FLORA OF TASMANIA, PART III, by Margaret Stones and Winifred Curtis. With a foreword by Lord Talbot de Malahide, Ariel Press, 14 King St., Covent Garden, London W. C. 2. 1971. This is part III of the monograph on the endemic flora of Tasmania. It is beautifully reproduced in color from plates prepared by Margaret Stones together with botanical and ecological text by Winifred Curtis. The foreword is by Lord Talbot de Malahide, the financial sponsor, who also provided the appendix on cultivation. The plates XLVIII to LXXI, accommodate 41 different plants, which are classified by plant families. A map of Tasmania at the beginning of this 3rd. volume, in seven colors to indicate approximate heights, is a valuable aid in finding the geographical location of the species. It is indicated that the Monograph will extend beyond the five parts originally planned. This excellent monograph cannot be too highly praised and we can hardly wait for the appearance of the remaining parts.

INTRODUCTION TO THE FINE STRUCTURE OF PLANT CELLS, by Myron C. Ledbetter and Keith R. Porter. Springer-Verlag, New York, 175 5th Av., New York, N. Y. 10010. 1970. Pp. 188. Illus. $14.80. Designed as a supplementary text for students of cell biology, and to introduce the research scientist, teacher and student of allied fields to the rapidly expanding subject of cell study by means of the electron microscope, this outstanding new book fills a definite need. The more than fifty full-page plates provide a survey of plant cells and their components as revealed by the electron microscope. The plates are grouped under general cell structure, fine structure interphase cell and cell organelles, dividing cells, cell wall and plasmadesmata, vacular tissues, schlerenchyma and collenchyma, epidermal cells and variants, photosynthetic apparatus, cells with special inclusions, and germinative cells. The plates are beautifully reproduced, and are accompanied by explanatory text discussions. This very important new book is indispensable to all who are interested in plants. Very highly recommended.

PLANT LIFE LIBRARY—continued on page 128.

3. GENETICS AND BREEDING

AMARYLLIS BREEDING WITH EMPHASIS ON INBREEDING

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

Fairly early in his work with *amaryllis*, but not as early as he would have liked, the writer studied the development of hybrid corn. The corn hybridists created pure inbred lines with known genetic factors and then crossed these lines to obtain uniformity plus extreme hybrid vigor (heterosis). The inbred plants were developed either by selfing, by crossing on siblings, or by crossing on other close relatives. All these procedures constitute inbreeding.

Geneticists can express the *degree* of inbreeding of a given seedling if they know its family tree. A high degree of inbreeding is most rapidly achieved by selfing, but forms of sterility often occur when selfing is attempted, and the problem becomes worse with succeeding generations. This kind of sterility seems to abound in *Amaryllis*, and it has destroyed many inbreeding plans. However, the author feels that inbreeding and then selective crossing afford the greatest opportunity for the amateur to make significant contributions—if the sterility problem can be solved. Several procedures that have proved helpful are described below.

First, consider for example the frustration of attempting to develop a pure white Amaryllis of good form, good vigor, and large size by starting with a small white clone having low vigor and poor form and a large red clone with high vigor and good form. Even if these characters are fixed and uniform in the two clones and each character is determined by a single non-dominant gene, the first generation crosses will be light red, of medium vigor and size, and of fair form. Crossing two of the siblings will give offspring with the following probabilities:

25% will probably be pure white
25% will probably have good form
25% will probably be large
25% will probably be vigorous

In other words, after two generations, one plant in 128 would have all the desired characters *on the average*. You *might* get only one desired result in a thousand. If each character were determined by two or more genes, if each original parent were a cross breed of mixed parentage, and if such phenomena as sex-linked genes occur, many thousands of seedlings and many generations of selective crossing would probably be required to get the desired result.

To obtain a large exhibition-type yellow clone in one man's life span from *Amaryllis evansiae* and a white clone of mixed parentage seems like a pious hope to the author. Of course, the effort is great fun.

The use of inbreeding to stabilize the desired characters would probably simplify most breeding programs and give hybrid vigor as a bonus. Following are some treatments that have been successful in some cases to combat sterility.

1. Spraying the style, immature anthers, and the ovaries of parent plants with an aerosol or standard solution of gibberellic acid is often effective where the problem is failure of initial fertilization. Repeated spraying from one week prior to pollination to two weeks afterward is suggested.

2. Often, initial fertilization will occur, but the seed pod will wither before maturity of the seeds. Here, gibberellins seem to help sometimes, but additional or alternative treatments seem effective. One simple treatment is to cut the scape off near the bulb shortly after fertilization and to mature the seed pods by immersing the cut end of the scape in water containing a little Captan or other fungicide and storing in a warm, shady location.

3. Again, after fertilization, very light daily spraying of the ovary with beta-mephthoxyacetic acid, the auxin used to increase the set of tomatoes, has prevented premature abscission and dropping of the ovary in seemingly sterile crosses.

4. The treatment found most effective by the author in very obstinate cases is to spray the ovary and style with gibberellic acid or mixed gibberellins at the time of pollination and then to keep the ovary moist with the following solution until the seed pod has swelled to full size. Cotton moistened in the following solution was wrapped around the ovary and then protected by a wrapping of aluminum foil. In a water solution:

Mixed gibberelins ("Wonder-Brel") ____1 pt. per million
Sugar (sucrose) _____2%
Rapidgro fertilizer _____½ tsp. per gal.
N-Dimethylaminosuccinamic acid .....½ tsp. per gal.

The last ingredient is a chemical used to prevent premature apple drop. The relative importance of the ingredients has not been thoroughly studied. Other mixtures are under investigation. It is realized that some chemicals are difficult to obtain by the amateur. Small vials of the solution described in method 4 are obtainable from the writer by serious workers at $20 per cc.

Selfing in a breeding program is controversial. For instance, in Plant Life, 1970, p. 118, the late Henry van Woesick, former head of the famous Ludwig and Company in Holland, advises against selfing. One cannot argue with the remarkable clones produced by the Dutch, but van Woesick's suggestion that selfing or any other form of close breeding is inevitably disastrous is not tenable. The inbred strains that go into the making of all hybrid tomato seeds are maintained through selfing. Selfing produces some freaks but also some uniformity if carried far enough.

Starting with the repeated selfing of one of the Ludwig clones, 'Fire Dance', the writer has developed a superior strain of very uniform, gorgeous reds. One parent is the third-generation self of 'Fire Dance', and the other parent is the third generation self of a cross between *Amaryllis reginae* and a selfed Dutch red. Two other inbred red strains show excellent heterosis when crossed with another inbred.

Many species of *Amaryllis,* which of course are inbred naturally, give great hybrid vigor when crossed with selfed strains, but one may require many generations of breeding to eliminate the unwanted characters of the species. A pleasant exception was a cross of *A evansiae* on a selfed strain of Dutch whites. Besides vigor, the only other trait of *evansiae* that shows in most seedlings is an ivory color. If inbred sterility can be conquered in this line, many inbreedings may eventually result in a deeper color.

Troubles can still linger even when sterility is defeated. From one selfed inbred, the seedlings were apparently haploid. That is, they seemed to contain only one set of chromosomes. They were about half the size of their parent, and further inbreeding seems impossible. Although the plants are weak, one is a pretty miniature pure white, but crossing with another white produced large, sterile, white blooms—larger than either parent. One logically supposes it to be a triploid. An attempt is now being made to double the chromosome numbers of these haploids.

The writer has made several crosses that were extremely obstinate. In several cases, the seedlings thereof grew very slowly and have not bloomed in four years. Some kind of chromosome maladjustment is suspected.

Besides the red hybrids mentioned above, the writer's most significant projects are as follows:

1. Two inbred white lines, one starting with the variety "American Beauty" and the other containing *A. evansiae* and Dutch white genes.
2. A flushed and spotted inbred line that produces beautiful crosses on *A. pardina* or on flushed inbreds.
3. Two selfed lines of miniature reds.
4. Hybrids with *A. aulica* blood. These are hard enough to cross with anything; selfing is a thing of the future for this line, but they have great vigor, good size, and outdoor hardiness in the San Francisco area.

The above projects and others require the growing of many seedlings to achieve distinction in a reasonable time. If anyone would like to collaborate in the development of some of these lines, please write the author. Intensive development should be more thrilling than random or "hunch" breeding, and there is plenty of fun and glory to go around.

CHROMOSOME NUMBER AND GROWTH HABIT OF **SPREKANTHUS CAGEI**

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

In Plant Life, volume 25, 1969, the author reported the first blossoming of an intergeneric hybrid of *Sprekelia formosissima* and *Habranthus robustus*. Since that report, bulbs of X *Sprekanthus cagei* Traub have fully matured, and further observations on culture and growth habits can now be made.

Also, chromosome studies on the plant have been made by W. S. Flory and his associates at Wake Forest University. These studies tend to confirm the opinion that genus *Sprekanthus* Traub is a true bigeneric hybrid and they tend to clarify the apparent complete sterility. The predominant count is 2n=66 in *Sprekanthus* Traub although some variation was found in chromosome numbers from cell to cell, which seems consistent with the variation found in the 120-chromosome race of *Sprekelia*. In *Sprekelia,* the count is 2n=120, and in Habranthus it is 2n=12. With 60 chromosomes from one parent and six from the other, viable crosses or selfs would seem improbable.

However, chromosome doubling in *Sprekanthus,* would be extremely interesting. Dr. Flory has suggested procedures for treatment with colchicine, and the author is presently trying to produce polyploidy. A tetraploid of the plant would hopefully be fertile.

Sprekanthus cagei grows and blooms well in the garden anywhere the soil does not freeze. Outside, its blooming habit is similar to that of *Habranthus,* but the scarlet blossoms, with just a hint of violet, are much prettier than *Habranthus* in the opinions of most people. Also, the segs are wider and the shape more graceful than in *Sprekelia.* Compared with *Sprekelia, Sprekanthus* blooms more freely and makes a much better recurrent-blooming pot plant. Every few months, the pots can be kept dry for a month to initiate bloom.

Sprekanthus forms many offsets, which can be grown to blooming size in about one year. The bulb could become commercially important. Cuttage has not yet been tried for propagation. A few mature bulbs will be made available in the fall of 1971.

CULTURE OF IMMATURE **AMARYLLIS** EMBRYOS

WILLIAM D. BELL,
Box 14192, University Station, Gainesville, Florida 32601

Failure of apparently successful crosses after partial enlargement of the seed capsule is perhaps more exasperating than total incompatibility. Two weeks of anticipation are followed by the disappointment of observing abscission of the capsule at the base of the pedicel. This occurred in an attempted pollination of the clone 'Superba' with the pollen of *Amaryllis evansiae.* Hoping that viable embryos were

present in the abscised capsule, an effort was made to retrieve the potential progeny of the cross.

METHODS

The recently abscised capsule was dipped momentarily in 95% ethanol and immersed for five minutes in 1% sodium hypochlorite (diluted laundry bleach). In a sterile transfer chamber, the capsule was then flamed twice with 95% ethanol and opened. Immature seeds averaging 4 mm in length were removed using standard sterile-culture techniques and placed on moist filter paper in Petri dishes. By transmitted light, those seeds containing small embryos approximately 1.5 mm long were selected for culture.

Table I

Stock Solutions for the Preparation of Amaryllis Culture Media

Macronutrient Solutions—Dilute 1:100 for final solutions (10 ml/1)

Component		Grams per liter
1. Calcium nitrate	$Ca(NO_3)_2.4H_2O$	118
Calcium chloride	$CaCl_2.2H_2O$	14.7
2. Potassium nitrate	KNO_3	50.5
Potassium phosphate monobasic	KH_2PO_4	13.6
3. Magnesium sulfate	$MgSO_4.7H_2O$	49.3
4. Disodium EDTA *	$Na_2EDTA.2H_2O$	3.7
Ferric chloride	$FeCl_3.6H_2O$	2.7

Micronutrient Solution—Dilute 1:1000 for final solutions (1 ml/1)

Component		Milligrams per liter
5. Manganese sulfate	$MnSO_4.H_2O$	1690
Zinc sulfate	$ZnSO_4.7H_2O$	1438
Potassium iodide	KI	830
Boric acid	H_3BO_3	618
Copper sulfate	$CuSO_4.5H_2O$	25
Sodium molybdate	$Na_2MoO_4.2H_2O$	25
Cobalt chloride	$Co\ Cl_2.6H_2O$	25

* Dissolve the disodium salt of ethylenedinitrilotetraacetic acid before adding the ferric chloride.

A modified Hoagland's solution (*2*) was employed for culturing embryos and the resulting seedlings. Salt components of the nutrient medium with suggested concentrations of compatible reagents for stock solutions are listed in Table I. Sucrose at 2% (20 g/1) and 1% agar (10 g/1) were included in the first stage embryo-culture medium. Benlate* (benomyl, methyl 1-butylcarbamoyl-2-benzimidazolecarbamate) added to media at 10mg/1 served as a useful fungistat *(3)*. Sucrose was deleted for the second stage medium; plantlets were transferred to the latter no

* Benlate, a Dupont product, is also useful in controlling damping off of "difficult" seedlings in open culture.

sooner than the appearance of the second leaf. Seedlings were later grown in horticultural vermiculite using the basic salt solution diluted with four additional parts of water. All solutions were adjusted to pH 5.5 with dilute sodium hydroxide or hydrochloric acid prior to the addition of agar.

Approximately 15 ml of nutrient medium were dispensed to each 20x150 mm culture tube for both aseptic stages. Tubes were capped with polypropylene closures and sterilized under pressure in an auto-

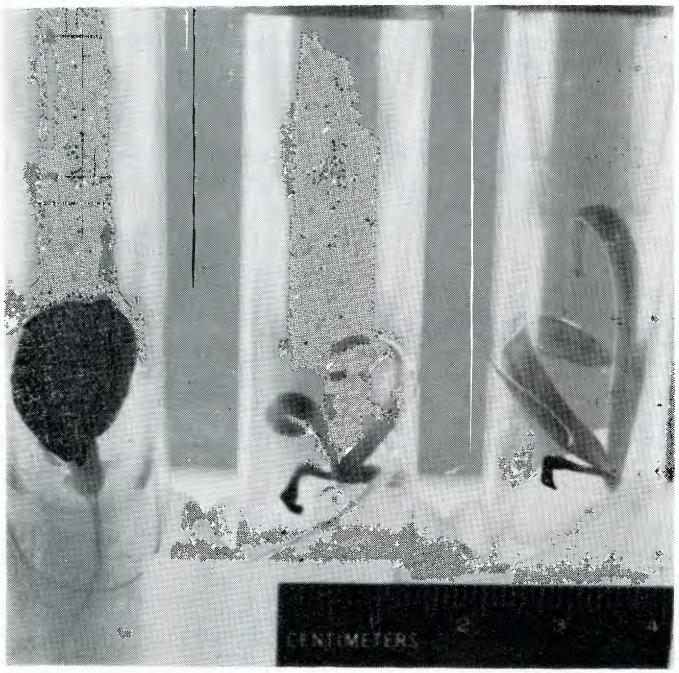


Fig. 21. Amaryllis plants at middle and right grown asceptically from immature embryos. Left, mature seed germinated for scale comparison

clave for 15 minutes at 121°C. One selected immature seed was placed in each tube after cooling and solidification of the medium. Agar surfaces prepared slanted at 30° facilitated later removal of seedlings. Cultures were illuminated by lateral banks of 40 watt cool white fluorescent lamps at a distance of 15 cm on a 16-hour photoperiod. Ambient temperatures during aseptic culture were 27 ± 5°C.

RESULTS AND DISCUSSION

No visible development of endosperm was observed in the excised seeds. Germination was evident five days after transfer to the first-

stage medium. A diminutive radicle emerged from the micropyle end of the seed and penetrated the agar. Approximately two weeks later, the first foliage leaves were observed on successful cultures. Development varied from seedling to seedling, but half of the cultures had produced a second foliage leaf six weeks after initiating the cultures. Of ten attempts, eight reached the two-leaf stage by the eighth week. Transferred to the second-stage medium lacking sucrose, all of the latter continued to enlarge. Two of the successful cultures during the fourth week after transfer to the second stage medium are illustrated (see Fig. 21). For comparison, a mature seed of a tetraploid cross had been grown aseptically on the first-stage medium. The addition of casein hydrolysate at 400 mg/1 did not further enhance growth of immature embryos similarly cultured with this often-included supplement. Mature seeds appeared to germinate more readily on the basic salt-agar medium than on that containing sucrose.

A point to be emphasized is the simplicity of the medium employed here for embryo culture. It appears that no growth regulators nor vitamins need be included. Iodide may not be required, but was incorporated in the micronutrient solution since White (*6*) indicated that tomato roots in culture grow better with iodide than in its absence. The medium differs from the original solution of Hoagland and Arnon (*2*) in two other important aspects: increased calcium content and the use of chelated iron. Cobalt may or may not be required by Amaryllids but is now generally included in culture media in traces. Seedlings have now been grown in vermiculite on the diluted salt solution for one full year and have exceeded the growth of similar-age seedlings grown in standard potting soil.

Techniques described here prepare the way for further ventures in sterile culture of Amaryllids. Culture of actively growing meristems may allow rapid multiplication of those which are difficult to propagate. Moreover, new methods employed for orchids might well be considered (*1,4*). Culture of meristemmatic tissue of virus-infected plants is another worthy consideration, especially when a new clone appears infected. One might treat diploid species such as *A. evansiae* with colchine aseptically with sucrose present on the recovery medium. Finally, anther culture, as in the techniques employed for tobacco (*5*), may result in the production of diploids from tetraploids, allowing fertile progeny to result when combining conventional germ plasm—the large tetraploid hybrids —with the recently described and most interesting diploid species. Anthers of tetraploids prepared for flowering appeared to me to be beyond the point at which one could expect embryogenesis from pollen. Even when anthers were removed by cutting these bulbs to expose buds, the pollen appeared developed past tetrads. In several attempts, anthers dissected from such exposed buds failed to develop further on the first-stage medium.

I suspect that the results of the cross described here will be triploid plants with little, if any, fertility. However, one plantlet has also been produced by this method when *A. belladonna* x *evansiae* pro-

vided by Mrs. Korsakoff resulted in a partially developed capsule which abscised similarly after selfing.

LITERATURE CITED

1. Churchill, M. E., J. Arditti and E. A. Ball. 1971. Clonal propagation of orchids from leaf tips. Amer. Orch. Soc. Bull. 40:109-113.
2. Hoagland, D. R., and D. I. Arnon. 1950. The water-culture method for growing plants without soil. Calif. Agr. Exp. Sta. Circ. 347.
3. Oberbacher, M. F., and G. E. Brown. 1968. Use of benzimidazoles for control of fungi in peel cultures of citrus fruits Hort. Science 3:286-287.
4. Steward, F. C., and M. O. Mapes. 1971. Morphogenesis in aseptic cell cultures of **Cymbidium.** Bot. Gaz. 132:65-70.
5. Sunderland, N., and F. N. Wicks. 1971. Embryoid formation in pollen grains of **Nicotiana tabacum.** J. Exp. Bot. 22:213-26.
6. White, P. R. 1963. The Cultivation of Animal and Plant Cells. 2nd edition. The Ronald Press Co. New York.

A NEW LYCORIS SPECIES?

SAM CALDWELL, *Route 4, Holt Road, Nashville, Tennessee 37211*

During flowering seasons of 1968, '69 and '70 I have had a total of eleven scapes of a "different," unidentified *Lycoris* to appear mixed in with other kinds from various sources. Scapes run to 21″ high with as many as eight flowers, making fairly large umbels up to 8¾″ across (see Fig. 22). Segments are relatively wide and smooth, but with some ruffling of the edges. Flowers are not of spiderlily form, although mine have appeared mostly among commercial "L. albiflora" stocks which do have the typical spiderlily pattern. A confusing factor is that color in different individuals varies. Mostly it runs to the daylily fanciers' "melon" tints—soft salmon or creamy orange—but one is lighter and almost yellow, while another has deeper shaded flowers, near bronze.

The flowers appeared among bulbs from the following sources:

1. Imported Japanese bulbs labeled "L. albiflora," received from the old Walter Guille bulb firm in 1959. Most of these have been blooming for years with off-white cream, pinkish and salmon tinted spiderlily flowers typical of *L. elsiae.*

2. Imported Japanese bulbs labeled "L. aurea Vermilion," received from R. D. Goedert in 1964. Most of these, too, have been producing the usual flowers expected from commercial Japanese "albifloras."

3. A bulb sent me in 1962 by Caroline Dormon, Louisiana botanist-gardener, who had received it as an unidentified *Lycoris* from Dr. Tsuneshige Rokujo, in Japan.

4. A bulb sent me in 1964 by B. Y. Morrison, labeled "L. albiflora Tawny Yellow," with the explanation that it had just shown up in some Japanese "albifloras" he had been growing for years.

These bulbs had all been growing with others in my lycoris cold-

frames for four to nine years before blooming in 1968. This may be because the previous winter here had been unusually mild. It could be that our normal winters here do not kill these bulbs but do inhibit their flowering.

Foliage of these bulbs is so much like that of the "albifloras" with which they are growing that I had never noticed them prior to their

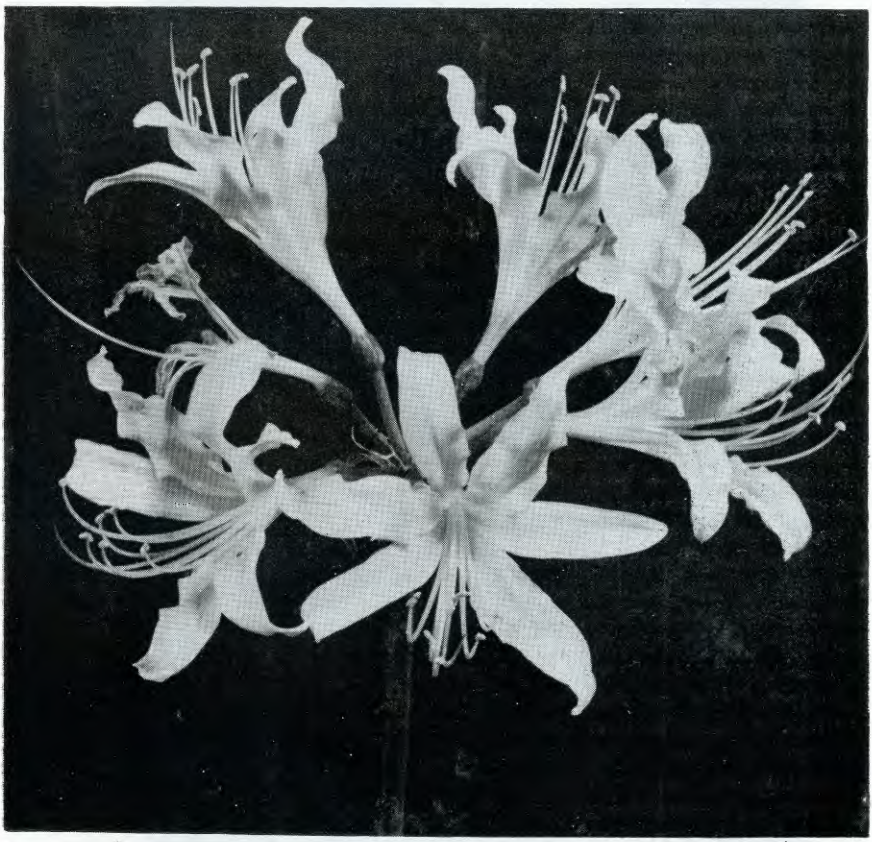


Fig. 22. Unidentified **Lycoris** species (?) flowering at Nashville, Tenn. Photo by Sam Caldwell.

blooming. After they did flower I marked each one with a stake, so as to observe foliage more carefully. This, again, brought confusion; although all of them started foliage growth weeks later than the "albifloras," they did not all start at the same time. Notes taken Dec. 3, 1968 showed one clump of the new lycoris with leaves 12 to 16″ tall. Another, just a few feet away, had leaves only three inches high, and a third individual had leaves barely emerging from the ground.

Fig. 23. Left, "Hayjax 1", selected seedling from **Lycoris haywardii** x **L.** x **jacksoniana** cross. Right, **Lycoris sprengeri x L. traubii** cross. Photos by Sam Caldwell.

Surely other bulb fanciers must have observed this lycoris. Information about it should be sent to Dr. Traub. For convenience I have simply labeled mine, "L. Melon." I suspect that it is the same lycoris sold for several years by the late James Giridlian through his Oakhurst Gardens catalog as "L. cinnabarium" (not "cinnabarina"). I now have some of his stock for comparison but have had no blossoms as yet.

This also may be the same lycoris as that pictured by Dr. Traub on page 59 of the 1966 *Plant Life* as possibly *L. koreana.* My impression is that koreana is close to the orange colored *L. sanguinea* and related *L. kiushiana* and "cinnabarina," all of which I have flowered. The new lycoris does, indeed, bear some resemblance to these. But with me sanguinea and relatives all make foliage in spring—starting in March—and are the first lycorises to bloom—usually in July. The new one is among the last to flower—around September 11—and foliage follows later in the fall or early winter. Incidentally, it is apparently fertile. One scape produced a seed pod which on maturing yielded one large, shiny black seed.

1970 LYCORIS REPORT

Sam Caldwell, *Route 4, Holt Road*
Nashville, Tennessee 37211

I began cross breeding *Lycoris* species in 1954. First hybrid blooms (*L. sprengeri* X *L. radiata,* now known as *L.* x *jacksoniana*) opened in 1961, and later years brought flowers from other crosses. Readers interested in this genus may wish to refer to my reports in the 1962, '64, '65 and '68 volumes of Plant Life for notes and photographs related to the hybridizing program. This current report covers bloom of 1968, '69 and '70. Many exciting new things appeared during these three seasons. Abbreviated descriptions follow, and accompanying photographs show some of the best ones.

L. haywardii X *L.* x *jacksoniana:* Cross made in 1961. First flowers in 1966, more each year since. Similar to *jacksoniana* but averaging a little larger flowers on taller scapes; color varies in the pinkish, lavender, violet range. One seedling, first flowering mid-August, 1968, is outstanding—a large, robust grower with scapes to 28″ tall and widely flared, smoothly tailored flowers, lavender-pink, turning bluish with age. Usually seven flowers to the umbel, which is 7⅛″ across. Reminds one of *L. squamigera* but is deeper colored and not quite as large. Apparently a good propagator, judging from foliage clump. For the present identified simply as "Hayjax 1."

L. sprengeri X *L. traubii:* Cross made in 1961 on my own *sprengeri* with *traubii* pollen mailed to me by the late B. Y. Morrison, Pass Christian, Miss. There are just nine bulbs; seven have bloomed. A most rewarding and exciting cross—better I think, than other crosses of

Fig. 24. **Left, Lycoris haywardii** x **L. chinensis. Right, Lycoris haywardii** x **L.** "sperryi." Photos by Sam Caldwell.

sprengeri with other yellow species. Bulbs produce thick, sturdy scapes with relatively large flowers, and there is variation in both color and flower form. Bloom in late August, early September.

One distinctive seedling has a big umbel on a 25″ scape with smooth, broad-segment flowers close to *sprengeri* form. Color is pale lilac-blue with a bit of gray in it, reminiscent of the "smoky" gladiolus; amber lines radiate out from base of each segment. Another is a soft buff-pink color with suggestion of lavender, reminding one of an opal. Segments unusually broad, to 11/16″, with edges beautifully ruffled. Others run in light pastel tints from pale lilac or "skim milk" color to cream and pink.

This cross should be tried by growers in the Lower South who have *L. traubii.* I will gladly furnish *sprengeri* pollen by mail on request as it is available, usually in the last half of August with me. While I used *L. sprengeri* as the seed parent, similar results should come from the reverse cross.

L. radiata X *L. traubii:* Cross made in 1961 on fertile *radiata* with *traubii* pollen from Mr. Morrison. First bloom September 13, 1968, a 19″ scape with six flowers making a 7″-wide umbel. Color, very pale cream-yellow with pinkish tints. Flower is practically identical to some of those on stocks of commercial Japanese "albiflora" bulbs and tends to confirm the theory that *L. albiflora* is a natural hybrid of *L. radiata* and a yellow species.

L. sanguinea X *L. "sperryi":* Cross made in 1961. Only three bulbs resulted; all flowered mid-August, 1969 and '70. Flowers are medium size, quite pretty spiderlily form and clear, medium yellow color. These need further observation. They may fill the need for a straight medium yellow lycoris without the orange shading of most yellow flowered species.

L. chinensis X *L. "cinnabarina"* (L. *"cinnabarina"* is a "catalog" name; the lycoris is close to orange-flowered *L. sanguinea,* with longer flower segments. It has not bloomed well for me.): Cross made in 1963. Just two bulbs; one flowered Aug. 13, 1969, a 12½″ scape with five flowers making a surprisingly large umbel, 8½″ across. Segments well rippled on edges and flower is close to spiderlily form. Might be described as a "sunset" colored lycoris, clear yellow on opening but on succeeding days edges of segments develop reddish-orange tints, as do the stamens and pistil. Bloomed again in 1970. This one looks promising.

L. haywardii X *L. chinensis:* Cross made in 1964; a half dozen bulbs grew and two flowered Aug. 12, 1969, five years from seed. Most crosses take six, seven or more years to bloom but seedlings from *haywardii* seem to be fastest. Even with them I have never had a bloom from seed in less than five years.

These are flowers of good size—umbels to 8½″ across. One opens pale creamy-yellow with lilac suffusions; the other has similar but warmer coloring—less lilac and more cream and buff tints. Both blooms age

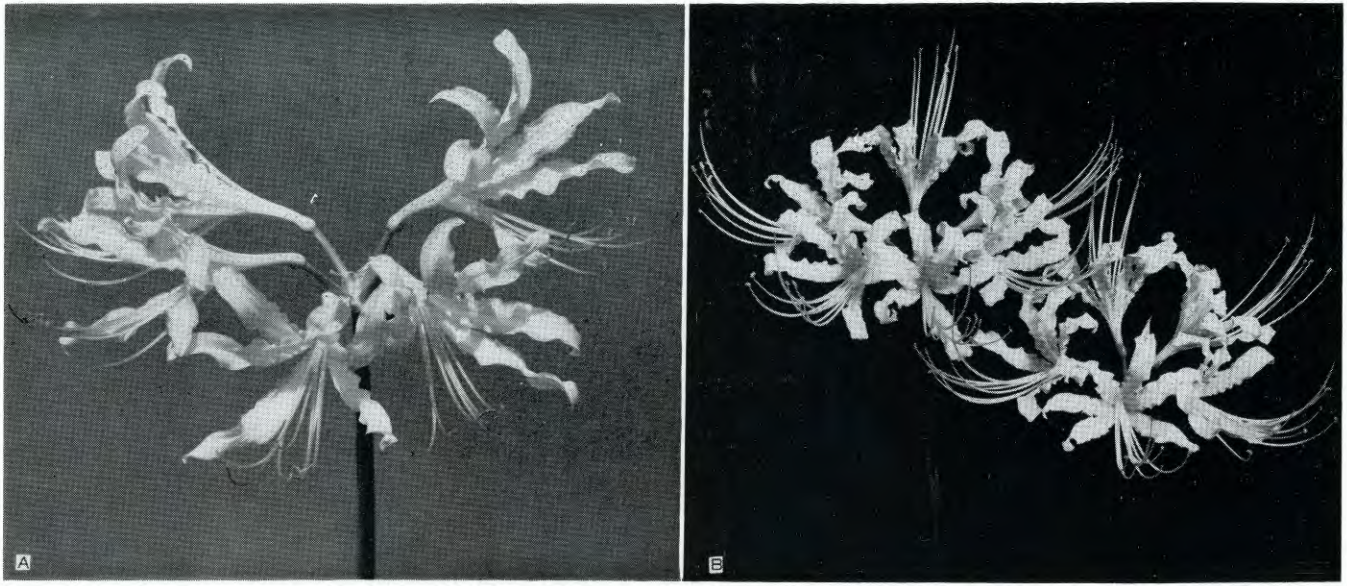


Fig. 25. Left, **Lycoris chinensis** x **L.** "cinnabarina". Right, **Lycoris radiata** x **L. chinensis** or **L.** "sperryi," named 'Fawn', parentage unknown. Photos by Sam Caldwell.

to off-white. It is interesting to note that these flowers differ from those produced previously by a similar cross, *L. haywardii* X *L. "sperryi."* Those practically all turned out near white with segments generally narrower than in the *haywardii-chinensis* hybrids.

L. haywardii X *L. "sperryi":* Cross made in 1958. First bloom was reported in the 1965 Plant Life; now that some twenty seedlings have flowered, this additional note is given. All are much alike, big, vigorous lycorises, quite hardy and thus far good bloomers under outdoor garden conditions in my area. In bud and early opening stages there are pinkish midrib lines and pale yellow coloring on most of the flowers but the over-all effect at peak bloom is white.

L. sprengeri X *L. "sperryi":* Cross made in 1959. Just a few of these have bloomed. Except for slightly wider segments most of these look like flowers of the *haywardii-"sperryi"* cross described immediately above. One, however, blooming first in 1968, has a big bloom of soft yellow color which holds the color fairly well even on aging. Unfortunately, this seems a slow natural propagator; although eleven years old from seed, it has made only two bulbs.

L. 'Fawn': This remarkably beautiful lycoris brought the greatest thrill of the 1968 bloom season when two scapes reached peak development on Sept. 6 (Fig. 25.). On scapes 15 and 16″ tall, respectively, with five and six flowers, the umbels are of classic spiderlily form, with relatively wide segments much ruffled along edges and reflexed at the tips. Flowers are evenly spaced to give round, symmetrical unbels which with long extending stamens reach 7¾″ across. Color on opening is a pastel tint of creamy-buff with deeper pinkish salmon bands from center of flower outward. A tawny effect in the throat suggests coloring I have seen on a young deer; hence the provisional name, 'Fawn.' Flowers age to off-white with pinkish tints. It bloomed also in 1969 and '70.

Apparently a good propagator, the original bulb has grown into a clump. Unfortunately, this is one of the rare cases in which I do not know the parentage. It is in a group of *L. sprengeri* X *L.* x *jacksoniana* seedlings from 1961, but obviously is not of that parentage. My records show that a small lot of seeds, while temporarily stored in a pot under my greenhouse bench, was upset—probably by a mouse—and mixed with other crosses I had made. Undoubtedly one of the parents is *L. radiata* and the other is probably either *L. chinensis* or *L. "sperryi",* since I have made those crosses many times. Seedlings previously flowered from such crosses, however, have run uniformly to a soft yellow coloring, though their form has been like that of 'Fawn.' Perhaps 'Fawn' is a lucky color variation, or there is a possibility that this is a *radiata-houdyshelii* cross—one I have tried often with no visible success as yet.

NEW ACQUISITIONS

By great good fortune I have met through correspondence this year Dr. Shiuchi Hirao, an enthusiastic amateur gardener-horticulturist in

Japan who has a special interest in amaryllids. He has shared with me rare bulbs, including three unidentified lycorises which may prove to be new species. One resembles *L. sprengeri* in form but is a clear lilac self color; another is off-white and the third is yellow. I hope to report on these in future years.

Through his influence eight of my color pictures of lycoris species and hybrids were published in a full page lay-out in the Autumn, 1970 issue of *Garden Life,* a leading Japanese garden quarterly, along with a translation of some of my observations on their culture in this country. We hope to increase popular interest in the genus in Japan and encourage the search for additional kinds not now in cultivation that may occur there in the wild.

Dr. Hirao also sent me bulbs of his own strain of *Nerine* hybrids. Four have flowered; they are most varied and beautiful, comparing favorably with some of the fine English introductions.

Finally, having strayed briefly from lycorises, may I ask if any of our members know whether anyone is attempting to propagate and distribute hymenocallis hybrids originated by the late Len Woelfle, of Cincinnati, Ohio? (See "Hymenocallis Report from Ohio," Plant Life 1962.) These are very beautiful, easily grown flowers, and I think, have commercial possibilities. Mr. Woelfle sent me a small offset of 'Pax,' his first hybrid, in 1963 and similar offsets of 'Icon' and 'Helios' the next year. All have thrived under normal "Gladiolus culture" customarily used for the common "Peruvian daffodils." 'Helios' seems to me the best of the lot; it has deeper yellow coloring which is held better through the life of the flower, but the other two are well worth growing.

AMARYLLIS BREEDING—1971 REPORT

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

Following a rather poor Amaryllis bloom season in 1970, I resolved to remedy this situation and my efforts were rewarded with bountiful bloom in 1971. Plenty of moisture and liquid fertilizer during the growing season did the job. The *Amaryllis* species and hybrids were grown outdoors during the summer of 1970, getting about a half day of sun, plenty of water and liquid fertilizer every 3-4 weeks. Growth was excellent under these conditions, particularly for those plants whose pots were imbedded in mulch (sugar cane bagasse). This keeps the pots from drying out. Most small clay pots dry out almost completely during our hot summers even though they may be watered daily. This significantly retards growth rate. Simply imbedding the pots in the mulch alleviates this condition. I presume other mulches or imbedding the pots in the soil would work as well as the bagasse.

I have previously mentioned the six *Amaryllis* species sent to me

under number by Dr. Cardenas in 1969. I grew these *Amaryllids* with great anticipation because of (1) the area in Bolivia in which these plants were collected, an area seldom visited by collectors, and (2) the generally vigorous growth shown by most of these species. The anticipation was not only for several new species useful in hybridizing, but also for excellent hybrid vigor among the progeny. My anticipation was not in vain.

These amaryllids were only identified by numbers one through six. Late in December, 1970 bloom scapes appeared on three of these species, Nos. 4, 5 and 6. Number 4 made two scapes, while Nos. 5 and 6 had one scape each. Blooms opened on numbers 4 and 5 almost simultaneously during the third week in January, and number 6 opened about a week later. All three were very striking and beautiful *Amaryllis.*

My unidentified species Number 5 is definitely *A. nelsonii,* which was described by Dr. Cardenas in PLANT LIFE (1971). Not having this description available to me at the time of my bloom, I considered it nearer to *A. mandonii* rather than *A. yungacensis* which it also resembles. My *A. nelsonii* bloomed on a 22 inch scape, with two florets, 5 inches across the face, 4½ inches long and nearly tubeless. The bloom posture is slightly above the horizontal. I consider the most striking feature of *A. nelsonii* to be its bold and contrasting color pattern. Deep in the throat the coloration is dark green, shading to greenish white over 70-80% of the length of the segments. The final 20-30% of the segments is marked with intensely contrasting scarlet red. The interior of the throat is marked with very small brownish-red spots.

A. nelsonii should be a valuable addition to the *Amaryllis* species for use in hybridizing. For me it grows vigorously, and hopefully will transmit this to its offspring. One bloom of *A. nelsonii* was self pollenated and the other was pollenated with unidentified species number 4 (described subsequently). Only the self pollenation set seed. I planted some and distributed some to other growers. *A. nelsonii* should therefore be easy to reproduce and distribute since it is self fertile.

My unidentified species number 4 remains unidentified. This species opened its bloooms on the first of two scapes within one day of *A. nelsonii.* One very distinctive feature of species number 4 is that the style extends beyond the tip of the bud (½-3/4″) just before opening. The 2¾ inch bulb had grown vigorously and made two 25 inch scapes. The umbel is 2-flowered, 4 inches across and 3½ inches long. Posture of the perigone is above the horizontal. There is little or no tube. Throat is pale green shading to greenish white which extends 80-90% of the length of the segments. Red coloration on the tips of the segments is a very irregular, splotched pattern in contrast to the regular markings of *A. nelsonii.* Edges of the segments are somewhat irregular and ruffled. Filaments are white, style white shading to red and the stigma is trifid. A photograph of unidentified species No. 4 is shown in Figure 26.

Species number 4 should be useful to the hybridizer because of its vigorous growth and above-horizontal posture. It was not self fertile.

Nor did it set seed with the pollen of *A. escobaruriae, A. nelsonii* or unidentified species No. 6 (to be described). But I did obtain seed set with the pollen of species No. 4 on *A. escobaruriae.*

In many respcts species number 6 was the most striking of the unidentified species collected by Dr. Cardenas. It rivals or exceeds

Fig. 26. Upper left, unidentified Amaryllis sp. #4; Upper right, **Amaryllis nelsonii** Card. (sp. #5). Lower left, Unidentified **Amaryllis** sp. #6. Lower right, **Amaryllis pardina** Hook. f. Photos by J. K. Mertzweiller.

A. nelsonii. I consider it closest to *A. pardina* and with some resemblance to *A. pseudopardina.* The bulb is on the small side, about 1½ inches in diameter, and made a single 11 inch scape. The umbel is 2-flowered, perigone 5½ inches across, 4 inches long, tubeless and with flaring form. Throat color is green. Ground color is white, flushed with green near the tips of the segments. Setepalsegs streaked red about ½ inch wide along centerline with somewhat narrower red streaks on petepalsegs. Edges of segments are stitched in red. White ground color of segments is profusely spotted with small red dots. The segments are broader and the bloom is more full that *A. pardina* (Hook.) These differences are easily apparent in Figure 26.

One bloom of the species number 6 was self pollinated and the other pollinated with *A. nelsonii.* Self pollenation was unsuccessful, and the X *A. nelsonii* appeared to be successful but the scape rotted off after about two weeks. I cultured the scape in water and one segment of the pod continued to develop. It reached almost full development and I finally planted a few brown colored seeds and was rewarded for my efforts with two small seedlings. I consider that these seedlings have as parents two of the finest *Amaryllis* species known.

The bulbs of the unidentified species designated numbers 2 and 3 made good growth but did not bloom in 1971. The number 3 bulb has remained dormant most of this spring and summer but is now showing some leaf growth. These are medium size bulbs and it is possible they could be identical to number 6. Mr. Ed Beckham bloomed his number 3 bulb and it was identical to my number 6. Apparently these bulbs may have been accidentally mixed in transit or storage. Bulb number 1 has presented some problems. When first received it was quite soft and required very careful culture. It has hardened, but has put out only a single leaf thus far during the 1971 growing season. The bulb is about one inch in diameter. Based on the appearance of the single leaf I feel quite sure this is *A. viridiflora.* I have previously described (PLANT LIFE, 1968, 1969) the use of frozen pollen of *A. viridiflora,* to set seed on one of my miniature hybrids. These seedlings are now two years old and growing moderately well. The leaf structure of these seedlings bear many similarities to that of unidentified species number 1. Both have narrow leaves, dark green in color and with a pronounced lighter green midrib. Species number 1 has a definite reddish coloration along the side of the leaf near the tip. The *A. viridiflora* seedlings show this coloration to a much lesser extent. Having lost my earlier bulb and with the growth rate of the present plant (species No. 1) it appears that *A. viridiflora* and its seedlings will not be among the easier amaryllis.

Late during the spring of 1971 I had two bloom scapes develop on a bulb of *A.* "Mrs. Sosa" which I had obtained from Dr. C. Gomez Ruppel of Mendoza, Argentina. This *Amaryllis* grows well in my area. The two scapes were about 24 inches tall and each was 4-flowered. This trumpet-type is about 6-7 inches long with a tube about four inches

long. The bloom is 3½ inches across the face and the segments are quite narrow, about ¾ inch wide. The most noteworthy feature of *A.* "Mrs. Sosa" is the color which is very close to the pale cream color of *A. evansiae.* So here is another source of the greenish-cream-yellow color in amaryllis, and in a trumpet flowering species. I was unable to set seed by selfing *A.* "Mrs. Sosa". I did obtain seed set with the following pollen parents: *A. vitatta* (var. tweediana), *A. elegans* and "Marie Goretti". Although only two seeds from the latter germinated I consider these very promising towards the objective of large flowered yellow hybrids.

Finally I would like to offer a few comments regarding my experiences in growing the *Amaryllis* species, particularly the less common species. It is always a great disappointment to witness the demise of a beautiful *Amaryllis* species that was obtained through great effort, generally on the part of an unheralded collector, and grown with all the care one can command. At the same time other species thrive and prosper. The simple fact is *not all of the Amaryllis species will thrive in any given location.* This is true in South America and it is true in the United States. Variations in climatic conditions are probably the principal reason for variations in performance of the species. *Amaryllis* native to the higher, cooler altitudes of South America are not at home in the hot humid climate of south Louisiana. *Amaryllis* native to the humid lower altitudes and even rain-forest conditions do quite well for us. Among those species which have failed for me are *A. umabisiana, A. mollevilquensis* and *A. elegans* (varieties Divifrancisi and Ambigua). *A. fosteri* and *A. maracasa* are barely holding on and I am afraid will never make blooming size. *A. cybister, A. pseudopardina* and *A. aglaiae* grow fairly well but are having difficulty making blooming size. *A. starkii* grows well but is a shy bloomer. Among the best growers and bloomers we can include most varieties of *A. aulica, A. pardina, A. yungacensis, A. forgetii, A. psittacina, A. escobaruriae, A. belladonna, A. evansiae, A. striata, A. flammigera, A. vitatta* and *A. fragrantissima.* So there is much challenge and also a bit of heartbreak in growing and hybridizing with *Amaryllis* species. But it is well worth the trouble when one witnesses the first bloom of a beautiful new species such as *A. nelsonii* and the other as yet unidentified species collected by Dr. Cardenas. In this respect the 1971 *Amaryllis* season was a very good one for me.

4. AMARYLLID CULTURE

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

SOME CULTURAL REQUIREMENTS OF **AMARYLLIS** SPECIES

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

To write an article of this kind is very difficult because technical information is often non-existent and observations of the collector are not conclusive. A wild plant may not be growing in the conditions it prefers, but is only existing in its indigenous environment.

A. aglaiae is reported to be found from 22°S to 28°S latitude on the eastern slop of the Andes between 65° and 66° W longitude. The colony to be discussed occurs at Los Azucenas at Km. 38 on the road between Acheral and Tafí de Valle at an altitude of 5000 feet. In Rio Sosa Canyon the temperatures are mild the year round, and there is rain every month except one. Amaryllis bloom around the last of October to the first of November. The prevailing wind comes up the canyon. It can be assumed that the humidity is always high. At blooming time the weed growth is only an inch or two high but later the weeds protect the plant.

Experience has shown that if planted in the normal, shallow manner *A. aglaiae* splits up into small bulbs which do not prosper. It is always found naturally with top of bulb about five inches below surface of soil. Experimental planting in tile pipe 6″ i.d. X 14″ long stopped the splitting and gave good growth.

A. striata, as observed growing in the Cerro do Mar of southeastern Brazil at 2500-3000 feet elevation, was growing in a cool moist area that receives 150 inches of rain per year. There is little diurnal temperature change. The area receives an occasional frost in winter. The soil is acid red clay. The plants grew in areas of open shade to full sun. Plants in open shade had very long leaves (100 cm) and correspondingly long scapes.

A. aulica has been found growing in the ground, in the crotches of trees and swinging on vines suspended between trees. It has a range of large area in a climate that touches the freezing point and is never very hot. This area has periods of drought but is usually quite moist. The soil is very infertile and acid. Is of easy culture in pots.

A. corriensis is found in the mountains west of Rio de Janerio at about 5000 ft. altitude, there are occasional freezing mornings here. The climate is moist with heavy rainfall in the summer months and drier in the winter months. It defeats mankinds efforts toward extinction by growing only on inaccessible cliffs where there is little or no soil.

but the roots are covered with a fluffy moss. These rock faces are wet daily by fog condensation. It grows easily in pot culture.

A. belladonna is found in many places with some variation in climate but always in a warm region with rain throughout the year. Some varieties (or types) appear to resent pot culture and decline or rot. Sometimes sand or sphagnum pads under the bulb help. However, this species, although evergreen, needs a yearly rest period for a couple of months, letting the soil dry out with only enough water to maintain a slightly moist condition in bottom of pot. If they don't grow vigorously they should be heat treated per instructions on page 178, THE AMARYLLIS MANUAL (TRAUB). They require less fertilization than other species.

A. reticulata is found in eastern Brazil from Sao Paulo to near the Espirito Santo- Bahia border, growing in moist, cool, shady conditions. Our experience has been to give it shade in the greenhouse by tucking it under other plants and to grow it in nearly pure fine sand with heavy watering and very little fertilizing. *A. bluminavia* although found much farther south seems to like similiar conditions.

A. petiolata is found along the Bolivian-Argentine border and again in Misiones Province of Argentina. I found it also in the Parana river basin about 100 miles north of the Argentine border. It grows in acid, tropical red clay where there is plenty of summer rain. In pot culture it requires a winter rest with water withheld—only enough to maintain slight moisture in bottom of pot.

A. calyptrata is found along with *A. striata* and *A. corriensis* in Brazil and is a good pot plant, a very rapid grower, requiring more than usual amounts of water, but has a tendency to suddenly go into decline. When this is observed heat treatment and warm growing conditions restore it to vigorous growth again.

A. fosteri is found in eastern Brazil 13° S lat. and 40° W in a near desert where only spring rain occurs. It is a hot area. Experience with this species is limited. It seems to require hot growing conditions but requires some kind of triggering to initiate growth. I believe a rest at 60°—70°F with dryness is required.

A. parodii and *A. argentina* occur in northern Argentina with *A. parodii* near 2000′ elevation along the eastern edge of the Andes and *A. argentinum* from 4500 - 7000′ elevation. This area has good soil although very rocky. It is an area of spring rain and long periods of drought. Very cold weather occurs during part of dry season. The plant has a very short growth period and remains dormant for several months. Because of the short period of growth all the leaves emerge at once and as soon as they are nearly developed the plant blooms. To successfully grow and bloom these, they should be kept dry for at least three months. They respond to large pots.

Many of the Bolivian species grow in nearly the same conditions. These are *yungacinsis, pardina, lapasense, escobaruriae, leopoldi,* and *nelsoni,* which grow at altitudes between 2000 and 6000 feet, on steep slopes with shallow soil in either brushy or lightly forested terrain,

usually covered with a litter of rocks, twigs and leaves. When collected it is very noticeable that the bulb is easily picked up but has roots spread in all directions over 3 ft. long. These are all of easy culture but like large pots and some fertilizer. The growth conditions of *mandonii* are noted in the article describing our trip in 1970.

A. evansiae comes from a warm area between 1500-2000 ft. altitude which gets seasonal rain, but is a near desert area. It often gives trouble in pots because it must have a dry rest period and should be given but little water during blooming, then until new roots and leaves form should receive careful watering. After leaves are well started it likes to be kept moist. I prefer to grow it in a basket the size of a 4″ pot or a 4″ pot with 4 large holes in it. The pot or basket contains only fine sand. In the spring after bloom it is plunged into a 7″ pot of ½ sponge-rok and ½ a mixture of leaf mold and manure. In late fall the 7″ pot is removed and as the mix dries it sloughs away leaving the bulbs in a pot of sand.

In growing seedlings I have found the place to accelerate growth is in the first few months of the plant's life. I prefer to start seed on water, moving them into 2¼ rose liners as soon as leaves are ½ to 1″ long. A rose liner is about an inch deeper than a corresponding sized pot. Four seedlings are placed in the corners of each pot. As soon as a leaf is 3″ long (about 2 months) they are transplanted to a 6″ pot (still 4 seedlings together). The mix for the 6″ pot is usually half leaf mold, half fine sand with 8 pounds of Mag Amp per yard added. The rose liners are always watered with a solution containing 90 p.p.M. N 36 p.p.M. P_2O_5, 72 p.p.M. K_2O, all nitrogen in nitrate form. At the end of a year most bulbs are 1½″ dia. Some plants like *A evansiae* and its bybrids bloom in 16 to 22 months.

AN AMATEUR'S NOTES ON GROWING AMARYLLIS

E. M. Beckham, *1452 Glenmore Ave., Baton Rouge, Louisiana*

It should be clearly understood that the information given is my own opinion and experience in growing amaryllis for the past twelve years or so. My experiences cover both growing in the open and greenhouse culture. I have been very fortunate in meeting many fine individuals and through the years feel I have obtained much valuable information on growing amaryllis that I hope will be of some value to those interested in pursuing this very interesting hobby.

Before one can successfully grow amaryllis, one has to provide the right growing environment (proper soil conditions, fertility, etc.) regardless of whether the bulb is to be grown in pots or outdoors. Following you will find my observations on growing amaryllis in the open.

What are the ideal soil conditions? Well, I believe that an excellent mix can consist of leaf mold, well rotted manure and coarse builders'

sand in the following proportions: two parts leaf mold, two parts rotted manure and one to one and one-half parts sand. In open culture, these materials should be tilled in (with a tiller, if available) to a depth of approximately twelve inches in a well drained area or in artifically raised beds on top of the soil in less well drained areas. Amaryllis bulbs should be grown in elevated beds approximately six to eight inches above the surrounding surface. Such beds should be located in semi-shaded areas which receive three-fourths sunlight. (Ideal conditions would be under well spaced pine trees.) In addition, a good mulch of bagasse (sugar cane pulp which is sold throughout the world as a poultry litter) should be applied at a depth of four inches before the first freeze. A good substitute can be pine straw or other coarse organic material. This will also protect the bulbs from the sun in the summer as well as help conserve moisture and keep down weeds and grass.

What about a feeding program? Well, this year soil samples from my amaryllis beds were analyzed by the Louisiana State University Soil Testing Laboratory and the results showed that the soil in the beds varied from 6.0 to 6.6 pH, which, according to the literature (Dr. H. P. Traubs' Amaryllis Manual, and also personal communication from Mr. H. J. N. v. Woesik of Ludwig and Company, and others) would be ideal for growing amaryllis. In analyzing the results of my soil it was pointed out that even though the soil had a perfect pH—the available phosphorus, potash, calcium, and other materials were far in excess of a plant's requirements. This would indicate that indiscriminate use of such commercial fertilizers should be avoided. For to do so would raise the phosphorus content of the soil to such a high level that the iron in the soil would be bound—thus making it (the iron) unavailable for the plants. Now in order to get good growth and green color in amaryllis, under my soil conditions, it was suggested to use small amounts of ammonium sulphate at frequent intervals, at the rate of 1½ ozs./square yard. (Which works out to be at a rate of 300 pounds/acre).—Soil tests every other year can guide one in the use of fertilizers and are recommended.

Others and I in the Baton Rouge area have grown amaryllis under these conditions quite successfully and it is hoped that this outline will be of some help to the average amaryllis grower.

One cannot over emphasize the importance of having the soil analyzed—because your leaf mold and manure may be from certain sources that may have extremely acid or alkaline reactions. Also, fertilizer used properly can be a blessing—used improperly, it can be a disaster. Hence, be cautious in the use of commercial fertilizers.

Although insects and diseases can become limiting under some conditions, their control is not too difficult and it is not dealt with here, since proper soil conditions are, in my opinion, the chief limiting factor in amaryllis growing in the Baton Rouge area.

Growing amaryllis in greenhouses really requires much more consideration and I know of no one to date who has found the perfect formula. I have been fairly successful in using a mixture of leaf mold—

organic material and rotted manure—a little sand, bone meal and perhaps a small amount of ground oyster shells. A good liquid feeding every several months should be applied. I have used several to good advantage. I would recommend a 5-10-15 or 5-10-10. Manure water to the color of tea is very good as an alternate feeding. Most important is a soil that will drain well and permit the roots to penetrate to the bottom of the pot.

Recently I have found a very good source of material to use to grow seedlings. Dr. E. N. O'Rourke, who has had some twenty years experience in this field, passed the information on to me. A mixture of the following—Perlite, Turface, Redi Earth or Jiffy Mix (1 part each), add about 10% organic material such as cow manure. (This can be secured from local nurserymen. Remember the material needs a good application of liquid fertilizer and perhaps a drench of Terraclor and Dexon would be advisable to avoid damp-off, etc. This would especially hold true for young seedlings. Feed your young seedlings with a 20-20-20 liquid fertilizer about every two or three weeks.

Two years ago I wrote to Dr. E. N. O'Rourke, Professor of Horticulture, asking that some research on amaryllis propagation and disease control be instigated at L.S.U. This was discussed with Dr. Don Newsom, Head of the Department of Horticulture (L.S.U). and work on this project was begun. Following is a report by Dr. O'Rourke on what has been done to date: (1970)

1. *Disease Control Study. Mosaic.*

A. Determination of heat tolerance of bulbs (thermal death point).

Heat treatment can be used to rid plants of some virus diseases. In order for this to work, the virus must be killed by a considerably lower temperature than that tolerated by the host plant. Most mosaic in amaryllis appears to be caused by the cucumber mosaic virus called CMV. A number of strains or types of CMV exist, some affecting certain plants but not others, differing in their virulence to certain host plants and in their tolerance to heat.

Evidence to date shows CMV strains killed by 10 minute exposures to temperatures in the range of 55-60°C. (Higher?) This is unfortunately high. There is, however, no published evidence on the tolerance to temperatures in this range of amaryllis bulbs. Tolerance can be affected by the duration of exposure, the rate of heating and cooling, the temperature level and possibly by the initial heat of the plant and its growing state (whether active or dormant). Dry heat may have a different effect than wet heat.

The size of massive structures such as bulbs is important in heat treatment, since the outer parts must endure longer exposures than the interior in any exposure that raises the interior to a given level. The time is less with smaller bulbs, and their survival to a given period of exposure may be better than that of larger bulbs.

A study of the effects of some of these factors is now underway. A water bath with thermostatically controlled heat and water stirrer is

being used in the wet heat studies. A recording device allows the study of temperature changes within the bulbs by means of small thermocouples inserted into the tissues at various depths.

To date, actively growing bulbs sized into six categories from ½ inch to 2½ inches in diameter have been heated until the centers were kept for ten minutes at 60°C. (140°F), 55°C. (131°F), and 50°C (122°F). The 60°C exposure killed all bulbs. All survived the lower temperature.

We will now narrow the temperature range to study the exact killing point for bulbs under actively growing conditions. Once this is determined, we will determine its effect on dormant bulbs and attempt to increase survival at the highest temperature possible in order to study the effects on the mosaic symptoms.

Dry heat, in an oven rather than a water bath, will be used in a similar study to determine if survival follows a different pattern.

2. Amaryllis propagation study:

Bulb cuttage, in particular the technique known as the "fractional scale-stem" method, is the chief means of increase of clones of amaryllis. It is largely practiced however, by the professional growers and shunned by amateurs because of their fear of losing the bulb they wish to increase.

In this method, the bulb is sectioned vertically into slices like orange segments. These slices are then cut horizontally across the stem portion to obtain small wedges of stem, each with one or two leaf base parts attached. These small divisions are then placed in a moist, well-aerated medium and in time each produces one or several bulblets.

Sanitation is important, since the cut tissues are quite vulnerable to a host of rot organisms. Certain fungicides and possibly bactericides are used by large commercial growers, but they do not divulge this information.

There are a number of points involved in amaryllis cuttage that deserve more study. The effects of such factors as heredity, dormancy and size of bulb, size of cuttings, after-cuttage treatment for disease prevention, growth substances such as auxins, gibberellins, and kinins, light temperature and medium deserve attention.

Mr. Ibrahim Yusof, currently pursuing studies toward a Ph.D. degree in the Horticulture Department at L.S.U., is beginning a series of studies to obtain more information about such relationships. He has completed a review of much of the pertinent literature and has assembled some of the materials. He will begin his experiments this month (May, 1971). You will be informed as information is ready for release on this project.

In closing, I would like to thank many very fine persons who have helped me so much in growing and hybridizing amaryllis, a hobby I dearly love.

Mr. Ted Tower has been instrumental in securing various amaryllis species from a friend, Fred Caulfield, a Methodist missionary in Bolivia —yellow (perhaps Evansiae), reds, pinks, etc. and some seed from what

they described as a pure white. We have crossed these with the best Dutch clones. Mr. Henry van Woesik was responsible for the very fine Dutch clones, some of which are still in the number stages and will not be released for some time. I have used many in crosses. Mr. Clarence Crochet, a hybridizer who has some very fine amaryllis, Dr. Joe Mertzweiler and Dr. Fred Buchmann (now deceased) are responsible for my interest in species, and Mr. Claude Davis, a very close friend (now deceased) is one who has contributed much to amaryllis culture. Mrs. T. K. McKnight, a local hybridizer who has many fine clones of Dutch X Mead crosses. Dr. Ira Nelson (deceased) whose name appears so many times on my tags, has helped me with various crosses. Also, Mr. Charles Ramelli, Biloxi, Mississippi, who has been so generous and has so many fine amaryllis crosses, including several fine doubles. Dr. Fred Schmitz, Plaquemine Parish, of whom I know you have heard so many favorable reports, especially in connection with those amaryllis so adaptable to outdoor culture. Many others have given me much encouragement and help. Among these are Mr. Frank Haight and members of the Baton Rouge Amaryllis Society and many friends in the New Orleans Men's Amaryllis Club.

I mention these fine people with the thought that, after all, a fine flower cannot be enjoyed unless it is shared with others and they should be remembered for the help given.

I hope the information will be of some help and if you have a beautiful bloom, please give me the privilege to see it.

GROWING RAIN LILIES IN GALVESTON

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

My father, the late Morris Clint, started my gardening interest in rain lilies (*Zephyranthes* and *Habranthus*) with about a dozen different species. We were living in Houston at the time and the bulbs were planted helter-skelter in groups around our wide back yard. Their blooms were always a bonus, for they required little care and multiplied rapidly. When we moved to Galveston, we found that land for newer homes was at a premium and our new gardening area quite small. For this reason, plus the fact that my gardening time was limited, my Houston rain lilies and a few hybrid *Amaryllis* were the only bulbs I transferred.

There were enough rain lilies to plant a border in front of rose bushes, alternating colors and blooming time for balance. Between the sandy loam soil and more dependable rainfall, they immediately put on a flower show. My mother visited us later and was so impressed with performance that she sent additional species for a greater variety of color and season. A few of her plant friends were also generous with both bulbs and helpful growing tips. Once my border of *Zephyranthes* and *Habranthus* was established, I began experimenting with other small

bulbs to prolong the season or add a change of color. I had to discard *Oxalis* because they needed more confinement. *Lycoris radiata* is a pleasant color change in the fall and the leaves are dormant when the rain lilies are most active. Because the blooms last so long and there is a variety of blooming time among species, the *Allium* species will probably be the best for my purposes. At the present time I grow only a pretty color form of *Allium mobilense.* All of the "odd" bulbs are planted in front of the rain lilies so they won't be disturbed when dormant. The *Allium* will even grow between rocks. Any number of small bulbs could be used in this manner as long as foliage and flowers are in proportion to the border and the growing requirements similar

Rain lilies are also nice in pots (which can be more easily protected from cold). Because of space, I grow only the more rare or difficult species this way. For pure beauty and enjoyment, however, some of the dainty bulbs are excellent. *Zephyranthes rosea, albiella, insularum* and *miradorensis* are just a few of the named species that are well suited for this purpose. Just for fun, I also grow a few bulbs along with *Cycads* in large pots. They are perfectly compatible as long as there is room for bloom to show. Both the *Zephyranthes* and *Habranthus* like good drainage and it was my parents' practice to add pebbles to the soil mix and to the top of the pot. This requires more frequent watering, but is worth it. My greatest difficulty is local water quality. I store rain water in plastic garbage cans and use this exclusively for the pot plants.

Galveston is one of the oldest cities in Texas and the gardens and wild flowers are colorful almost all year. Right after we moved to the Island, our daughter found a pretty white *Cooperia* growing in a vacant lot next door. Jamie was only three at the time and she was so proud to find "a flower like the ones in the back yard." I sent plant material to Brownsville and my mother identified it as *Z. traubii.* Subsequently, *Z. traubii* was noticed in a few other vacant lots around town and along the high shoulder of a road toward the west end of the Island. Colonies are usually small, contained, and may be some distance apart. There is variation in flower size with the local *Z. traubii* and it blooms repeatedly from June through the fall, sometimes as late as December. Strangely, these bulbs grown in the garden do not set seed as readily as in the wild. Another *Cooperia (Z. brazosensis)* is sometimes found growing with *Z. traubii,* or alone in filled areas. *Allium mobilense* (identified by Dr. Thad Howard) was also found growing next door in three color forms: purple, pale purple and white. The only other place I have noticed this in bloom is near the airport. Whether this latter area was filled at one time I do not know.

After the 1900 Hurricane, the first part of a 17-foot sea wall was built and the east end of the Island was elevated with the salty sand and clay from dredging of the harbor. This "grade raising", as it was called, filled many basements and almost all vegetation was either removed or covered. As the city grew westward, a grade standard was maintained that required a certain amount of fill for each new section.

While some basic fill presently comes from parts of the Island, the best top soil has always come from the mainland (Galveston and Brazoria counties). This may explain the possible introduction of many plants now native, including the ones mentioned earlier.

In my travels about town I have also noticed several other *Zephyranthes* species that have "escaped" from their original gardens. Among these are *Z. drummondii (C. pedunculata), Z. grandiflora* and *Z. candida.* These vigorous bulbs thrive even with regular mowing of grass. I have attempted to produce my own "natural" garden by discarding ripe seed capsules in the grass, but after several years only a few seedlings are evident.

Rain lilies in the ground are almost maintenance-free in this area. With a few exceptions, they like a sunny, well drained spot that receives each rain shower. With sandy soil, an annual mulching with humus is helpful, along with a light feeding of a balanced fertilizer every six weeks or so. I have often been negligent about the latter, but they seem to bloom as usual. When my border "crop" grew beyond the dozen or so plant names I had memorized, I faced a problem with labeling. I used an inexpensive stickon-tape labelmaker for one side of the white plastic label and used a #1 pencil to mark on the reverse side. As added insurance, I marked a chart as I planted new material and buried the label in front of the particular clone. This last precaution is necessary because of curious youngsters. Time will tell, but after several years in the ground the labels are like new. The one annoyance is removing all seed capsules as they form. Winters are usually mild in the Galveston area, so hardiness has not been a problem.

At one time I thought the rain lilies attracted few pests. However, we occasionally have a bumper crop of large snails and both night and day feeding cut worms. I find chemical and bait eradication slow at best and often remove them by hand at dark when they come out to feed on the succulent leaves and buds. My pot plants are elevated and are rarely bothered. An occasional mealy bug appears on these plants and it may also be controlled by hand.

The genus *Zephyranthes* (including subgenus *Cooperia*) is particularly large with named species, available unnamed species or variations, and the growing number of lovely hybrids. The *Habranthus* are more limited in number and some are difficult to bloom, especially the Mexican species. I kept "score" on my bulbs for a season and each one listed below bloomed a minimum of three times. Some on the minimum bloom scale are listed because of season, unusual color or other personality factor. These may not suit every area and can be affected by rainfall patterns in a given season. Any omission of a particularly vigorous clone (mainly unnamed species) is due to insufficient experience. The numbers listed at the top of the next page indicate approximate blooming period.

(1) April-May (2) June-July (3) Aug.-Oct.

NAMED SPECIES

Pink-Rose Red	Gold-Lt. Yellow	Cream-White
Z. morrisclintii (1)	**Z. howardii** (1, 2)	**Z. drummondii** (1)
H. robustus (1, 2)	**Z. citrina** (2, 3)	**H. cardenasiana** (1, 2)
Z. clintiae (1, 3)	**Z. pulchella** (2, 3)	**Z. albiella** (1, 2, 3)
***H. martinezii** (2)	**Z. smallii** (2, 3)	**Z. insularum** (2, 3)
Z. grandiflora (2, 3)	**Z. refugiensis** (3)	**Z. traubii (2, 3)**
H. brachyandrus (2, 3)		**Z. candida** (3)
Z. macrosiphon (2, 3)		
Z. lindleyana (2, 3)		
Z. rosea (3)		

* I have been growing this clone as **H.** sp. Korsakoff 1199 and he recently wrote that it will be or has been published as **H. martinezii.**

The fact that a plant species has not been published does not detract from its performance in the garden. Listed below are just a few of the unnamed Mexican *Zephyranthes* that are generally available. These are easy to grow and bloom frequently.

UNNAMED SPECIES

Z. sp. Horsetail Falls (1) (Howard 62-1)	Z. sp. Jacala Yellow (3) (Clint M-449)	Z. sp. El Naranjo (2, 3) (Clint M-550)
Z. sp. San Luis Potosi (Korsakoff 484) (1, 2)	Z. sp. Jacala Bicolor (2, 3) (Clint M-618)	
Z. sp. Mrs. Strout's (2) (Large Rose)		
Z. sp. Tamazunchale (3) (Clint M-375)		

While hybrids will never replace some of the most outstanding rain lily species, they certainly are an asset in the garden for unusual color, size, repeat bloom, vigor, etc. My experience is limited, but I've had some great surprises from a sampling of both old and new varieties. As an example. *X H. floryii (H. brachyandrus X H. robustus)* is intermediate in appearance, starts blooming with *H. robustus* and continues to bloom until late fall. It multiplies nicely in the ground and the blooms last well.

A DELIGHTFUL SUBJECT: **LEUCOCORYNE IXIOIDES ODORATA**

CHARLES HARDMAN, *P. O. Box 938, Temple City, Calif. 91780*

The genus *Leucocoryne* contains several species which are worth more than casual interest by the collectors of Amaryllids One of these is *L. ixioides,* and especially its variety, "odorata". I grew this for the first time in 1971. Now that I have seen it bloom, I am frankly at a loss to explain why it is not more widely grown.

It appears that the species was first introduced into the United States from Chile, early in the 1930's. Several years of publicity resulted in widespread popularity so that nurseries stocked it and sold the bulbs at a brisk rate. For some reason, the boom in this delightful

subject died out, and it is now difficult to find bulbs. Specialty nurseries sometimes do have them for sale, however, and they are well worth the small price usually asked.

The bulbs seem to take crowding well, and it is by putting a group of them into a three- or four-inch pot that the best effect is obtained. Don't expect growth right away. In this respect they are a little frustrating, for they frequently dawdle along for several months after planting before showing any growth. On the other hand, they *may* come up within a month. Either way, the bulbs won't bloom until they're good and ready. But the flowers are well worth the initial wait.

The leaves are thread-like and hardly seem capable of providing sufficient nourishment for the bulbs let alone the remarkably vigorous flower spike which emerges from them. This grows to a height of from 12 to 15 inches and is quite strong in spite of its fineness.

I dislike putting myself out on an unscientific limb, but I suspect—no proof is at hand as yet—that the flower stem, once having bloomed, may have a role to play in producing food for the growing bulb, as it remains green and healthy long after the flowers are gone even when no seed pods are forming. I have noticed similar behavior displayed in other bulbous plants. A group of bulbs of a *Cyranthus* I have (species as yet undetermined) provides a case in point. The plants still retain vigorous, living flower stalks, although it has been more than three months since they bloomed and no seed is forming. I believe this green stem may serve as a supplemental food factory to the narrow leaves, acting as an "additional" leaf. But I repeat, this is entirely speculation on my part and I have never seen the idea confirmed.

Last year, several forms appeared within my group of twenty-five bulbs. The name "*odorata*" evidently signifies a seed propagated variety rather than a clonally propagated one. One form was quite dark in color, really more of a purple than the usual lavender-blue. This one had narrow segments and the flower appeared a bit smaller than most of the others. Three plants displayed flowers with wide segments and very blue color. Most of the rest showed segments of average width and the common lavender-blue flowers.

Each of these flowers exhibits a startling white star in its center, and a cluster of three yellow pseudo-stamens protruding from this star quite boldly, all of which adds greatly to the interest of the blooms which are about two inches across.

The fragrance of this *Leucocoryne* has become a legend; it is at once powerful, yet hauntingly lovely. For me, the scent is of sweet licorice with overtones of coffee or chocolate. This fragrance is particularly in evidence at night, a fact which was overlooked or considered unimportant by the individual who gave the plant its dramatic common name: "Glory of the Sun".

Arrangers would do well to become acquainted with this gem; for cut-flower use the blooms are splendid. Each flower remains bright and cheerful for over a week when left on the plant, and freshness lasts at

least five or six days when the flowers are cut. They add greatly to certain arrangements.

Hybridizing is an easy task, but the flowers must be destroyed in order to get to the anthers and pistil, as these are set deep within the flower's throat. Seed production is scant.

I would like to see a tetraploid form of this fine subject developed. With this objective in mind, I intend to begin work at once.

EXPERIENCES WITH AMARYLLIDS, 1970

RICHARD E. TISCH,
Woodland Hills, California 91364

General. This year was a continuation of last year in more than the standard progression of the seasons. The faster maturation of plants in plastic pots continued to be demonstrated by most of the age groups, so all plants were finally transferred out of clay pots—either to outdoor beds to check their garden hardiness, or on up to square plastic pots or plastic juice pitchers. It seemed, additionally, that there was less damage from insects and diseases. The use of plastic pans for seedlings again proved optimum for my space and handling practices. Weather conditions were adverse for most of the specimens, alternating from unseasonable heat and bright sunshine when overcast and rain would normally prevail, to sudden plunges into downright chilly and clammy days and nights, followed by a stretch of bone dry hot winds and scorching sunlight. I marvelled that most of the plants survived in good health, even though their flowering and leafing-out stages were stressed to extremes.

Amaryllis hybrids. The number one happy day was a brilliant and balmy morning when an extra-large flower opened outside at one end of the family room picture window: pure pink, with absolutely no green inside, head up, and eight petals! There were two sets of balanced segs, four in a set. There were four long stamens and four shorter stamens. The stigma was four-lobed, and the ovary was four-celled, square. Of course it was pampered and protected, but something got to it regardless and chewed a great hole in the scape, where disease started and where it eventually folded over before seeds could develop far enough to be saved. But pollen from this plant was used generously, and strong seedlings are growing healthily in a protected plastic pan under a clear plastic cover. It was crossed onto the strongest large red, onto a small orange-red, and onto a deep burgundy red; only the large red has green inside the petals. The second flower had the normal flower, so the doubling or squaring (?) is apparently not characteristic of the plant as a whole. The plant is one from a batch of seedlings which had been treated with colchicine prior to sowing. So far as the coming seedlings are concerned, the next four years will include some impatient watching and fussing until they flower.

The large red flower upon which the aforementioned cross was made has been an excellent seed parent, not alone because it sets seed readily and passes along strength and early maturation, but also because it is recurrent blooming. During 1969 to 27 July 1971 it flowered ten times! Its earliest flower came on 21 March, its latest on 14 November.

Allium unifolium. This pleasing little flower seems to have made itself at home in the shade of an Olive tree in our back yard. Each April it sends up its slender scapes with pink umbels, sets seed and goes dormant by early July. Crosses resulted in seed, but no known progeny exist yet.

Brodiaea pulchella. From a visit to an historical location north of here in April 1970 I brought home some bulbs of this little beauty. It is shown in the very fine "Wild Flowers of the United States" publication of the New York Botanical Garden, Volume Four, "The Southwestern States". The ones I brought back were slightly more on the bluish side than are those shown in this excellent color reproduction. They have not flourished here, nor have any seed germinated. I intend to try again because of their grace and neatness of form.

Habranthus and *Zephyranthes.* These pretty little pixies have to be watched carefully; again this year some have popped up and flowered before I was aware of the presence of their fast-growing scapes. However an early morning prowl resulted in the detection of some *H. andersonii* that were ready to open. My notes show that I pried them open and removed the anthers at 6:30 AM and that the anthers were open by 7:15 AM. Also, I deanthered a *Z. drummondi* just this afternoon, but I'm convinced that the scape was not evident yesterday morning when I examined the coldframe. One of the *H. andersonii* seedlings flowered in two years, indicating that changes may come about faster than in some of the others which take several years to mature.

Hemerocallis. One of the seedlings from a standard commercial clone has stayed dwarf, being 20 cm high. It has divided into two small plants, one of which had a rather ordinary flower at leaf top height. This may become a plant useful for edging in this area, or for use along the top of a low wall. It is one from a batch of seeds treated with colchicine prior to sowing.

Caloscordum neriniflorum. This flowered for the first time last year, but I thought it was surely immature: its umbel resembled a cluster of pink match heads and its scape was so slender and weak that it had to be propped up with little bamboo hibachi spears. This year it produced the same kind of scape and umbel, so I removed it from the shelter of the coldframe where it may have been too shaded and planted the onion set sized bulbs in full sunlight. Next year we'll see what they do.

Rhodophiala x huntiana. After excellent leaf growth to 15 cm, and a period of dormancy in late summer, up came some sturdy little flowers of deep ox blood red which changed to a glowing burgundy. Some bizarre crosses which were tried were rejected; I'll try again this Fall. They will apparently make a satisfactory edging plant, in

morning sun.

Miscellaneous comments. With all the experimenting that is going on around me, I still find pleasure in growing the untouched species which have seen no alterations to their heritage other than that which has occurred in their native habitat. *Amaryllis striata* continues to send up its apricot flowers on graceful scapes, amidst rich green arching leaves. at almost any time of the year. *Brunsvigia rosea* continues to mark the advent of middle July with the brave tips which push up out of the hard dry soil, to flower in late July and early August; its pink tones and sweet fragrance are indeed welcome at that time of year. *Tulbaghia violacea* forms clumps of continuously flowering slender scapes with graceful violet umbels from late Spring to early Winter. I often wonder why I should be trying to change happily adapted flowers such as these.

NERINE COMMITTEE REPORT, 1971

CHARLES HARDMAN, *Chairman, Nerine Committee,*
Box 936, Temple City, California 91780

The hobby of hybridizing ornamental plants has reached such levels of intensity throughout the world, that it is safe to say no major genus has been left untouched by the backyard gene mixers. Yet certain genera, deserving of wider popularity among hybridizers, have gone begging for lack of intensive work by more than a handful of people. Many subjects which merit serious consideration by amateurs and professionals alike, are ripe and ready for building on the scant work already done. One of these is the genus *Nerine.*

I use the term "scant work" with the full knowledge that I will be taken to task for it. The early work of H. J. Elwes which was begun in the 1800's, the later work of E. de Rothschild earlier in this century, and the work currently being done throughout the world—which is not meant to omit Barr, Clarke, and a good many others along the way who certainly should be given credit for their contributions—cannot be written off lightly. And I am not trying to do so.

Yet, compared to Iris, Gladiolus, Daylilies, Dahlias, Chrysanthemums, Roses, and even Amaryllis themselves, it must be admitted that the work which has been carried out thus far on Nerines has been anything but exhaustive.

While the bolder cousins of the Nerines have held the spotlight for so many years, this genus has been assigned an occasional walk-on role, usually in crowd scenes at the far end of flower shows. Certainly the popular demand for flowers of large size impeded the progress of Nerines during the era we are currently leaving behind. There is little doubt that floral charm and grace and elegance—all attributes Nerines have in abundance—were often sacrificed in an atmosphere that equated large size with quality. In England and Continental Europe, small flowers have always been admired and grown in abundance.

This favorable state of affairs is gradually making inroads into other cultures as they mature and become willing to admit qualities which have been overlooked or even brushed aside before.

At the moment, the future for Nerines looks brighter than it has for a long time. What appears to be a major breakthrough in collecting, growing, and hybridizing is just now gathering a head of steam.

In England, for instance, the Nerine Society, in existence for only four years, already could boast a membership of 235 by the end of 1970. These members represent eleven countries.

Correspondence with the Honorable Secretary of the Nerine Society revealed some surprising facts. On April 28th, 1971, C. A. Norris of Worcestershire, England, wrote me: "I have just returned from a six weeks trip to South Africa, where I have been collecting Nerine bulbs and meeting people interested in the genus. Altogether I have picked up bulbs of some 25 species and a number of subspecies. . . . This now brings my collection up to nearly 400 named cultivars . . . and about 30 species."

Frankly, I was unprepared for that statement of facts, but the comment which followed provided the real surprise: " I suppose I have one of the biggest collections with about 40,000 (bulbs). . . ." From the vantage point of my own small collection, one which numbers 40,000 bulbs seems staggering in its proportions even if they are ". . . mostly the very common and ordinary forms like Corusca Major, N. sarniensis, "Fothergillii Major", "Mansellii", and "N. bowdenii. . .".

In my correspondence with Mr. Norris, I complained of the lack of sources of supply here in America for Nerine bulbs and asked if he could advise of any other parts of the world. The reply I received was this: "The fact is that this shortage is not limited to America. A friend of mine with a small collection of a few hundred bulbs put in a small advertisement in one of our gardening magazines and sold the lot within a week. There just is no stock anywhere except Borde Hill Gardens, Haywards Heath, Sussex, . . .". Mr. Norris is very nearly correct in this. It is a state of affairs I hope to see adjusted with the advent of a large crop of enthusiasts.

One enthusiast I met for the first time during the 1971 season is Roger Boddaert. He is a young man who has a refreshing attitude: he does things instead of merely talking about doing things. I was fortunate in being able to see his Nerine collection while some of the prettier varieties were blooming. This was a revelation in itself. But that was not the end of it. Hearing Roger talk about Nerines could make an enthusiast out of all but the most hardened gardener. The man is that rare combination of poet/scientist/hard worker so badly needed and yet so badly lacking in today's society. My understanding is that Roger will be having a few bulbs for sale occasionally. What is more, he intends to do as much hybridizing within the genus as time will allow.

Of course, when anyone speaks of Nerines in general and American

Nerines in particular, the name of Mrs. Emma Menninger has to be brought into the conversation at once. This fine lady has been hybridizing Nerines for over twenty years now. To view her collection in bloom is an experience which ranks with those other few experiences in a gardener's life that can be said to be high points. Spectacular as the blooms are when seen as individuals, there is a lacy grandeur about a mass of blossoming spikes which is almost overpowering in its total effect. Here in Mrs. Menninger's garden are the ballerinas of the Amaryllis family on display in great numbers, exhibiting a graceful elegance unique in the entire plant world.

We learned with sorrow of the passing of Mrs. Menninger's husband this year. Emma's constant companion in her hybridizing work, Elmore Menninger will be sadly missed by the many friends and plant lovers who were always welcomed at the garden gate by his great good cheer.

It is August as I write this, and nearly time for another season of bloom. Along about this time of year, the edge on my anticipation becomes honed pretty fine. I think it's partly due to the fact that Nerines bloom the reverse of so many plants: the icing comes before the cake. Somehow, there is something very satisfying about that procedure for me. Perhaps it's because the growing plants themselves do not disappoint me. The long, green leaves growing out of those plump, brown bulbs provide a source of casual beauty easily overlooked, but well worth a few moment's contemplation from time to time.

This year, a number of imported varieties are being added to my collection. I'm hoping many will bloom so hybridizing can be undertaken and seeds planted right away. It will be three or four years before the results can be judged, of course. But that time will be spent in the same way all other plantsmen spend their time: working with an ever-increasing collection of plants.

During the 1970's and '80's, we can look forward to a great deal of progress. Varieties—both species forms and hybrids—and especially the hybrids—will increase in numbers, colors, forms, and quality. Some breeders are already working with Colchicine, and once a sufficient number of fertile tetraploid forms are available, some wonderful combinations should begin to appear. Recently, certain triploid forms have demonstrated that they are fertile, or even "very fertile" as the information was given to me. Whether the viable seed obtained from these triploid crosses prove to be from true crosses or merely parthenogenetic "crosses" remains to be seen. But the prospects are exciting, with perfection, elusive as ever, always the goal.

Until the perfect Nerines arrive on the scene, however, those of us who grow the less perfect ones will content ourselves with the fine qualities this genus already exhibits. After all, the serious hybridizing work is just beginning on a widespread scale.

NERINE POT CULTURE

The following cultural instructions are furnished with *Nerine* hybrid bulbs offered by Borde Hill Garden, Ltd., Haywards Heath, Sussex, England:

The Nerines are natives of South Africa and belong to the Amaryllis Family. They have given rise to many beautiful hybrids.

As soon as the bulbs show signs of making growth in August or early September, submerge the pots in water for six to eight hours to ensure the soil being uniformly moist, and then give water sparingly until the flower scapes are well advanced from September to November.

After the bulbs have finished flowering, place the pots in an airy sunny situation close to the glass and encourage a free foliage growth by giving a little weak liquid manure. In May, when the foliage commences to turn yellow, gradually cease giving water and allow the bulbs to ripen off in their pots during their dormant period.

Plenty of air and sunshine are their principal requirements, and a minimum temperature of 34 degrees F.

Re-pot when necessary, say every third or fourth year. When potting, put plenty of crocks to ensure good drainage and put in a compost of 4 parts fibrous loam, I part coarse sand and a little dry well-decayed manure with a sprinkling of bone meal, well mixed. If these ingredients are not available, John Innis Compost No. III can be substituted.

Always pot firmly, leaving the upper half of the bulb above the soil.

Nerines are propagated by offsets or by seeds. The latter are best sown when ripe on the surface of the soil.

1971 DAYLILY REPORT

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

Based on the growing number of tetraploid registrations made, as well as upon comments from growers and hybridizers all over the country, it seems that the momentum toward a complete shift of interest over to the tetraploid daylily is finally increasing. Interest in hybridizing with tetraploids is very high, and there is surprising activity in actually treating plants and flower spikes with the colchicine techniques described by the pioneers Schreiner, Buck, Traub, Fay, Griesbach, Arisumi, and Lachman.

In 1971 severe drought was prevalent in the Midwest, down into Tennessee, and in most of the Southeastern States. Florida and some of the eastern seaboard states were plagued by severe drought followed by excessive downpours late in the summer. Southern California had severe heat at unusual seasons. In spite of all these natural hindrances most daylily growers were able to get much work done as they enjoyed

the flowers that they had.

In this reporter's garden 'Mary Todd' (Fay), in spite of a tendency to fade slightly in the hot sun, holds its place quite firmly as the best midseason tetraploid yellow daylily, based on performance and quality, being unchallenged here by 'Golden Surrey' (Fay), which has been reported most favorably from some areas. The newer very round pale yellow 'Galena Moon' (Blocher), wide petalled 'Bonnie John Seton' (Peck), the heavy substanced, round ('Golden Ring' (Traub), and the stalwart new 'Yellow Crystal' (Griesbach) must develop into larger clumps before they can be compared for performance. The robust large yellows, 'Northbrook Star' (Fay) and the pale 'White Cloud' (Traub), did give much better performances as older and better established plants, The early flowering gold 'Dr. Ned Miller' (Buck), slated for early release, was particularly lovely because of its perfect classical shape and amazing substance.

'Sir Patrick Spens' (Peck) has for several years been the best sunfast red tetraploid, but this year it had competition in a newcomer, 'Lusty Lealand' (Peck), a refreshing bright red with large yellow throat, very sun resistant and a good parent. 'Red Cherry' (Hardy) was a nicely shaped bright red, but it could not take our heat and sun. 'Gypsy Trail' (Griesbach) produced fine spikes of velvety big flowers, which do not hold up in the sun, and which gave only one seed pod. The normally less resistant green-throated 'Arriba' (Griesbach) was inconsistently and surprisingly sun tolerant on some of our hottest days. A small treated plant of 'Congo King' (Lenington) gave interesting crosses which hopefully will carry its deep velvety red.

The electrifying deep rose color of 'Jock Randall' (Peck) stands out as a highlight of the year; this marvelous big variety should give rise to other even clearer and purer rose colors. 'Jane Austin' (Griesbach) was another large rose of almost equally important breeding potential, and both of these "roses" performed well as both seed and pollen parents.

The purest color in deep rose pink was found in 'Cherry Cheeks' (Peck) and the treated 'Vivacious' (Munson), and this wonderful clarity of color and their beautiful round shape make these two important parents. In light pinks 'Zadol' (Spaulding) and 'Pink Superior' (Fay) were the clearest varieties used in treated forms, followed closely by the tetraploids 'Pink China' (Hardy) and 'Shell Pink' (Fay). 'Pink Fluff' (Spaulding) and F63-1 (Fay) were excellent parents in the treated forms used.

The Munson tetraploids grown were a delight in color, which in general was a blending of pink, rose, coral, cream, peach, in varying tones; these beautiful colors, however, resented the Southern California heat. Even so, it was impossible not to like the purity of color in 'Scarborough Fair', 'Empress Mei Ling', 'Domani', and 'Georgica', the latter having wonderfully branched short scapes, also. The very large pink 'Secret Garden', fine as it is, does not have the same purity of

color.

Among the lavenders and lavender-purples, 'Tai Pan', 64-37, and 'Charlemangne' (Moldovan); 'Little Wart', 'Wannetta', 'Lavender Flight', and 'Blue Jay' (Spaulding), 'Lavender Parade' (Fay); Dorothy Lambert' (Lambert) were the best clones available this year. The Moldovan and Spalding varieties showed unusual purity of color here. A small treated plant of yellow-throated 'Silver Shadows' (Munson) and treated 'Lady Mary Montague' (Wynne) gave promising crosses for lavenders.

Among the melons the best performers were 'Lady Cynthia', 'Kathleen Elsie Randall' (Fay); and 'Loyal Subject' (Bro. Charles). 'Alison' (Peck) faded too badly in our sun to be ranked with the preceding three. 'Lynn Markham' and 'Harry Randall' (Fay) will be outstanding on larger clumps, probably.

Reports coming from hybridizers include the exciting news from James E. Marsh of Chicago that his new purple and lavender seedlings in 1971 were even better than he had hoped for; his red tetroploids did not show the same progress. Dr. Robert A. Griesbach had a number of outstanding new pink seedlings, and Bro. Charles Reckamp had a number of superb new melons. Dr. Virginia L. Peck flowered many fine new seedlings in spite of drought, as did also Wm. A. Munson, Jr., whose whole seedling field was of very outstanding quality.

The Buck garden produced a new pink tetraploid seedling of most delightful color, and a diploid wine-purple self of such marvelous color quality that it demands polyploidizing at once. Treated forms of 'Francis Fay' (Fay), 'June Rhapsody' (Childs), and 'Grace Lenington' (Lenington) gave most interesting crosses when combined with some of the new tetraploids already mentioned.

This sketchy and very incomplete report for 1971 hopefully does reflect the energy of effort and the resulting progress in the improvement of the daylily, which is still the finest and most unfailing summer perennial for so much of our country.

GROWING AMARYLLIDS IN OVERCROWDED POTS

JOSEPHINE DE N. HENRY, *Gladwyne, Penna.*

Here in the greenhouse the most spectacular displays of Amaryllids come from the overcrowded pots. A few have been neglected, and others have been *deliberately* left undisturbed to such an extent that the pot is completely packed with the bulbs. In some cases the bulbs are totally upon the surface of the soil and quite often too, the pots are cracked by the expanding roots, necessitating a new and larger pot. Years ago I begged my mother not to disturb some of these overburdened containers because a pot of many bulbs abloom is an extraordinarily beautiful sight. To her, and to most bulb specialists, members of the Amaryllidaceae deserved better treatment. The only drawback that I see to too many bulbs per pot is that each plant requires more space upon the

bench in the greenhouse. They also require more frequent watering and fertilizing.

One eight inch pot now accommodates some eighteen. This is a vivid red hybrid between *Amaryllis* x *henryae* and van Meeuwen's 'Graceful'. This cross was made by my mother because she was so disappointed in the lack of grace in the latter hybrid. The stalks, of a lovely purplish hue, were heavy in proportion to the blossoms which were small but of fine form. She visualized the result as being an improvement on this Dutch miniature, which it happily proved to be. The resultant plant is beautifully proportioned and vigorous. The foliage is very dark and glossy green, the scapes are tinged with pinkish violet, and the flowers are well proportioned and of splendid substance.

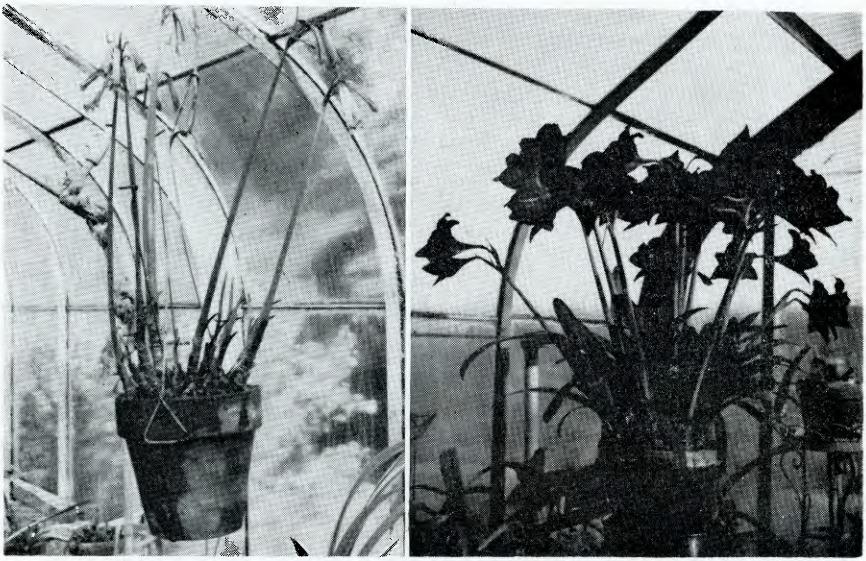


Fig. 27. Left, **Eustephia darwinii** Vargas. Right, Amaryllis x **henryae** Traub x **Amaryllis** clone 'Graceful'. From color prints by Josephine Henry.

They are totally deep garnet red with light yellow pollen. The height of the plant in flower is eighteen inches above the bulb. Each blooming bulb is fully half out of the soil. The accompanying Figure 27, from a photo taken this year illustrates eleven stalks, many of which boasted four flowers each.

Another handsome Amaryllid is *Eustephia darwinii,* a gift from Dr. Cesar Vargas of Cuzco, Peru. Although it became a part of this collection in 1957, it never flowered until 1969 when it produced a lone stalk. In 1970 there were six beautifully coral-tinted stems with their bright salmon blossoms hanging as though the petal tips were weighted with a lovely green border, the stunning yellow pollen dangling below upon red filaments. It was just beautiful, even though there was only

the promise of bronzy foliage issuing from the bulbs. The seven-inch pot is tightly packed with the bulbs, and wee young ones are sitting upon the interstices . . . it is just jammed! Perhaps this bulb initially was overindulged when first received.

A *Eucharis* species given to my mother years ago by Mulford Foster, *E. fosteri,* has become a mound of bulbs from which issues a billowing of rich green and glossy foliage. The green display throughout the year justifies harboring the plant alone. The flowers are small and white, but their display deserves scant comment.

The other *Eucharis* (I don't know whether it is the same species as the above, but they do resemble one another in spite of the difference in their habitats) is from the region Northeast of Lake Titicaca in Peru near Sandia. It was growing on a rocky ledge well beyond my reach and was discovered in my effort to obtain a clump of *Amaryllis,* presumably *A. forgetii.* It was nearly impossible to gain a foothold upon the very narrow ledge, and I had to flatten myself against the rock in order to give myself a chance to get the *Amaryllis* bulbs from an even narrower ledge way above my head. A friend handed me a long pole. It was no easy matter to look up and pry the bulbs loose and maintain my balance, but by very cautious prying for some time—they were happily attached—I made some headway. Suddenly, the mass came loose showering me with bulbs, gravel and detritus, the latter two falling down my back. After gingerly letting myself down, I collected the bundle of bulbs and found the *Amaryllis* was intergrown with a *Eucharis* species—a bonus! After presenting the treasures to my mother, I hastily resorted to the roaring river, feeling my way between the shrubs and boulders, to remove the scratchy, wet debris from my back and nearly take a bath. It had enjoyed cramped quarters upon its ledge. Here this species thrives with all the bulbs forced from the soil just about in the same manner as in its own habitat. It is potted primarily in what amounts to one part soil, one part coarse builders' sand, one part peat, plus sprinklings of fine and coarse road grit. A few little pieces of charcoal are tossed into the mix. In my family there have been few hard and fast rules concerning soil mixtures, perhaps due to the fact that so many opportunities for observation of plant localities and their soils have been beneath our feet and sifted through our fingers. After all, in far places one does not always have a proper digging device, and I have collected from Alaska to Florida, most of Mexico and Central America, a good deal of South America, Iran, India from Kashmir to Assam, and in the interior of China. I have often resorted to any implement—files, tire irons, knives, etc.—and, naturally, the hand finishes each excavation. All of this has impelled me to behave like a seasoned and experimental cook—adding a little of this and a little of that, unlike a young Englishman of my acquaintance who protested that he did not see the point of more than three soil mixes. Obviously, he had no familiarity with geology nor experience in the field.

The most admired *Amaryllis* is the *Amaryllis* x *henryae* which Dr.

Hamilton P. Traub used as the frontispiece in his book, "The Amaryllis Manual", to illustrate what he proclaims to be the finest small *Amaryllis* extant. *Amaryllis* x *henryae* 'Frontispiece', as I propose to call it, has remained undivided since it emerged as a seed fledgling and was potted. Each year my mother had intended removing a bulb but because of the beauty in bloom, it was delayed during her lifetime. This year I carefully removed three blooming-sized bulbs and one wee one from the perimeter of the pot immediately following the blooming period. It was hard to bring myself to do this, but after this a cluster of fourteen bulbs remained. Their roots were hosed a bit and dead ones removed, but the bulbs were not separated before restoring them to the same sized pot with a fresh, loose mixture of soil of the type employed by my mother.

In innumerable sites bulbs were cramped as some of ours now are in pots. On these ledges they obviously received considerable run-off or drip from the rock faces which, undoubtedly, transported nutrients to the rather naked bulbs whose roots had gathered falling material about them for sustenance.

However, many others of the Amaryllidaceae, such as *Stenomesson, Eucharis* and *Hymenocallis,* including the green species (formerly *Stenomesson viridiflorum*) grew sporadically. It seemed that when their existence was threated or they were required to make an effort for their survival, they proliferated. The finest clump I ever saw of *Eucharis* (formerly *Urceolina*) was on the top edge of a steep, uncomfortable road embankment. A green *Hymenocallis* was massed along an irrigation ditch which was excessively steep so the running water, plus the threat of a cave-in, was ever present. I do not know how much of this might be true, but merely observations in the field have caused me to consider it possible that their increase is above normal when deprived of favorable conditions. No doubt, growing bulbs in this fashion would not be good in every case, but here in our latitude under greenhouse conditions of 60 degrees during the day and cooler at night, scant or no watering from mid-summer, they thrive. This illustrates that it is not necessary to repot as often as frequently recommended. Actually, I am sure that not one of these pots has received fertilizer on any regular basis. One advantage we do have is our own water supply.

GOOD REPRODUCTION OF COLOR SLIDES

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

Having noted that most printed reproductions of color slides were not only too contrasty but of very poor quality, I consulted Robert Armstrong of Alvin's in Pasadena. He told me that Eastman Kodak could make an internegative which when printed on Panalure paper, gave very good black and white prints. I used this method and the results are very good as shown in PLANT LIFE 1970 pages 50 through 55.

PLANT LIFE

VOLUME 28

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

1972

GENERAL EDITION

EDITED BY
HAMILTON P. TRAUB
HAROLD N. MOLDENKE

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

A BULB COLLECTING TREK THROUGH MEXICO

James A. Bauml, *130 Melba,*
San Antonio, Texas 78216

From July 2 to July 20, 1971, Dr. Thad Howard and I enjoyed the adventures and thrills provided by Mexico's scenery, climate, culture and plant life. Traversing twelve states, we made one hundred and twenty collections ranging from *Anthericum* to *Zephyranthes.* In addition to the majority of recollected species, as usual, we found a few plants new to us both and to science.

DURANGO

As is the custom, the hot and relatively uninteresting Sonora desert we crossed in the cool of night, arriving for a cat nap about five P.M. an hour or so outside the city of Durango. With the Saturday morning sunrise, we awakened, and the field trip officially began. Exploring our immediate environment, we found a white flowered *Anthericum,* a few *Milla biflora, Zephyranthes longifolia,* an *Oxalis sp.,* and an interesting bulbous succulent with a little three inch rosette of leaves and a branching stem with small white flowers. Fifteen miles further, we stopped again to find more *Millas* in addition to a stoloniferous *Allium* species.

One of the more spectacular sites of the trip greeted our eyes just east of the city. A still undescribed *Hymenocallis* from that locality was in peak flower and formed a white sheet on both sides of the highway, fading out only at the base of the hills beyond. While digging a few, we found it impossible to walk among them without stepping on seedlings, so thickly did they grow. The aquatic *Allium Mannii* Traub grew on the other side of Durango in low spots.

West of the city, as the altitude increased, so did our comfort. On our climb into the mountains we found a *Calochortus sp.,* a *Nemastylis sp.* in leaf, *Allium Durangoense* Traub, and several types of terrestrial orchids. We began a close watch for the bright yellow *Tigridia Dugesii* which we found with already faded flowers after several stops. In this same vicinity, normally rock-loving Sprekelias were seen growing and blooming on the flat roadside.

East of the village of El Salto, the cool wet Llanos were home for another *Tigridia,* the (blue through purple) *T. durangense,* diminuative in size, and variable in form and markings, it grew in the clay muck with a semi-aquatic *Allium sp.* Disbelieving native children gathered around as the gringos gathered and washed the plants in the chill ponds.

Heavy rains and fog brought visibility to a minimum and slowed the afternoon mountain driving. As evening began to darken the landscape, we re-collected another unpublished *Hymenocallis* in flower and fruit east of Mazatlan at Km. 224. This shade-lover with broad, thin leaves grew in fluffy black humus and could almost be pulled rather than dug from the ground.

MAZATLAN TO TEPIC AND BEYOND

Our arrival in Mazatlan brought us into humid coastal lowlands. In this environment we found *Hymenocallis sinaloensis* the next morning flowering in roadside ditches on our way south down the coast. Soon, thick colonies of another little Irid, *Cypella Roseii,* appeared. We saw them by the thousands growing in hard-packed sand. Though predominently pale blue with maroon spotting in the centers, some of the globular-shaped flowers ranged from white all the way to dark purple with all combinations in between. As while digging the *Hymenocallis,* mosquitoes attacked us in swarms until our continued repellent applications made us unbearable to the apparently insatiable insects.

After passing through the village of Acaponeta, we found our first *Besseras* growing among the roadside rocks. Ten Km. further a large colony of *H. sinaloensis* beckoned us to stop and appreciate more closely their beauty with eye and camera.

Forty-one km. from Tepic, we spotted another spiderlily. We were then into *Hymenocallis horsemanii* territory, and we found a small form of that plant growing by the roadway. The *Besseras* were still with us, and we made our collection from a group not far away.

We turned right toward San Blas and the blue Pacific in mid afternoon. After passing through palm and jungle country we arrived at the village where we waded, rested, and ate lunch before returning to the main highway.

We found a coral-flowered *Stenorrynchus sp.* of terrestrial orchid in bloom from the San Blas turnoff all the way to Tepic and beyond. The rock bluffs seventeen miles north of the city were the home of a green flowered tuberous *Begonia sp.* with interesting jagged leaves in addition to a *Pitcairnia sp.* of rock-loving bromeliad and a ginger-like plant. Our last plants for the day were *Tigridia passiflora* in fruit and bud and a dwarf *Euphorbia sp.* with the bright red bracts of its poinsettia relative, both collected just a couple of miles north of Tepic where we spent the night.

Again headed south, we collected more *Tigridia passiflora,* this colony containing members with less colorful and clear markings and often with yellowish segments as compared to usual white. *Bessera, Hypoxis,* and *Manfreda* also grew on the knoll.

From a rock formation at km. 176, a beautiful patch of color caught our eye as we whizzed past. When we turned back, we found the source of the brightness to be a Bletia-type orchid in bloom. At the end of a two foot spike, a group of jewel-like purple and creme flowers opened wide. Growing also in the cool damp moss were another tuberous *Begonia sp.* in leaf and a small fleshy-rooted *Sisyrinchium* with showy little yellow flowers.

IXTLAN DEL RIO TO TEQUILA

We soon passed through a lava flow where we photographed the barren but exotic landscape of igneous boulders. Ixtlan del Rio lay not far down the highway, and two miles on the other side of the city,

we located a population of extremely robust plants of *Hymenocallis horsemanii* with bulbs and stems twice the size of the first we had seen. Various members of the Commellinaceae also grew here with some white flowered Anthericums.

One kilometer past the Nayarit-Jalisco state line, on a steep damp hillside, a deep-growing but beautiful rose pink *Oxalis sp.* was recollected along with a Bomarea-type vining plant having tuberous roots. Another large colony of scarlet *Bessera elegrans* nine miles further provided the second location in Jalisco for digging.

Back into relatively flat land, we noted the appearance of the first *Milla biflora* of any quantity. The soil here was dry, pebbly, and of a light reddish-brown color. Although this group did not approach the same quality we expected to find later, we nevertheless took a representative bagful with the trusty rockpicks.

Four km. down the highway at km. 94, we ran into a virtual "rock garden" on an otherwise barren rocky hillside. *Milla biflora,* a *Nemastylis sp.* in leaf, *Tigridia passiflora,* yellow flowered Anthericums, the coral-flowered *Stenorrynchus sp.,* a small *Oxalis sp.,* and a *Polianthes sp.* provided an unusually rich plant collecting site.

The village of Tequila provided an excuse to stop for eating. Distilleries here for years have processed the potent juice of *Agave tequilana* into the famous beverage for which the town was named. Whole mountainsides of the plant covered the land for miles on both sides of the town.

GUADALAJARA TO THE PACIFIC COAST

We turned southwest toward the coast upon reaching the outskirts of Guadalajara. Three km. down highway 80 we collected *Milla biflora* in seed plus another *Nemastylis sp.*

At km. 50 we found *Hymenocallis acutifolia* growing under several inches of water in a roadside ditch. Attempts to make a collection proved futile as the bulbs clung stubbornly to their deep hold in the mucky clay.

Ten km. further, when we stopped to investigate the first *Hymenocallis mexicana,* what should we find but a Sprekelia—no, several of them—growing in the dark roadside soil. No, it was not a Sprekelia—or was it? The ovaries were sessile, but the leaves, as many as ten, were flat, very wide, and shiny green. We both began digging, and soon Dr. Howard found a bulb in flower. It was rose pink of typical *Zephranthes* form. We quickly nicknamed the plant *Zeph. "sprekeliafolia."*

We reposed at a newly refurnished hotel, identifiable only by its new neon sign on a narrow bumpy street in the little town of Union de Tula. That night we enjoved the experience of staying at one of these really rare places with large comfortable rooms, sturdy beds, a combination bath-shower, and hot water . . . all for $1.00 each.

Among the rocks of a hillside outside Union de Tula at km. 129 a colony of *Bravoa gemniflora* with its stalks of bright red pendulous

tubular flowers caught Dr. Howard's eye. We stopped to collect these and a *Calochortus sp.* in leaf.

Before arriving at a very rich ravine at km. 169, we found more of the *Oxalis* of the day before plus a few orange-red Besseras south of Autlan. The ravine yielded the beautiful Bletia-type orchid in a slightly more purple form, another tuberous *Begonia sp.,* a colony of a purple flowered *Pinguicula sp.,* a *Bravoa sp.* in bud, *Achimenes,* aroids, and *Hymenocallis azteciana* Traub in leaf. They all grew in beautiful peaty humus in shady spots on both sides of the steep gorge down which trickled the icy water of a mountain spring.

We soon spotted the above *Hymenocallis* in flower, *Tigridia meleagris* in leaf, and the first of the dwarf Sprekelias in leaf and fruit. We discovered that some of these miniatures had bloomed from bulbs only one inch in diameter.

BARRO DE NAVIDAD TO URUPAN AND BEYOND

We took advantage of the blue-green Pacific for swimming, and we ate lunch on the beach of Barro de Navidad before proceeding southeast on Mexico 200, then northeast on Mexico 110 toward Colima. From km. 23 through 20, we collected more dwarf Sprekelias, a tuberous *Begonia* with maple-shaped, red-speckled leaves, a dark pink flowered *Pinguicula sp.* growing in little dirt pockets of a flat limestone rock face, and giant purple Besseras. Almost into Colima, we turned back to try again locating an illusive yellow flowered *Nemastylis sp.* which had thus far evaded our close watch. A search on foot rewarded us with the Irid, so we continued on to Tuxpan.

Wednesday morning a stop in the pine forests west of the Jalisco-Michoacan state line netted more *T. meleagris* and *Sisyrinchiums.*

We noted *Hymenocallis mexicana,* a few *Zephranthes,* and *H. riparia* along the highway before we arrived at Zamora. East of here, at the exit from the village of Zopoca, we found a white flowered stoloniferous *Allium sp.* which was easily dug from the dark brown soil.

We turned south from Carapan on highway 37 toward Arteaga, but we saw no different plants until we stopped thirty miles south of Uruapan, a few kilometers past the village of La Laguna. A pasture, now very dry and overgrazed, which had supported "tricolor" Besseras in previous years, beckoned for our investigation. I could find no hint of a plant, but Dr. Howard soon noted an inch of *Bessera* leaf poking from the soil. So we collected as best as we could by the scanty foliage, noting that holes in the ground and empty corm coats sometimes marked the spot where a meal had been unearthed and consumed by a small quadruped.

We encountered another real adventure at km. 165 where we stopped to recollect the rare blue-flowered *Dandya Hannibalii.* The sun sank lower in the late afternoon sky as we two plant people began our ascent up the steep, rocky, tree-studded hillside. We searched in vain about one-half mile of ground when we decided to climb to the top and then back down to scan the lower ledges. Panting, we reached the top with

no success. As we dismally climbed downward, I noticed one tuft of terete leaves and asked, "What's this?" "That's it!" exclaimed Dr. Howard. With the optimism generated by this find, it was not long until we found more and more until Dr. Howard came upon a big colony. In the quickly fading light we dug a substantial number of corms even finding two in bud. The moon coming over the mountains hailed us and was our guide on the lonely stretch to Arteaga where we stayed that night.

PLAYA AZUL TO IXTAPAN

Thursday morning we decided to venture down to Playa Azul, the coastal town thirty miles south of Arteaga. On the stretch were *Hymenocallis glauca, Bessera elegans, Manfredas sp.,* and various terrestrial orchids. The little town provided a beach for swimming, crab watching, and rock collecting. We soon turned north again and ate lunch back in Arteaga.

In a burned-off clearing, then a cornfield, at km. 245 we found both *H. glauca* and *H. mexicana* growing side by side. While the latter flowered, the former set seed. No hybridization was apparent.

In the next few miles, we collected most of the air plants of the trip. These included *Oncidium cebolletta,* an *Epidendrum sp., Tillandsia caput-medusa,* and *T. carinata.*

At San Gabriel Zamora, Dr. Howard noticed a pink *Crinum* blooming in the front yard of a native abode. He asked if I had noticed. Since I had been looking elsewhere, we turned around to look again. This out-of-the-ordinary *Crinum* at first glance resembled *C. americanum,* but with its larger, more abundant pink flowers, reminded Dr. Howard of *C. erubescens.* We stopped and chatted with the lady of the household, and Dr. Howard successfully completed a business transaction. Her son unearthed several large bulbs which had escaped via rhizomes under the fence. Thus not all our plants came from the wildlands.

Before arriving at Patzquaro, our day's destination, we made a stop for a large colony of *Zephranthes* of the Jalisco complex. We found it possible to collect a good representation of all the shades—from white through dark rose pink.

We departed the city early, drove through Quiroga, and stopped in Morelia to visit the magnificent cathedral and purchase some food. Still on Mexico 15 we saw more dwarf Sprekelias and *Hymenocallis* before stopping at km. 212 for the gathering of another tuberous *Begonia,* this one with leaves having red margins and silver undersides. Another Stenorrynchus-type orchid was found here in the damp humus.

In the next few kilometers as we climbed in altitude an *Echeveria sp.,* some specimens over a foot in diameter, and a *Calochortus sp.* appeared on rock faces beside the road. Likewise, two *Sisyrinchium ssp.,* one a couple of feet tall, caught our eye before we reached the pines and evergreens.

A small rise along the road at km. 153 again proved to be a valu-

able spot this year as *Tigridia violacea,* deep in moist heavy clay, a Bletia-type terrestrial orchid with green and purple flowers, *Bravoa gemiflora* in its orangey-red form, and robust *Milla biflora* grew in abundance.

Another such knoll, replete with plant life, attracted us at km. 117. Many vining *Bomareas,* more *Tigridia meleagris,* another *Calochortus sp., Oxalis,* a *Milla sp.,* and *Allium michoacanum* covered the low rise. The *Bomarea* tubers luckily did not fall apart as they usually do upon being unearthed. One kilometer more and the "non-flowering" Milla sp. we had also seen in Jalisco again grew thickly-like clumps of grass. We dug more here and packed these in peat with the tuberous roots from the previous stop.

A new *Echeveria sp.,* this one with large wavy leaves, along with the pretty *Oxalis deppei,* grew in the fluffy black soil of a rock hillside at km. 44 after we had crossed the Michoacan-Mexico state line and had passed through Toluca. Before we reached Ixtapan, our spot of repose for the day, our last stop resulted from my desire to pluck a scarlet blooming *Pitcairnia* from some roadside rocks.

STATE OF GUERRERO TO ACAPULCO

The next morning we made our first stop five km. outside the city for *Milla "filifolia"* growing in dryish pebbly soil. At the lookout point, km. 204, in the state of Guerrero we not only spotted marvelous scenery but also a miniature *Anthericum* in leaf, a white flowered *Nemastylis* in leaf, plus more *Milla "filifolia."* Within the next mile, *Zephyranthes Nelsonii* appeared.

As we journeyed further southward, we saw *H. glauca* again beginning at km. 110 and *Milla magnifica* at 120. An impressive sight at km. 65 was a colony of tuberous Begonias, all of which sported only one leaf. Still more amazing was the fact that the flower stem emerged directly from the leaf's center. Needless to say, we rock-picked several of these exotics from their tenacious hold on the vertical rocks.

Growing in profusion at km. 73 was *Milla magnifica* in leaf. In this Bessera-like rocky terrain, they grew in humus pockets between and around the strata. These corms can exceed two inches in diameter in cultivation, and some of these collected corms almost matched this size. In ten kilometers, we arrived in the scenic tourist town of Taxco where we ate lunch and shopped.

We noticed scarlet *Bessera elegans* and *Hymenocallis riparia* before reaching Iguala where, in search of pendulus flowered *Tigridia Ehrenbergii,* we turned west toward Teloloapan. Ten miles from the cutoff, a sloping rocky cornfield appeared promising. An Irid did grow here. But much to our surprise a dissected spathe showed the plant to be a white *Sessilanthera sp.* We had planned to find this one later south of Iguala and so took the opportunity of doing the re-collecting here instead.

South of Iguala, approximately thirty miles, started the territory of the interesting white flowered *Dandya thadhowardii.* When we

finally found a colony, they really grew in abundance. In light red gravelly soil in forest shade, there appeared to be thousands of the corms each within inches of each other.

After passing through Chilpancingo, we noted the appearance or reappearance of four of our friends, namely a yellow *Sessilanthera sp., Hymenocallis glauca, H. riparia, Bessera elegans,* Sprekelias, and more terrestrial orchids in leaf.

Dr. Moore described the type location of *Petronymphe decora* as being Acaquizotla, and that is where we headed after turning off highway 95 at km. 34.5. Through two gates and in and out of dangerous chugholes we came into the lush little area through which the old highway once wound. Various achimenes and the yellow *Sessilanthera,* a Bletia-type and a semi-terrestrial orchid we found on the rocks. Bromeliads and an Oncidium-type orchid hung precariously over a pit cave. Also, we noted the presence of many ferns and tuberous *Begonias.* Dr. Howard came through with another new plant here too—this one being a small, glabrous, wide-leafed *Hymenocallis sp.* in fruit which he spotted among the other greenery. As for *P. decora,* we did see a few on the rocks, but as dusk approached, we chose to continue to Acapulco and make the time consuming climb to the plants on our way back.

The bustling city, the white beaches, and glistening blue waters of the bay coaxed us to relax and enjoy our Saturday in typical tourist fashion. The next day we drove west on coastal highway 200 to Zihuatinejo, an undiscovered and undeveloped "miniature Acapulco" also built on a bay. Not only for sight-seeing did we make the up-coast excursion also for investigating Petatlan, type locality for *Hymenocallis cordifolia.* Villagers in that town the next morning admitted to knowing of the mountain-growing "weed," the leaves of which they fed to their pigs. On several sets of conficting directions we spent hours trying to reach the mountain road where the plant reputedly grew. Bad luck forced us to return to Acapulco without this illusive Amerindian Lily.

MINOR AUTO ACCIDENT AND RETURN

Our ensuing minor auto accident on the outskirts of the city gave further evidence of the bad luck of this day. The front end of Dr. Howard's VW bus suffered the damage as we hit the rear of a flatbed truck which stopped suddenly for some obstacle while going around a curve. Thus the second phase of our trip, sans private transportation, mainly involved sight seeing in Acapulco for two days and in Mexico City for six days when the insurance company shipped the bus north for availability of parts. The delay included the time-consuming procedure of having official paperwork completed, first by the insurance company and then by a federal office, to allow us to leave via public bus rather than by car.

Dr. Howard, being a true plant collector, would not let the absence of an auto disuade him from gathering more species. Of our days of detention, one was spent at the University of Mexico campus via city bus where we recollected a rare white *Habranthus sp.* whose

bulbs at maturity reach *Amaryllis* size. Several terrestrial orchids too were found in this Pedregal area where the decomposed black lava made for a wonderful soil. Complete with pick, sharpshooter, and bags of plants, we no doubt presented an unusual picture on the bus travelling back across town.

The next day we caught a bus to Pachuca sixty miles north and then chartered a taxi. We unsuccessfully searched the alpine countryside for *Tigridia alpestris,* but we did collect another *Calochortus* and a very dwarf white to purple *Nemastylis sp.* which may be a new one.

The bus ride to Monterrey to Laredo to San Antonio brought us home on the evening of the eighteenth day, and only after another month would Dr. Howard be able to return for his repaired bus and the plants.

In two weeks we had completed a whole summer's worth of field work. The pace was hectic, and the work was often hard. But the scenery, the cities, and the experience of botanizing in Mexico will not soon be forgotten.

LATIN AMERICAN AMARYLLIDS, 1971

Pedro F. Ravenna, *P. F. R. Castilla, 21128*
Sucursal 21, Santiago, Chile

[The text translation which follows was published by the writer in "Noticiario Mensual, Museo Nacional de Historia Natural", Nr.173 (23 Dec. 1970), Santiago, Chile. Seven new species of *Habranthus* were described in that work; additional illustrations, as well as the original, are included here.—*Pedro Félix Ravenna*]

Habranthus salinarum Ravenna, Notic. Mens. Mus. Nac. Hist. Nat. Chile, 173 :3.1970.—*Plant* to 15-20 cm tall. *Bulb* subglobose about 20-28 mm long, 18-26 mm in diam., dark brown on the outside, produced into a pseudo-neck for 25-50 mm. *Leaves* often serotinous, very narrowly linear to 15-20 cm long, 1-2 mm broad. *Scape* cylindrical to 10-16 cm long, 2.5 mm broad. *Umbel* one-flowered. *Spathe* membranous, to 23 mm long, bifid for 7 mm. *Pedicel* about 15-22 mm long. Flower white, narrowly infundibulate, ca. 35 mm long, 18-22 mm in diam. *Ovary* narrowly eliptical to 4.5 mm long, 2.5 mm broad. Perígone: *tepalsegs* oblanceolate, connate for 2.5 mm, the outer ca. 36-37 mm long, 8-8.5 mm broad, apiculate, inner subequal, acute or almost obtuse. *Stamens:* filaments declined, somewhat incurved at the apex, lateral episepal ca. 8.5-11 mm long, upper episepal to 14-15 mm long, lower epipetal ca. 16 mm long, lateral epipetal about 19-20 mm long. *Style* declined ca. 27.5-31 mm long. Stigma trifid, its divisions recurved, to 1.5-1.7 mm long. *Capsule* globose-tricoccous, ca. 10-11 mm in diam. *Seeds* compressed, black, semilunate-reniform or ovate-cuneate, ca. 5.5-7.5 mm long, 4-5.5 mm broad. (Fig.28)

Hab.—In sandy salty places at the Salinas Grandes border, in the province of Córdoba, Argentina.

Habranthus salinarum is somewhat similar with *H. cearensis* Herb.

In fact, the flower of the latter species shows considerable resemblance in shape, but it is smaller in size; on the other hand, leaves are broader. *H. andalgalensis* Rav., a species from Catamarca, has whitish flowers, but larger, and its leaves are practically filiform.

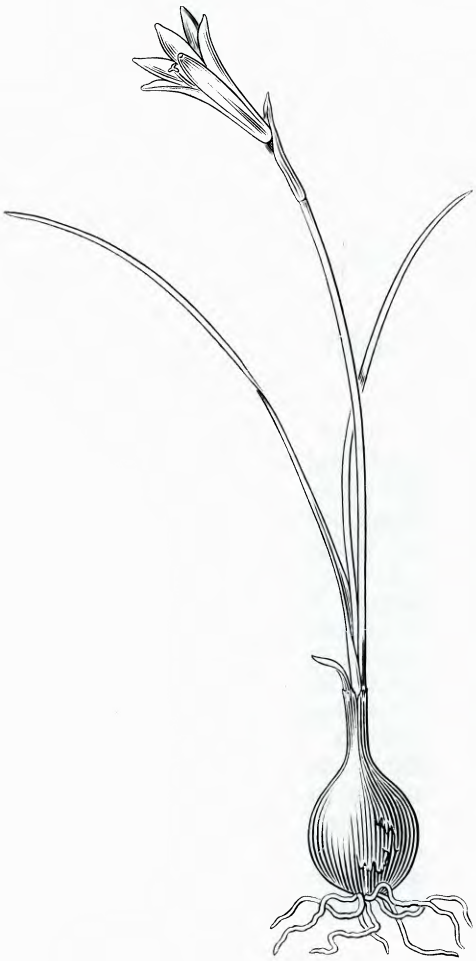


Fig. 28. **Habranthus salinarum** Rav., general view of plant (x 0.3). From figure in B. Piccinini in Ragonese's "La Vegetacion de Las Salinas Grandes." P. F. Ravenna del.

The species was treated by Ragonese in "La vegetación de las Salinas Grandes", under the name of "Zephyranthes mesochloa" (see Rev. Inv. Agr. 5(1-2) : 108, f. 8. 1951).

Habranthus martinezii Rav., Notic. Mens. Mus. Nac. Hist. Nat. Chile 173: 3. 1970.—Plant to 15 cm tall. *Bulb* subglobose, about 16-20 mm in diam., produced into a short pseudo-neck; the outer coats of dark brown. *Leaves* none at anthesis, serotinous, about three, linear channelled, a bright green, ca 3 mm broad, nearly of the scapes length. *Scape* cylindrical to 8-14 cm long, 2.3 mm broad. *Umbel* one-flowered, *Spathe* ca. 21-34 mm long, of a pale whitish-pink or reddish-ocher, fenestrated or bifid for 8-18 mm. Pedicel to 25-40 mm long. *Flower* ca. 40-44 mm long, 24-45 mm in its horizontal diameter, and 30-50 mm in its vertical diam. *Ovary* oblong or almost obvate, obtusely trigonous, a dark green, to 28-52 mm long. 2.1-3 mm broad. Perigone tepalsegs oblanceolate, a pale pink, purple-brownish in the lower third, connate for 2 mm at the base, the outer to 37-51 mm long, 10-13.5 mm broad, with an obtuse, 0.9-1.5 mm long, apiculum, the inner to 35-46 mm long, 7-10 mm broad. *Stamens:* filiments carmineous below, whitish toward the incurved apex, upper episepal to 9-11 mm long, lateral episepal ca. 12-19 mm long, lower epipetal to 16-19 mm long, lateral epipetal about 18-21 mm long. Anthers more or less semilunate, ca. 3-3.2 mm long. *Style* declined, carmineous excepting the upper third which is white, about 29-31 mm long; stigma trifid, its divisions recurved, to 2.5-2.7 mm long. *Capsule* squared-globose, almost tricoccous, ca. 12 mm in diam. *Seeds* semicircular, compressed, black, ca. 4mm broad with membranous papyraceous margins. See Fig. 29.

Hab.—Fields of the province of Entre Ríos, in the Martín García island, and on the hills near Pocitos, in the province of Salta, Argentina; also in the Uruguay republic.

Habranthus martinezii resembles somewhat *H. magnoii* Rav., a native of the province of Córdoba (Argentina). The latter has, however, broader, pruinose, leaves, and its flowers are greenish toward the base.

It was brought to me, for the first time, by my friend, the enthomologist Antonio Martínez, in whose honor the species is dedicated. He collected bulbs on the hills near Pocitos, in the province of Salta. The flowers that I had firstly examined were from plants of that population cultivated by me in Buenos Aires. Afterwards, I have seen plants, at the Darwinion Institute, from the province of Entre Ríos, and, in 1967, I found the same species growing in wild state in the Martín García island. As appears from the mentioned records, the species seems to have a discontinuous range, rather unfrequent in the genus.

Habranthus chacoensis Rav., Notic. Mens. Mus. Nac. Hist. Nat. Chile 173: 4. 1970. See Figs. 29 and 30. Plant to 18-19 cm tall. *Leaves* incipient at anthesis, linear, fleshy, rather channelled toward the base, upwards almost flat, green, not pruinose nor glaucescent, after the anthesis ca. 11-12 cm long, 5-5.5 mm broad. *Scape* to 11.5 cm long, a pale green excepting a pale pink-ocher near the base. *Umbel* 1-flowered. *Spathe* to 35-37 mm long, of a dirty greenish-pink, tubular for 16-20 mm, bifid or fenestrate at the apex. *Pedicel* to 17-36 mm long, often almost completely included in the spathe. *Flower* ca. 40-45 mm long, 33 mm in diam. *Ovary* almost cylindrical, reddish-brown, to 4.7 mm long, 2.3-

Fig. 29. Front floral views: **A, Habranthus martinezii** Rav., **B, H. chacoensis** Rav, **C** and **D,** side views of **Habranthus erectus** Rav. Photos by S. Magno.

2.4 mm broad. *Perigone* tepalsegs oblanceolate connate for 3 mm, the outer ca. 42 mm long, 11.9-19.5 mm broad, a pale purple or greenish below, externally purplish, whitish inside; the apiculus 1.2 mm long, externally of a carmine-pink; inner acute, not apiculate, of the same color as the outer, lateral pair to 41.3 mm long, 7.5-8.5 mm broad, lower one ca. 42.9 mm long, 6.9-7.5 mm broad. *Stamens:* Filaments of a pale carmine-pink in the lower half, the rest whitish, upper episepal ca. 10mm long, lateral episepal to 12 mm long, lower epipetal 19 mm long, lateral epipetal about 21 mm long. Anthers flexuose semilunate, to 6 mm long, 0.6-0.7 mm broad; pollen of a pale yellow. *Style* about 29.5 mm long, a pale pink in the lower half, whitish upwards, its divisions ca. 7 mm long, recurved at the apex. (Figs. 29 and 30)

Hab.—In sandy clay, in the rainy season, very damp. in the region of Colonia Benítez, province of Chaco, Argentina.

Habranthus chacoensis is related with *H. magnoii* Rav., and with *H. martinezii Rav.* It is separable from both, on account of the lower inner tepal, which is narrower than the others of the same series; this character allies it with *H. erectus.* It differs from the latter because of the leaf shape and the cernuous flower. The lower part of the flower can be of a pale carmine color or greenish.

According to Dr. Schulz, of the Agricultural Experimental Farm of Colonia Benítez (Chaco), this species is the commonest in the region. It adapts itself well to cultivation in Buenos Aires.

Habranthus erectus Rav., Notic. Mens. Mus. Nac. Hist. Nat. Chile 173: 4. 1970. See Fig. 29. *Bulb* ovate ca. 3 cm long, 2.4 cm in diam., covered with dark brown coats and produced for 5 cm into a pseudoneck. *Leaves* somewhat fleshy, almost filiform, to 20-36 cm long, 0.9-1.3 mm broad, not marginate, very narrowly channelled or furrowed, a pale green or ash green. *Scape* to 10-12 cm long, of a pale green, pruinose, brownish toward the base, ca 2.6 mm broad. *Umbel* one-flowered. *Spathe* membranous, a yellowish-brown, tubulose for 7.5 mm, then bifid for 11 mm. *Flower* erect, of a pale pink, a dark carmine toward the base, almost bell-shaped, to 4.8-5.7 cm long, 35 mm in diam. *Ovary* obtusely trigonous, to 3.8-4 mm long, 3.7-4 mm broad. Perigone: tepalsegs oblanceolate, connate for 4 mm, the outer to 48-53 mm long, the upper outer ca. 18 mm broad, lateral to 14 mm broad, inner series about 45-53 mm long, lateral inner ca 13 mm lata, lower inner about 12 mm broad. *Stamens:* filaments declined, whitish excepting the lower part, which is reddish, the upper episepal to 18 mm long, lateral episepal ca. 15 mm long, lower epipetal about 22 mm long, lateral epipetal to 24 mm long. Anthers semilunate, yellow, ca. 4 mm long, attached in the lower third, from the back, to the filaments. *Style* declined-ascendent, to 29 mm long. Stigma trifid, its divisions recurved, ca. 4 mm long. (Fig 29)

Hab.—In sandy places near San Juancito, in the province of Jujuy, Argentina. It grows near a species of the same genus, with smaller, whitish, cernuous flowers.

This species has tepalsegs of four different sizes, which is an interesting feature. The inner series differs from the outer because of the length, and in both groups bear one tepalseg (the upper or the inner), of a different width. *Habranthus erectus* cannot be compared

Fig. 30. Side floral views: **A** and **B, Habranthus carmineus** Rav.; **C** and **D, H. chacoensis** Rav. Photos by S. Magno.

with any known species, because its erect flowers and the indicated character of the tepalsegs, which are unique in the genus.

In the same places where *H. erectus* grows, is also found another undescribed species. The latter has leaves of the same shape, but flowers are cernuous, of smaller size and different color.

Habranthus carmineus Rav., Notic. Mens. Mus. Nac. Hist. Nat. Chile 173: 5. 1970.—See Fig. 30. Plant to 25 cm tall. *Bulb* subglobose ca. 25-30 mm in diam., produced for 4-5 cm into a pseudo-neck, outer coats of a dark brown. *Leaves* at anthesis none, after anthesis to 15-18 cm long, 7-9 mm broad, rather channelled, a dark green. *Scape* ca. 15-20 cm long, sometimes somewhat compressed, a pale green, slightly pruinose. *Umbel* 1-flowered. *Spathe* reddish, ca. 35 mm long, membranous, compressed in the upper part, tubulose for 28 mm, then bifid for 7 mm. *Pedicel to* 6 mm long. *Flower* a carmine-pink, about 45-57 mm long, ca. 45-57 mm in diam. *Ovary* cylindrical sometimes obtusely trigonous, a dark green, to 8 mm long, 2.9 mm broad. *Perigone:* tepalsegs oblanceolate, connate for 1.6 mm, imbricate for 38 mm, the outer to 50-59 mm long, 12-13 mm broad, minutely apiculate (apiculum ca. 0.7-0.8 mm long), inner ca. 49-56 mm long, 9.4-10.2 mm broad, acute. *Stamens:* filaments declined, upper episepal to 10 mm long, lateral episepal ca. 16 mm long, lateral epipetal about 24 mm long, lower epipetal to 27 mm long. *Style* whitish, about 33 mm long; lobes of the stigma erecto-patent or spreading, recurved at the apex, about 7 mm long. (Fig. 30)

Hab.—In grassy fields at Concepción del Uruguay, in the province of Entre Ríos, Argentina. It grows in black soil, near *Habranthus tubispathus* (L'Her.) Traub ssp. *macranthus* Rav., *H. coeruleus* (Gris.) Traub, *Nothoscordum bonariense* (Pers.) Beauv., *N. inodorum* (Ait.) Nich, ssp., *Anemone decapetala,* and others.

A species allied with *H. longpipes* (Bak.) Traub, from which it differs by the tepals closely contiguous almost two thirds of their length; this makes the flower much narrowed toward the base. *H. concordiae* Rav., also from Entre Ríos, has inflorescences 1-3 flowered.

Habranthus carmineus was found only in the region of Concepción del Uruguay. Cultivated in my collection at Buenos Aires.

Habranthus saltensis Rav., Notic. Mens. Mus. Nac. Hist. Nat. Chile 173: 6. 1970.—Plant to 11-15 cm tall. *Bulb* ovate, ca. 4 cm long, 2-2.3 cm in diam., covered with dark brown coats and produced into a short pseudo-neck. *Leaves* none at anthesis, after anthesis, linear, moderately channelled, ash-green, rather pruinose, spreading or often prostrated, obtuse, to 10 cm long (or more?), ca. 6-7 mm broad. *Scape* cylindrical, an ocher-green, to 6.5-10 cm long, 2.7 mm broad. *Umbel* one-flowered. *Spathe* a dirty whitish or white-greenish, to 29-36 mm long, tubular for 28 mm, with a fenestrate apex, or bifid for 9 mm. *Flower* cernuous, to 39-43 mm long, 23-30 mm in its vertical diameter and 24-29 mm in its horizontal diameter. *Pedicel* ca. 26-38 mm long. *Ovary* cylindrical, brownish-green, to 5.9-8 mm long, 2.2-2.8 mm broad. *Perigone:* tepalsegs oblanceolate, connate for 1.4-1.5 mm, about 27-37

mm closely contiguous, a pale brownish-green, then obliquely spreading, white, slightly reddish on the outide; the outer to 41.5-45 mm long, 10.5-13.9 mm broad, sometimes marked with a green spot at the apex, the apiculum almost conical, ca. 0.5-1.5 mm long; the lateral outer pair slightly approximate to the lower inner, the lateral inner pair ca. 40.5-42.5 mm long, 6-8.7 mm broad, slightly approximate to the upper outer one, the lower inner about 41.5-44.5 mm long, 6-8 mm broad. *Stamens:* filaments whitish, somewhat incurved at the apex, lateral episepal pair to 7.5-10 mm long, upper episepal ca. 9-12 mm long, lower epipetal, about 18-19 mm long, lateral epipetal to 22-23 mm long. Anthers of two kinds, those of the episepal stamens flexuose-linear, to 8.5-11 mm long, those of the epipetal falcate-semilunate, ca 5-7 mm long; pollen yellow. *Style* declined or sometimes almost straight, to 29-30 mm long; stigma divisions recurved, ca 3-6 mm long.

Hab.—Dry, often more or less open, woods near Lumbreras, in the province of Salta, Argentina.

Habranthus saltensis has some exclusive features of great interest. Tepals show a tendency of arranging themselves in two groups, this circumstance accentuates the effect of bilateral symmetry. The lateral outer pair approaches to the lower inner, and the lateral inner tc the upper outer one. Something similar occur in the genus *Griffinia*, but in this case the grouped tepals are five, being apart the lower inner.

Another interesting character is found in the dimorphism between the anthers of the episepal and epipetal stamens. Existing differences in size and shape, cannot be explained satisfactorily. This even considering the fact that the episepal stamens are included in the tube; the latter is composed of the tepals, which are closely contiguous for much of their length.

The enthomologist Antonio Martínez found this interesting species in the region of Lumbreras, Salta, about 5 km south from the "gasoduct" pumping-engine. Nevertheless, it seems frequent in other places, as for instance, in the neighborhood of Güemes. Additional specimens will be quoted, as soon as their identities are confirmed.

Habranthus spectabilis Rav., Notic. Mens. Mus. Nac. Hist. Nat. Chile 173: 6. 1970.—Plant to 36 cm tall. *Bulb* obovate, ca. 30-35 mm long, 20-30 mm in diam., produced for 18-64 mm into a pseudo-neck, covered with dark brown, more or less rugose, coats. *Leaves* none at anthesis, probably linear. *Scape* cylindrical, to 20-27 cm long. *Umbel* one-flowered. *Spathe* membranous, ca. 29-43 mm long, tubulose for 16-21 mm, then bifid or rarely fenestrate. *Pedicel,* about 5-8.2 cm long. Flower lilac-pink on the outside, white inside, to 55-60 mm long, 45-50 mm broad. Perigone tepalsegs oblanceolate, connate for 3 mm, the outer about 60 mm long, 15-16 mm broad, apiculum 1-1.5 mm long, inner about of the same length, somewhat narrower, acute. *Stamens* filaments declined, the upper episepal to 14 mm long, lateral episepal pair ca. 18-20 mm long, lower epipetal to 26 mm long, lateral epipetal pair about 23-24 mm long. Anthers falcate-semilunate, about 5-7 mm long. Basal scales

of stamens small, laciniate, ca. 1.4 mm long. *Ovary* narrowly obovate, probably obtusely trigonous, to 6-8 mm long, 2.2-3 mm broad. *Style* declined, to 36-38 mm long; stigma divisions recurved, ca. 3.7-6 mm long.

Hab.—Region of Ledesma, in the province of Jujuy, Argentina.

Habranthus spectabilis is apparently allied with *H. robustus* Herb. ex Sweet. However, the flower shape is more regular in the species here described. On the other hand, *H. robustus* belongs to a quite different ecological habitat, in the East side of the States of Santa Catarina and Paraná, in Brazil. It seems that *H. robustus,* has apparently escaped from cultivation in some places of the province of Misiones; this is a statement from people which has not been verified by me as yet.

[The following lines represent the translation from Dr. Vargas' article "Una nueva especie de Amaryllis del Sur de Perú", in *Biota* 7(65) : 1-3. 1970. It is noted that there must be a mistake or misprint in the measurements of the bulb. The stigma is obscurely defined as "trifidum, capitatum" (?). The figure is not precise enough as to clear up the latter point.—*P. F. Ravenna.*]

Amaryllis macbrideii Vargas, Biota 8(65) : 1-3. Fig. on page 2. 1970.

Bulb almost globose, depressed above, 8-9 cm in diam., 5.5 cm wide. Roots fascicled dense, 20-25 cm long. *Scape* 2-3 or more each bulb, about 26 cm long or more, cylindrical, ca. 15 mm in section at the base, 12 mm at the apex, subcompressed, green. *Flowers,* rarely 3, its *pedicels* greenish, 75 mm long; *bracts* two, lanceolate, green, overtopping the ovary; bracteoles 2, 12 mm long, greenish-white. *Perianth* white, flushed with pink and veined with greenish yellow, with a star of a dark green passing to greenish upwards. *Paraperigone* whitish-hyaline, 2-3 mm long, lacinied for 1 mm. Outer tepals ovate-lanceolate, 10 cm long, 4.8 cm broad at the middle, its apicules [as "apex unguiculatus", sic!] green, 2 mm long; inner tepals ovate-lanceolate, 10 cm long, 3.5 cm broad, not apiculate [as "unguiculata", sic!], lower inner tepal ["labellum", sic!] shorter. *Stamens* as long as segments, the filaments greenish-white for one third; anthers oblanceolate [?], after dehiscence 6.5 mm long; pollen yellow. *Style* exceeding the style for 20 mm; stigma trifid capitate; ovary subtrigonous, green, 20 mm long.

The preceding description was made in 1963 [by Dr. Vargas], upon living material; the bulbs were brought from Sandia, Dept. of Puno; they were cultivated at Urubamba, Cuzco, until the present with satisfactory results. The type-specimen agrees with the description in all perianth parts; nevertheless, it must be said that some plants showed narrower tepals, giving a wider appearance to the flower. I have dedicated the species to my faithful friend, J. Francis Macbride, author of "Flora of Peru", to whose stimulus and teaching, I owe most of my scarce knowledge on the Peruvian botany.

CORRIGENDA—See page vi, present issue, for Corrigenda, Ravenna article—Latin American Amaryllids, PLANT LIFE 27: pages 133 and 134. 1971.

PLANT LIFE LIBRARY—continued from page 68.

TREES: STRUCTURE AND FUNCTION, by Martin H. Zimmerman and Claud L. Brown. Springer-Verlag New York, 175 5th Av., New York, N. Y. 10010. 1971. Pp. 336. Illus. $19.80. This important new book is concerned with the aspects of tree physiology which is peculiar to tall woodly plants. The emphasis is on function as it relates to structure. Such a dynamic view concentrates on how trees grow, but not how growth is modified by differences in environment. The subject is developed under the headings—primary growth, secondary growth, growth and form, transport in the xylem, and phloem, the steady state thermodynamics of translocation in plants, and storage, mobilization and circulation of assimilates. This outstanding text is indispensable to all interested in the physiology of plants. Very highly recommended.

THE RUST FUNGI OF CEREALS, GRASSES AND BAMBOOS, by George Baker Cummins. Springer-Verlag of New York, 175 5th Av., New York, N. Y. 10010. 1971. Pp. 570. Illus. $19.50. This illustrated descriptive manual of the rust fungi (**Uredinales**) of the **Gramineae** provides the first world-wide coverage of the taxonomy and nomenclature of these important pathogens. The species are "keyed" first by genera of grasses, but the novel feature of this book is the attempt to produce a system whereby these pathogens may be recognized on the basis of their morphology. The number of species described number 419 in 7 genera, including the form genus **Uredo.** The species illustrated number 362. This is an indispensable manual for all interested in the **Gramineae.** Very highly recommended.

PROPAGATING HOUSE PLANTS, by Arno and Irene Nehrling Hearthside Press, 445 Northern Blvd., Great Neck, N. Y. 11021. 1971. Pp. 292. Illus. $6.95. This reprint of the 1962 edition of this valuable book on propagating house plants by two outstanding authorities will be welcomed by those who did not obtain a copy in the 1960's. It is to be noted that a new section on the culture of herbs and vegetables indoors has been added. The other sections are devoted to an introduction, how to propagate, aids in propagation, steps from window to greenhouse gardening, how to grow plants the easy way, dictionary of house plants, and propagation for special purposes. Highly recommended.

TROPICAL GARDENING, by Peggy Hickok Hodge. Charles E. Tuttle Co., Rutland, Vermont 05701. 1971. Pp. 129. Illus. $7.50. Subtitled a "Handbook for the Home Gardener", this attractive book is a revised 2nd edition of "Home Gardens in Hawaii". It is indicated that the ideas in the book can be adapted to other areas by following directions given for climate, weather, moisture, sun and rainfall. The sections in the book are devoted to popular Island ornamentals (Hibiscus, Ginger, etc.), outdoor plantings that show, flower beds, indoor plants and flowers, outdoor arrangements, trees for Hawaii, fruit in the garden, more things good to eat, and battle of the bugs. Recommended to those who garden in subtropical and tropical climates.

AUSTRALIAN NATIVE ORCHIDS IN COLOUR, by Leo Cady and E. R. Rotherham. Charles E. Tuttle Co., Rutland, Vermont 05701. 1971. Pp. 112. Illus. in color. $6.75. Following an instructive introduction, and a description of orchid flowers, the species in 37 genera of orchids are discussed; and the Subtribe Sarcanthinae and miscellaneous genera are considered. The text is beautifully illustrated in color, and these illustrations alone are worth more than the price of the book. Highly recommended to all interested in the orchids.

THE ORDER ALLIALES

HAMILTON P. TRAUB

It had long been known that laticifers are present in the tissues of *Allium* L. species (see Rendle, 1884, Menz, 1910, Hoffman, 1930, Mann, 1952, and others), but no attempts were made to determine the phylogenetic significance of this very unusual anatomical feature on a wider comparative basis in the one genus; also in relation to the other genera of the Family Alliaceae, and the other families assigned to the Order Liliales (Takhtajan, 1961, 1969; Cronquist, 1968).

For many years the writer did his best to interest graduate students in this fertile field of thesis material but there were no takers. Fortunately, out of the clear blue sky in 1967, Dr. Clarence Sterling of the Department of Food Science and Technology, University of California at Davis, wrote that he had a graduate student interested in studying the laticifers of *Allium* L. The writer took this opportunity to send not only bulbs of *Allium* L. species, but also to send stock of species in other genera of the Family Alliaceae, including *Caloscordum* Herb. (Eastern Siberia to Mongolia, China and Japan), *Nothoscordum* Kunth (Mexico and Chile), *Tristagma* Poepp. (Argentina), *Tulbaghia* L. (South Africa), add *Agapanthus* L'Herit. (South Africa), a selection which was calculated to give a wide-ranging insight into the phylogenetic significance of this unique anatomical feature, if present, on a comparative basis. The writer also suggested possible sources of *Hesperocallis* Asa Gray from southwestern United States; and species of *Leucocoryne* Lindl., from Chile, *Miersia* Lindl., from Chile and also *Brodiaea* J. E. Smith, and related genera, from the North American Pacific Coast, and *Milla Cav.*, and related genera from Mexico. Due to time limitations, the graduate student, as noted below, found it practicable to include only the genera *Allium, Caloscordum, Nothoscordum, Tristagma* and *Tulbaghia,* but this was sufficient to set a landmark, and lay the foundation for progress in this field.

When the results were in, the editors of the American Journal of Botany published only the part concerning *Allium* L. (see Huang & Sterling, 1970). These are significant results in a number of directions. Previously Traub (1968a, 1968b) had recognized the subgenera *Ameral-lium* and *Allium* in the Genus *Allium* L. on the basis of chromosome number and the distribution of the vascular bundles in the leaves of *Allium* L. species. The validity of these conclusions was corrobated by Huang & Sterling (1970) on the basis of the depth at which the laticifers are located in the leaves of *Allium* species. The reader should consult the original article (Huang & Sterling, 1970) for more details about this subject, and other results obtained.

Since the results concerning the other genera—*Caloscordum, Nothoscordum, Tristagma,* and *Tulbaghia*—were not published, the writer as editor offered to publish these. They appear in the article by Sterling & Huang (1972) in the present issue of PLANT LIFE. These show

that laticifers are present in all of the genera investigated, ranging from the Northern Hemisphere to South America and South Africa, and reveal that the group is well-defined and unique on the basis of laticifer anatomy.

In the subfamily Allioideae as recognized up to the present (Traub, 1970), it is known that the alliaceous scent is present when the tissues are broken in *Hesperocallis undulata* and *Milula spicata,* and is widespread in the subfamily as a whole. In the Genus *Allium* L. apparently *A. nigrum* L. and several other species are without this scent, and similarly species of *Tulbaghia* L. have the alliaceous oder except *T. fragrans* Verd. Similar conditions are found in *Leucocoryne, Tristagma, Nothoscordum,* and species of the Tribe Gilliesieae. This leads to the conclusion that when this feature is lacking, it has been lost through evolution. Thus, on the basis of the presence of the alliaceous scent, this group is unique in the plant subkingdom.

In addition to the alliaceous scent, the presence of laticifers has now been shown to be widespread in the Family Alliaceae, a unique anatomical feature when considered in connection with the other families included under the Order Liliales up to the present. As pointed out by Eames (1961), in connection with the presence of laticifers in the Alismatales (Limnocharitaceae and Alismataceae), that such an important anatomical feature cannot be ignored when phylogenetic relationships are considered. Thus, it was necessary to recognize the Alliaceae as a very distinct group under the Order Alliales (Traub, 1971).

In the case of the Order Alliales it is not necessary to reconstruct a hypothetical first alliad because the Alliales include also the "living fossils" (see Traub, 1968b, 1970), the raceme bearing *Hesperocallis undulata* Asa Gray (2n=48), from the southwestern United States (Rountree, 1941; Traub, 1970), and the spicate *Milula spicata* Prain, (2n=?) from Tibet and Nepal (Prain, 1895, 1896, Stearn, 1960, Traub, 1963, 1970). Both have to be included in the Alliales due to the biochemical marker of the alliceous scent when the tissues are broken, as well as some gross morphological features. These are relicts apparently representing relatively primitive living descendants of the extinct primitive line from which the well-known species of the Alliaceae also evolved. These "living fossils" cannot be united with the more advanced Family Alliaceae and have to be recognized for what they are—distinct relict families, each having evolved in a different direction, and each with only a single surviving relict species. *Hesperocallis undulata* is apparently nearest to the extinct primitive line. The basal leaves plus *leafy stem,* and *racemose inflorescence* are relatively primitive. The line may even have continued from the original alliads *with evolution* in an unbroken sequence to *Hesperocallis undulata.* However, the bulbous rootstock, the perigone united below into a tube, stamens inserted at the throat, syncarpous ovary and capsule, are relatively advanced characters, showing continued parallel evolution along the later alliad pattern—similarities developed in two or more lineages of common ancestry, and on the basis of, or channeled by, the characteristics of that ancestry (Traub, 1964).

The Order Alliales thus consists of three families—Hesperocallaceae, Milulaceae and Alliaceae, including 6 tribes, 32 genera, and over 800 species. The Order is summarized below:

Order **ALLIALES** Traub, **ord. nov.**, (Monocotyledones); Traub, in Lily Order—Liliales, in Encyc. Brit., new ed in prep., article **(anglice)** submitted 1971.
Caudex plerumque bulbosus interdum rhizomatosus vel cormasus; glandulae laticiferae in texturis totarum plantarum investigatarum ad sunt; odor alliaceus saepe adest ubi texturae fracta sunt; folia plerumque basales; inflorescentia racemosa spicatave umbellatave; ovarium superum; perigonium 6- (raro 5- vel 3-) partitum; stamina 6 vel raro 3 vel 2; fructus capsularis trilocularis loculicidalis; semina in quoque loculo 1 vel 2 (interdum plus numerosa).
Typus: Family **Alliaceae** Agarth (1858)

Family 1. **HESPEROCALLACEAE** Traub, **fam. nov.**
Caudex bulbosus; folia principales basales; caulis erectus, in parte inferiori folias paucas breviores gerens; inflorescentia racemosa, bracteis flores fragrantes subtentis; pedicelli ad apicem articulati; perigonium infra medium connatum (= tubis tepalorum), supra medium 6-divisum (= segmentis tepalorum); stamina 6 in fauce inserta; ovarium superum triloculare; stigma discoideum; capsula loculicidalis; semina numerosa nigra complanata.
Typus: Genus **Hesperocallis** Asa Gray (1868)
Tribe 1. **HESPEROCALLEAE** Traub, in Plant Life 24: 50. 1968; Traub, in intro. Herb. Amaryll. 1970, pp. 79-80. Nomenifer: Genus **Hesperocallis** Asa Gray (1868)
1. **Hesperocallis** Asa Gray (1868)

Family 2. **MILULACEAE** Traub, **fam. nov.**
Caudex bulbosus; folia linearilanceolata; scapus aphyllus; spatha monophylla; inflorescentia spicata, spica densa cylindrica, flosculis omnis per bracteam ovalem subtentus; perigonium infra connatum (=tubus tepalorum), supra 6-divisum (=segmenti tepalorum); stamina 6, filamentis 3 exterioribus infra dilatatis et breviter bidentatis, dentibus lateralibus; ovarium superum triloculare, ovulis in quoque loculo 2; capsula loculicidalis; semina oblonga nigra
Typus: Genus **Milula** Prain (1895)
Tribe 2. **MILULEAE** (Prain) K. Krause (1930). Nomenifer: Genus **Milula** Prain (1895)
2. **Milula** Prain (1895)

Family 3. **ALLIACEAE** Agarth (1843). Nomenifer: Genus **Allium** L. (1753)
Subfamily 1. **ALLIOIDEAE** Engler (1887), syn.- Infrafamily **Allioidinae** Traub, in Plant Life 24: 50. 1968.
Tribe 3. **ALLIEAE** Kunth (1843)
Subtribe 1. **ALLINAE** Traub (1963)

3. **Allium** L. (1753)
4. **Caloscordum** Herb. (1844)
5. **Steinmannia** R. A. Phil. (1844)
6. **Nothoscordum** Kunth (1833)
7. **Leucocoryne** Lindl. (1830)
8. **Tulbaghia** L. (1771)
9. **Tristagma** Poepp. (1833)

Subtribe 2. **AGAPANTHINAE** (Endl.) Traub, **comb. nov.** Syn.- Tribe **Agapantheae** Endl., Gen. Pl. 111-113. 1836.
10. **Aganpanthus** L'Herit. (1788)

Tribe 4. **GILLIESIEAE** Lindl. (1826)

11. **SCHICKENDANTZIELLA** Speg. (1903)
12. **SPEEA** Loeser (1927)
13. **MIERSIA** Lindl. (1826)
14. **GETHYUM** R. A. Phil. (1873)
15. **GILLIESIA** Lindl. (1826)
16. **SOLARIA** R. A. Phil. (1857)
17. **ERINNA** R. A. Phil. (1864)
18. **TRICHLORA** Bak. (1877)
19. **ANCRUMIA** Harv. ex Bak. (1877)

Subfamily 2. **BRODIAEOIDEAE** Traub, **subfam. nov.**, Rhizoma cormiformi; floribus regularribus; ovario ad apicem pedicelli vel in gynophoro gerente; staminibus certis 6 vel 3. Typus: Genus **Brodiaea** J. E. Smith (1811)
Tribe 5. **BRODIAEEAE** Traub, Plant Life 24: 49. 1968, **ibid. 25:** 48. 1969.

20. **MUILLA** S. Wats. (1879)
21. **BLOOMERIA** Kell. (1863)
22. **TRITELEIA** Dougl. Ex Lindl. (1830)
23. **DICHELOSTEMMA** Kunth (1843)
24. **BRODIAEA** J. E. Smith (1811)
25. **TRITELEIOPSIS** Hoover (1941)
26. **ANDROSTEPHIUM** Torr. (1858)

Tribe 6. **MILLEAE** Traub, In Plant Life 24: 49. 1968, **ibid. 25:** 48. 1969.

27. **DANDYA** H. E. Moore
28. **BESSERA** Schult. f. (1829)
29. **BEHRIA** Greene (1886)
30. **PETRONYMPHE** H. E. Moore (1951)
31. **MILLA** Cav. (1793)
32. **DIPHALANGIUM** Schauer (1847)

LITERATURE CITED

Cronquist, Arthur. The evolution and classification of flowering plants. Houghton, Mifflin Co., 1961.
Eames, Arthur J. Morphology of the angiosperms. McGraw-Hill. 1961.

Huang, Shiu-mei and Clarence Sterling. Laticifers in the bulb scales of **Allium.** Amer. Jour. Bot. **57**: 1000-1003. 1970.
Mann, L. K. Anatomy of the garlic bulb and factors affecting bulb development. **Hilgardia 21**: 195-251. 1952.
Hoffman, Charles Andrew. Developmental morphology of **Allium cepa.** Bot. Gaz. **95**: 279-299. 1933.
Menz, Johanna. Beitraege zur vergleichenden Antomie der Gattung Allium, etc. Akad. der Wiss. Wien, Math.-Nat Kl. Stizber. Abt. 1, 119(1): 475-533. 1910.
Prain, D. On **Milula**, a new genus of Liliaceae from the Eastern Himalaya. Sci. Mem. Med. Off. Army India **9**: 25-27, pl. 1. 1895.
——. The same. Ann. Roy. Bot. Gard. Calcutta **5**: 165-166, pl. 200. 1896.
Rendle, A. B. On the vescular vessels of the onion. Ann. Bot. **3**: 169-177. 1889.
Rountree, Lester. The Desert Lily, **Hesperocallis undulata.** Herbertia **8**: 149-152, pl. 219. 1941.
Stearn, W. T. **Allium** and **Milula** in the central and eastern Himalaya. Bull. Brit. Mus. (Nat. Hist.) Bot. **2**: 11—119. 1960.
Sterling, Clarence and Shiu-mei Huang. Notes on the laticifers of **Allium, Caloscordum, Nothoscordum, Tristagma** and **Tulbaghia.** Plant Life **28**: 43—46. 1972.
Takhtajan, Armen. The origin of angiospermous plants. 2nd ed. (Russian), Moscow. 1961.
——. Flowering plants: Origin & Dispersal. Smithsonian Inst. Wash. D. C. 1969.
Traub, Hamilton P. The Genera of Amaryllidaceae. The American Plant Life Society, La Jolla, Calif. 1963, p. 31.
——. Lineagics. The American Plant Life Society, La Jolla, Calif. 1964.
——. Orientation of vascular bundles in **Allium** leaves. Plant Life **24**: 143-146. 1968a.
——. The subgenera, sections and subsections of **Allium** L. Plant Life, **24**: 147-163. 1968b.
——. Introduction to Herbert's Amaryllidaceae, and related works. [93 pp.] Issued separately, and with the facsimile reprint of Herbert's Amaryllidaceae, 1837. Verlag von Cramer, Lehre, West Germany. 1970.
——. [Order Alliales], in Lily Order—Liliales. In Encyc. Brit. new ed. in prep., article submitted in 1971.

GENUS **ALLIUM** L.—SUBGENERA, SECTIONS AND SUBSECTIONS

HAMILTON P. TRAUB

ABSTRACT

The grouping of the **Allium** L. species under the three subgenera—**Amerallium, Nectaroscordum** and **Allium**—on the basis of basic chromosome numbers (Traub, 1968c) has been corroborated by the reported results on the orientation of the leaf vascular bundles (Mann, 1962, Traub 1968b) and the structure and distribution of the bulb scale or leaf laticifers (Mann, 1962, Huang & Sterling, 1970, and Sterling & Huang, 1972).

Since the publication of the article on the subgenera, sections and subsections of *Allium* L. (Traub, 1968c), additional evidence to corroborate the subgeneric grouping has appeared in the literature. The purpose of the present brief paper is to consider this new evidence as it bears on the previous findings and the linordination of the subgeneric groups of *Allium* L.

I. BASIC CHROMOSOME NUMBERS

Originally, Traub (1968c) grouped the species of *Allium* L. under three subgenera—*Amerallium, Nectaroscordum* and *Allium*—solely according to the basic chromosome numbers and the number of floral tepal nerves.

1. *SUBG. AMERALLIUM.* The subgenus *Amerallium* includes two related geographical groups with 1-nerved floral tepals. (a) North American *Allium* species, which have been almost all sampled, are revealed as having the basic x-7 chromosome number. These include almost all of the Allium species native to North America. (b) A lesser number of Old World species, with the basic x=7 chromosome number, and with few exceptions having $x_2=8$ or $x_3=9$ basic numbers,

apparently belong here. These Old World exceptional species apparently are the result of a relatively recent evolution from x=7 species since x=7 and x_3=9 numbers, for instance, appear in the same species, *A. pendulinum* Ten., 2n=14, 18. Also as indicated under article sections 2 and 3 below, the vascular bundle orientation in the leaves, and the distribution of the laticifers in the bulb scales are similar to those found in the species with the x=7 basic chromosome number.

2. *SUBG. NECTAROSCORDUM.* This very small group with 2 or 3 species, ranging from southern France to Iran, including species having the basic x_2=8 basic chromosome number, and (1)—3—7-nerved floral tepals, is confined to the Old World as indicated.

3. *SUBG. ALLIUM.* The residual Subgenus *Allium,* with 1-nerved tepals, includes two related geographical groups. These two groups as a whole have been sampled to a fair extent for chromosome numbers. (a) The small North American group includes *A. tricoccum* Ait., 2n=32, confined to eastern North America, and *A. victorialis* L. ssp. *platyphyllum* Hult., 2n=32, confined to extreme western Aleutian Is., both in the Section *Anguinum* G. Don, a distinctly Old World Section; and *A. schoenoprasum* L. var. *sibiricum* (L.) Hartm., 2n=16, 32, ranging widely over northern North America, belonging to Section *Cepa* (Moench) Prokanov, again, a distinctly Old World section. (b) The second very large group includes the bulk of the Old World species with the basic x_2=8, x_3=9 or x_4=10 chromosome numbers.

2. VASCULAR BUNDLE ORIENTATION IN LEAVES

The results presented (Mann, 1962, Traub, 1968b) show that in the case of the Subgenus *Amerallium* (with 1-nerved floral tepals), and with the basic x=7 chromosome number, with few exceptions as indicated under article Section 1, above; and Subgenus *Nectaroscordum,* with (1)—3—7-nerved floral tepals, and the x_2=8 basic chromosome number, the leaf blade vascular bundles in cross section are in one row, with few exceptions. In contrast, in Subgenus *Allium,* with 1-nerved tepals, and x_2=8, x_3=9 or x_4=10 basic chromosome numbers, the leaf blade vascular bundles are in two opposing rows or in a circle. Thus, the grouping (Traub, 1968c) has been corroborated.

3. DISTRIBUTION OF LATICIFERS IN BULB SCALES

It has been shown by Mann (1962), Huang & Sterling (1970) and Sterling & Huang (1972) that the laticifers in Subgenera *Amerallium* and *Nectaroscordum* are hypodermal in the bulb scales whereas in Subgenus Allium they occur in the second layer below the epidermis or deeper. Again, the grouping (Traub, 1968c) has been verified.

4. CATEGORY LEVELS UNDER GENUS ALLIUM L.

Separating the species in a very large genus such as *Allium* L. with 600+ species into subgenera as *far as warranted* is an important step towards understanding such a diverse assemblage. However, a subgenus is nearing the generic level, and should not be based on minor gross mor-

phological differences because that would not give a natural or evolutionary grouping. The subgroups should be meaningful and should be based as in the present case on fundamental differences such as (a) the primary (x), secondary (x_2), tertiary (x_3), and quadrinary (x_4) basic chromosome numbers; (b) the orientation of leaf blade vascular bundles, (c) the depth of the bulb scale laticifers, as indicated above, and still other fundamental characters, if available. If further subdivisions are necessary at lower category levels (Traub, 1964, 1968b, 1968c) these may be based on less fundamental features, such as the rhizomatic or bulbous rootstock, differences in bulb coats, differences in the umbellate inflorescence, structure of the stamen-filiments, and many other such characters.

The decreasing levels of categories are as follows:

Genus
Subgenus
Infragenus, if needed
Section
Subsection
Alliance, if needed

In the following summary key, the categories *subgenus, section* and *subsection* are considered as sufficient.

5. SUBGENERA, SECTIONS AND SUBSECTIONS OF ALLIUM L.

1a. Species (a) with leaf blade vascular bundles in one row, with few exceptions, (b) with hypodermal laticifers in the bulb scales, and (c) with the basic x = 7 chromosome number, with few exceptions, $x_2 = 8$ and $x_3 = 9$ in number, in such cases the features indicated under (a) and (b) are present.

2a. Tepals 1-nerved:

SUBGENUS I. AMERALLIUM Traub
Plant Life 24: 159-161. 1968; nomenifer: **A. canadense** L. **2n=14, 28.**

3a. North American species; basic chromosome number x = 7, leaf blade vascular bundles in one row, with few exceptions, and hypodermal laticifers of bulb scales:

SECTION I. CAULORHIZIDEUM Traub, nomenifer: **A. validum** S. Wats., **2n=28, 56.** Plant Life **23**: 69. 1967: **ibid. 24** 156-157. 1968.

SECTION II. AMERALLIUM. Nomenifer: **A.** canadense L., **2n=14, 28.** Plant Life **23**: 89-95. 1967; **ibid. 24**; 160. 1968.

SUBSECTION 1. MEXICANA Traub. Nomenifer: **A. mexicanum** Traub, **2n=?** Plant Life **23**: 89-95. 1967; ibid. **24**; 135, 160. 1968.

SUBSECTION 2. CANADENSIA Ownbey ex Traub, nomenifer: **A. canadense** L. **2n=14, 28.** Plant Life **23**; 89, 95. 1967; ibid **24**; 160. 1968.

SECTION III. LOPHIOPRASON Traub, nomenifer: **A. sanbornii** Wood, **2n=14.** Plant Life **23**: 69. 1967, **ibid. 24**: 160. 1968.

SUBSECTION 1. FALSIFOLIA Ownbey ex Traub, nomenifer: **A. falsifolium** Hook. & Arnott; **2n=14.** Plant Life **23**: 69. 1967; **ibid. 24**; 160. 1968.

SUBSECTION 2. CERNUA Ownbey ex Traub, nomenifer: **A. cernuum** Roth & Roem., **2n=14.** Plant Life **23**; 69, 1967; **ibid.**

24: 160. 1968.

SUBSECTION 3. SANBORNIANA Ownbey ex Traub, nomenifer: **A. sanbornii** Wood, **2n=14.** Plant Life **23;** 69. 1967, **ibid. 24;** 160. 1968.

SUBSECTION 4. ACUMINATA Ownbey ex Traub, nomenifer: **A. acuminatum** Hook., **2n=14.** Plant Life **23;** 69. 1967 **ibid.** 24: 161. 1968.

SUBSECTION 5. CAMPANULATA Ownbey ex Traub, nomenifer: **A. campanulatum** S. Wats. **2n=14.** Plant Life **23:** 69. 1967, **ibid. 24:** 161. 1968.

SUBSECTION 6. BOLANDERIANA Traub, nomenifer: **A. bolanderi** S. Wats. **2n=14.** Plant Life **23;** 69, 1967. **ibid. 24;** 161. 1968.

SECTION IV. RHOPHETOPRASON Traub, nomenifer: **A. glandulosum** Link & Otto, **2n=28.** Plant Life **23:** 110. 1967, **ibid. 24:** 141, 161. 1968.

3b. Old World species; basic chromosome number almost always $x=7$, except $x_2=8$ or $x_3=9$ in a few instances, and then the leaf blade vascular bundles are in one row, and laticifers in the bulb scales are hypodermal:

4a. Scape **not** triquetrous:

SECTION V. MOLIUM Endl. (1836) nomenifer: **A. neapolitanum** L. **2n=14, 28.** Syn.—**A. moly** L. **2n=14, 28.** Plant Life 24: 161. 1968.

5a. Floral umbel **not** nesting in center of the prostrate leaves:

SUBSECTION 1. MOLIANA. nomenifer: **A. neapolitanum** L. **2n=14, 28.** Plant Life **24:** 146. 1968. sphalm.; **ibid. 27:** iv. 1971.

SUBSECTION 2. XANTHOPRASA (F. Hermann) Traub, **comb. nov.** syn.—Section **Xanthoprason** F. Hermann, Fedde Rep. 46: 57-58. 1939; nomenifer: **A. moly** L., **2n=14;** Plant Life **24:** 146, sphalm., 1968. **ibid. 27;** iv. 1971.

5b. Floral umbel **nesting** in the center of the prostrate leaves; minute species, leaves 4, narrow, umbel 4-fld, fls. white:

SUBSECTION 3. CHAMAEPRASA (F. Hermann) Traub, **comb. nov.** Syn.—Section **Chamaeprason** F. Hermann, Fedde Rep. 46: 57-58. 1939, nomenifer: **A. chamaemoly** L. **2n=?** Plant Life **24:** 146. 1968.

4b. Scape triquetrous:

SECTION VI. OPHIOSCORODON (Wallr.) Endl. (1836); nomenifer: **A. ursinum** L. **2n=28.** Plant Life **24:** 161. 1968.

6a. Leaves oblong, acuminate at both ends:

SUBSECTION 1. URSINA Traub, Plant Life **24:** 161. 1968. nomenifer: **A. ursinum** L. **2n=14.**

6b. Leaves petiolate, blade sharply keeled; stamen-filaments very narrow, inserted in two series; seeds arillated:

SUBSECTION 2. TRIQUETRA Traub, Plant Life **24:** 161. 1968, nomenifer: **A. triquetrum** L. **2n=18.** Note also **A. pendulinum** Ten., **2n=14, 18; A. paradocum** (M. B.) G. Don, **2n=16.**

2b. Tepals (1)—3—7-nerved; seeds 8—11 per locule; pedicels often markedly discoidally swollen at the paex: basic chromosome number as far as known $x_2=8$.

SUBGENUS II. NECTAROSCORDUM (Lindl.) Traub

Plant Life 24: 162. 1968. Syn.—Genus **Nectaroscordum** Lindl. Bot. Reg. 9: pl. 1912. 1836. Nomenifer: **A. siculum** Ucria, **2n=16.**

SECTION VII. NECTAROSCORDUM

1b. Species with (a) leaf-blade vascular bundles in 2 opposing rows, or in a circle, with few exceptions, (b) laticifers in the bulb scales occur in the second layer below the epidermis or lower, (c) with $x_2=8$, $x_3=9$, $x_4=10$ basic chromosome numbers; and (d) tepals 1-nerved. All Old World taxa, except **Allium tricoccum** Ait., native to eastern North America, and **A. victorialis** L. ssp. **platyphyllum** Hult., confined to extreme western Aleution Is., both in Sect. **Anguinum**; and **A. schoenoprasum** var. **sibiricum** L. Hartm. (Sect. Cepa), ranging over much of northern North America.

SUBGENUS III. ALLIUM.

Plant Life 24: 162. 1968. Nomenifer: **A. sativum** L. **2n=16, 48.**

7a. Leaves **not** fistulose:

8a. Leaves oval or petiolate:

SECTION VIII. ANGUINUM G. Don ex Koch (1837); nomenifer: **A. victorialis** L. **2n=16, 32.**

8b. Leaves **not** oval or petiolate:

9a. Umbel more than 2-flowered:

SECTION IX. RHIZIRIDEUM G. Don ex Koch (1837); nomenifer **A. senescens** L. **2n=32, 48.**
SUBSECTION 1. TUBEROSA, nomenifer: **A. tuberosum** Rott. ex Spreng. **2n=16, 32.**
SUBSECTION 2. INDERIENSIA, nomenifer: **A. indieriense** Fisch. ex Bunge, **2n=?).**
SUBSECTION 3. SENESCENSIA, nomenifer: **A. senescens** L. **2n=32, 48.**
SUBSECTION 4. SIKKIMENSIA, Nomenifer: **A. sikkimense** Bak. **2n=32.**
SECTION X. MELANOCROMMYUM, Webb & Berth. (1843), nomenifer: **A. nigrum** L. **2n=16.**
SECTION XI. CONDONOPRASON (Rchb.) Endl. (1836) nomenifer: **A. oleraceum** L. **2n=32, 40.**
SECTION XII. PETROPRASON F. Hermann (1939), nomenifer: **A. obliquum** L. **2n=16.**
SECTION XIII. ALLIUM, nomenifer: **A. sativum** L. **2n=16.**
SECTION XIV. HAEMOPRASON F. Hermann (1939); nomenifer: **A. melanantherum** Panc. **2n=?.**

9b. Umbel 1-, rarely 2-flowered; plant small, delicate, slight alliaceous odor; leaves 1—2, nesting on the ground; style 3-lobed nearly to the middle:
SECTION XV. MICROSCORDUM Maxim. (1887); nomenifer: **A. monanthum** Maxim. **2=16, 32.**

7b. Leaves **fistulose:**

SECTION XVI. CEPA (Moench) Prokh. (1931); nomenifer: **A. Cepa** L. **2n=16, 32.**
SUBSECTION 1. CEPA; nomenifer: **A. cepa** L. **2n=16, 32.**
SUBSECTION 2. FISTULOSA; nomenifer: **A. fistulosum** L. **2n=16.**
SUBSECTION 3. SCHOENOPRASA, nomenifer: **A. schoenoprasum** L. **2n=16, 32.**
SUBSECTION 4. POPOVIANA, nomenifer: **A. popovii** Vved. **2n=16.**

LITERATURE CITED

Huang, Shiu-Mei, and Clarence Sterling. Laticifers in bulb scales of **Allium** Amer. Jour. Bot. **57**: 1000-1003. 1970.

Mann, L. K. "Section of leaf (fresh) shows laticifers adjacent to epidermis and single row of vascular bundles in **Allium bulgaricum** (Janka) Prodan," [Subg. **Nectaroscordum**], [dated] "April 11, 1962", from Notes, in Dept. of Vegetable Crops, Univ. Calif., Davis.

Sterling, Clarence and Shiu-Mei Huang. Notes on the laticifers of **Allium, Caloscordum, Nothoscordum, Tristagma** and **Tulbaghia.** Plant Life **28**: 43-46. 1972.

Traub, Hamilton P. Lineagics. La Jolla, Calif. 1964.

———————. New Guatemalan and Mexican Alliums. Plant Life **24**: 127-142. 1968a.

———————. Orientation of vascular bundles in **Allium** leaves. Plant Life **24**: 143-146. 1968b.

———————. [Postscript—Section **Molium**]. Plant Life **24**: 146. 1968c-1; **ibid. 27**: Corrigenda. iv. 1971.

———————. The subgenera, sections and subsections of **Allium** L. Plant Life **24**: 147-163. 1968c.

TRIBE HOSTEAE, FAMILY AGAVACEAE

Hamilton P. Traub

The work of McKelvey & Sax (1933), Whitaker (1934), Sato (1935) and Granick (1944) taken together has shown that the species of the Tribes Yucceae and Agaveae, Family Agavaceae, have a unique basic chromosome complement, n=5 large + 25 small chromosomes. That this chromosome complement is very stable is demonstrated by the fact that polyploid species with multiples of the basic number exist. *Hosta* has a similar chromosome complement. The chances against the evolution of a similar complement in another unrelated line are very great, and it is assumed that species of *Hosta* are related to the species of the tribes *Yucceae* and *Agaveae.* Apparently species of *Hosta* were once more widely distributed (see Granick, 1944) and are Agavaceae that evolved in a humid climate. In contrast, the *Yucceae* and *Agaveae* evolved in a xerophytic climate. This apparently accounts for the morphological differences between them as suggested by Traub (1953), who proposed the Tribe *Hosteae,* Family Agavaceae. Darlington and Wylie (1956) on the basis of chromosome similarity concurred in this conclusion.

Tribus *Hosteae* Traub, *tribus nov.,* Family Agavaceae Endl. (1841); Traub Plant Life 9: 134-137. 1953, *anglice.*

Herbae perennes, rhizomatibus lignosis, folis petiolatis, floribus bisexualibus albis vel caeruleis tubaeformibus vel campanulatis racemosis, racemis brevibus laxis scapo terminantibus; ovario supero; fructu capsulari; seminibus alatis. Typus: Genus *Hosta* Tratt. (1812).

LITERATURE CITED

Darlington, C. D. and A. P. Wylie. Chromosome Atlas of Flowering Plants. Macmillan. 1956. See pp. viii & xvii, and p. 395, for placement of *Hosta* with the Agavaceae.

Granick, E. B. A karyosystematic study of the genus *Agave*. Amer. J. Bot. 31: 283-343. 1944.

McKelvey, S. D. & K. Sax. Taxonomic and cytological relationships of *Yucca* and *Agave*. J. Arnold Arboretum 14: 76-80. 1933.

Sato, D. Analysis of the Karyotypes in *Yucca, Agave* and related genera with special reference to the Phylogenetic significance. Jap. J. Genetics 11: 272-278. 1935.

Traub, Hamilton P. The Tribes and Genera of the Agavaceae. Plant Life 9: 134-137. 1953.

Whitaker, Thomas W. Chromosome constitution in certain Monocotyledons. J. Arnold Arboretum 15: 135-143. 1934.

ORIGIN OF EUKARYOTIC CELLS, by Lynn Margulis. Yale Univ. Press, 92A Yale Station, New Haven, Conn. 06520. 1970. Pp. xxii+349. Illus. $15.00. This attractively produced book, extensively and beautifully illustrated, is concerned with the hypothesis of the symbiotic origin of chloroplasts and mitrochondria in eukaryotic cells. This hypothesis is not new. However, the author is to be congratulated for bringing it up-to-date. Much of her argument is grounded on interpretations of cytoplasmic inheritance data. In the scientific frame of reference, the author agrees that if the hypothesis is correct it "provides new ways of looking at microbial evolution during vast stretches of Precambrian time. It will require altering the simplistic view that animal cells are more complex **Escherichia coli** and accepting the concept that they are a trigenomic complex (nucleus, mitrochondria, and (9+2) homologue) that has been evolving as an entity for more than 600 million years." If it is not correct, "it will at least provide a framework on which to place much of the immense amount of raw experimental data continuously published." And for this service alone. this book is most valuable. Thus, it is agreed that the hypothesis may or may not be true, and as pointed out by Stanier (1970), it appears that "we shall surely never know with certainty." He also emphasizes that such speculation is in the nature of metascience, and if it does not become an obsecession it may serve a useful purpose. On that basis Dr. Margulis' book is highly recommended to all who are interested in biology.—**Hamilton P. Traub.**

LITERATURE CITED

Stanier, R. Y. Some aspects of the biology of cells and their possible evolutionary significance. Pp. 1—38, Plates 1—3, In, H. P. Charles & B. C. J. G. Knight, editors, Organization and control in prokaryotic and eukaryotic cells. Cambridge Univ. Press, 1970.

PLANT LIFE LIBRARY

CHEMOTAXONOMIE DER PFLANZEN, by R. Hegnauer. Five volumes of this very important series have now appeared as indicated below:

VOL. 1. THALLOPHYTEN, BRYOPHYTEN, PTERIDOPHYTEN UND GYMNOSPERMEN, by R. Hegnauer. Birkhauser Verlag, P. O. Box CH-4010, Basel, Switzerland. 1962. Pp. 517. Illus. sfr. (Swiss francs) 106.00. In this first volume, Dr. Hegnauer presents a general introduction to the entire series which is to cover the families of plants. The author also presents a comprehensive bibliography of the available literature on plant systematics, and anatomy, chemical composition, phytochemical surveys, and reports on the useful (economic), medicinal and poisonous plants of the world. The rest of the volume is devoted to the chemotaxonomy of the Thallophytes, Bryophytes, Peteridophytes and Gymnopserms, including sections on the systematic arrangement and anatomical characteristics, and summary of observations for each family. A comprehensive index completes the volume. It is evident at once that this book is indispensable to all interested in the taxonomy of plants, and it is very highly recommended.

The readers of PLANT LIFE will remember that VOLUME 2. MONOCOTYLEDONEAE. 1963: VOLUME 3. DICOTYLEDONEAE PART 1, ACANTHACEAE TO CYRILLACEAE. 1964; and VOL. 4. DICOTYLEDONEAE [PART 2] DAPHNIPHYLLACEAE TO LYTHRACEAE. 1966, have been previously reviewed in PLANT LIFE. These volumes may be obtained from Birkhauser Verlag; address as given above.

CHEMOTAXONOMIE DER PFLANZEN, VOL. 5. DICOTYLEDONEAE [PART 3], MAGNOLIACEAE TO QUIINACEAE. by R. Hegnauer. Birkhauser Verlag, P. O. Box CH-4010, Basel, Switzerland. 1969. Pp. 506. Illus. sfr. (Swiss francs) 106.00. In this 5th volume, the 61 families of flowering plants beginning with the interesting Magnoliaceae and ending with the Quiinaceae, are considered in detail on the basis of systematic arrangement, and anatomical and chemical characteristics. Information which became available after the main text was completed is included in a supplement. A comprehensive index completes the volume. This important book is a mine of information for all who are interested in the systematics of plants, and cannot be too highly recommended.

SELECTARUM STIRPIUM AMERICANARUM HISTORIA, by Nicolai Josephi Jacquin. Facsimile of the 1763 edition, with an introduction by Frans A. Stafleu. Hafner Publ. Co. 866 Third Av., New York, N. Y. 10022. 1971 Vol. I. Text. Pp. F32, (x), vii, (v), 284, (14). Vol. II 183 Plates. $62.50.

Jacquin was among the first to adopt the artificial Linnean system for classifying plants and his Selectum Stirpium Americanarum Historia, 1763 edition, represents the most important work dealing with his American plant collections. The 435 plants described are mostly new species or species which had so far not been described according to the Linnean system. These plants are native to Cuba, Jamaica, Haiti and other lesser West Indian Islands, and Venezuela. Several new genera are proposed. The 183 adequate illustrations are from copper engravings from drawings made by Jacquin himself in the field and based on living specimens. An important feature that accompanies this facsimile reprint is the Introduction by Dr. Stafleu. It includes a brief biography of Jacquin, an inventory of his collections, and publications, a translation of Jacquin's Preface to the 1763 edition, the botanical explorations of the Caribbean before Jacquin, and abbreviations and references in Jacquin's work. Very highly recommended.

FOUNDATIONS OF PLANT GEOGRAPHY, by Stanley A. Cain. Facsimile of the 1944 edition. Hafner Publ. Co., 866 Third Av., New York, N. Y. 10022. 1971. Pp. ix=556. Illus. $11.95. Written as "an inquiry into

the foundations of the science of plant geography", this important book by an outstanding authority, has served as a reference source since it was first published in 1944. The subject is presented in five parts, plant geography as a borderline science, aerography, evolution and plant geography, and the significance of polyploidy in plant geography. The reprint edition will be welcomed by all who did not have the opportunity of obtaining a copy of the original edition. Very highly recommended.

THE NATURAL PHILOSOPHY OF PLANT FORM, by Agnes Arber. Facsimile of the 1950 edition. Hafner Publ. Co., 866 Third Av., New York, N. Y. 10022, 1970. Pp. 247. Illus. In this stimulating book Arber attempts to discuss the morphology of flowering plants on a tentative and provisional basis the modes of thought which are characteristic of philosophy rather than biology. She defines the term morphology to include both form and function. The subject is developed under the headings—meaning and content of morphology, plant morphology of the Aristotelian school, of Albertus Magnus and Andrea Cesalpino, Joachim Jung, Goethe and de Candolle; the organization type, the partial-shoot theory of the leaf, the urge to whole-shoot-hood in the leaf, bearing of partial-shoot theory of leaf on other morphological problems, repetitive branching and the Gestalt type, the mechanism and the interpretation of plant morphology. Those who did not obtain a copy of the original 1950 edition will be grateful of this opportunity for securing this outstanding book in this attractive reprint edition. Very highly recommended.

THE ALGAE OF ILLINOIS, by Lewis Hanford Tiffany and Max Edwin Britton, Facsimile of the 1952 edition. Hafner Publ. Co., 866 Third Av., New York, N. Y. 10022, 1971. Pp. ix+407. Illus. $14.95. The authors furnish descriptions of the algae species of the State of Illinois. Following a brief synopsis of the algal classes, the Illinois Algae are grouped under the phyla Chlorophyta, Chrysophyta, Pyrrophyta, Euglenophyta, Myxophyta and Rhodophyta. This profusely illustrated text is highly recommended to all interested in the Algae.

FLORA NEOTROPICA, MONOGRAPH NO. 6. TREMELLALES, by Bernard Lowy. Published for the Organization for Flora Neotropica, by Hafner Publ. Co., 866 Third Av., New York, N. Y. 10022. 1971. Pp. 153. Illus. Paper covers, $12.95. This is a periodical designed to present in monographic form taxonomic accounts of all plants growing within the Western Hemisphere tropics. Geographic, ecologic, cytologic, ecologic, anatomic, morphologic, chemical and economic data are presented as well as bibliographies, citations of species names and indices, for each group treated. Monograph No. 6. Tremellales, is highly recommended to all who are interested in the flora of the New World tropics.

PHLOEM TRANSPORT IN PLANTS, by Alden S. Crafts and Carl E. Crisp. W. H. Freeman & Co., 660 Market St., San Francisco, Calif. 94104. 1971. Pp. xxii+481. Illus $12.50. The objective of this excellent new text "is to collect and interpret the experimental information available on phloem transport in plants." The subject is developed under the headings —1. structure—function relations; structure of the phloem, translocation path, phloem plugging and phloem exudation; 2. Experimental results: assimilate movement, plant harmone transport, and movement of exogenous substances; 3. Translocation mechanism: proposed mechanisms, effects of environmental factors, some qualitative aspects of translocation, and in retrospect. Very highly recommended to all interested in the physiology of plants.

PLANT LIFE LIBRARY—continued on page vi.

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.

1. THE AMERICAN AMARYLLIS SOCIETY

[A Committee of the American Plant Life Society]

[AMERICAN AMARYLLIS SOCIETY, continued from page 2.]

(c) REGISTRATION OF PLANT NAMES

Mr. W. D. Morton, Jr., Emeritus Registrar, 3114 State St. Dr., New Orleans 25. La.

Mr. James E. Mahan, Registrar, 3028 Palmyra St., New Orleans, La. 70119

Mr. Charles Hardman, Associate Registrar, Box 936, Temple City, Calif. 91780

Correspondence about the registration of plant names should be sent directly to Mr. Mahan, and a self-addressed, stamped envelope should be enclosed if a reply is expected.

(d) AMARYLLID SECTIONS

GENERAL AMARYLLID SECTION

GENERAL AMARYLLID COMMITTEE—MRS. PAUL A. KANE, *Chairman.*
1001 McIlvaine St., San Antonio 1, Texas

Miss Elaine Brackenridge, *Texas*
Mrs. B. E. Seale, *Texas*

AMARYLLIS SECTION

AMARYLLIS COMMITTEE—MR. J. L. DORAN, *Chairman.*
1117 N. Beachwood Ave., Burbank, Calif. 91502

Mr. Hugh L. Bush, *Missouri*
Dr. John Cage, *California*
Mr. Robt. D. Goedert, *Florida*
Mrs. Flores Foster, *California*

THE NATIONAL AMARYLLIS JUDGES COUNCIL

Mr. W. D. Morton, Jr., Emeritus Registrar
Mrs. B. E. Seale, Chairman
4036 Prescott Ave., Dallas 19, Tex.

Mr. James E. Mahan, Secretary, and Registrar of Amaryllis Names,
3028 Palmyra St., New Orleans, La. 70119

OFFICIAL AMARYLLIS JUDGING INSTRUCTORS

Mrs. A. C. Pickard,
1702 N. Blvd., Houston, Tex.
Mr. W. C. Strain,
563 Mohawk St., Mobile, Ala.
Mr. Robert E. Parker,
3051 Baronne St., Mobile, Ala.
Mrs. Sam Forbert,
117 N. 23rd Ave., Hattiesburg, Miss.
Mrs. Bert Williams,
2601 La Prensa, South San Gabriel, Calif. 91777

The Chairman and Secretary of the Council also function as Official Instructors.

Examinations.—Those desiring to take the examination for the Official Amaryllis Judges Certificate, should preferably apply to the Official Instructor for details. See Plant Life Vol. 17, 1961, pages 30—34, for further details.

All accredited Amaryllis judges of the AMERICAN AMARYLLIS SOCIETY are members of the COUNCIL.

AMARYLLIS ROUND ROBINS

Mrs. Fred Flick, *Chairman*
Carthage, Indiana

GROUP LEADERS

Mrs. Glen Fisher, *Wisconsin*
Mrs. Fred Tebban, *Florida*
Mrs. Fred Flick, *Indiana*
Mr. Richard Guerdan, *Missouri*
Mrs. K. B. Anderson, *California*
Dr. Joseph C. Smith, *California*

Each leader directs one Robin, except Mrs. Flick, the Chairman, and Mrs. Tebban, who each direct two Robins.

(Send a self-addressed stamped envelope, if a reply is expected.)

CRINEAE SECTION

NERINE COMMITTEE—Mr. Charles Hardman, *Chairman*
Box 936, Temple City, Calif. 91780

Mr. Burr Clouette, *California*
Mr. Ken Douglas, *South Africa*
Dr. Hamilton P. Traub, *California*
Mr. Barry W. Clark, *Louisiana*
Mrs. Emma D. Menninger, *Calif.*

INTERNATIONAL REGISTRAR OF NERINE CLONAL NAMES—Mr. Charles Hardman, *Box 936, Temple City, Calif. 91780, U.S.A.*

NARCISSUS SECTION

NARCISSUS COMMITTEE—Mr. Grant E. Mitsch, *Chairman*,
Daffodil Haven, Canby, Oregon

Mr. Jan de Graaff, *Oregon*
Mr. Frank Reinelt, *California*

ALSTROEMERID SECTION

ALSTROEMERID COMMITTEE—Mr. Horace Anderson, *Chairman*,
400 La Costa Ave., Leucadia, Calif. 92024

Mr. Bruce Hinman, *Illinois*
Mr. Mulford B. Foster, *Florida*
Mr. W. M. James, *California*

ALLIEAE SECTION

ALLIEAE COMMITTEE ....., *Chairman*

.....

Mr. F. Cleveland Morgan, *Quebec*
Mr. Claude A. Barr, *South Dakota*
Dr. Henry A. Jones, *Maryland*
Mr. F. L. Skinner, *Manitoba*

PANCRATIAEAE SECTION

PANCRATIAEAE COMMITTEE ....., *Chairman*

.....

Dr. W. S. Flory, *Virginia*
Mrs. Morris Clint, *Texas*
Dr. T. M. Howard, *Texas*
Dr. Hamilton P. Traub, *California*

HEMEROCALLIS SECTION

DAYLILY (HEMEROCALLIS) COMMITTEE—Mr. W. Quinn Buck, *Chairman, 26 East Camino Real, Arcadia, California*.

Mr. Wyndham Hayward, *Florida* Mr. George Gilmer, *Virginia*
Dr. Hamilton P. Traub, *California*

II. OTHER COMMITTEES

GESNERIACEAE COMMITTEE—Dr. Kenneth H. Mosher, *Chairman, 7215 Dayton Ave., Seattle 3, Washington*

Mr. Wyndham Hayward, *Florida*

ARACEAE COMMITTEE—Mr. Wyndham Hayward, *Chairman, Winter Park, Florida*

Dr. Hamilton P. Traub, *California* Mr. Leon W. Frost, *Florida*

AGAVACEAE COMMITTEE—Mrs. Morris Clint, *Chairman, 2005 Palm Boulevard, Brownsville, Texas*

Mr. Wyndham Hayward, *Florida* Dr. Hamilton P. Traub, *California*
Mr. Dick Felger, *California* Dr. Thomas W. Whitaker, *California*

CYCADACEAE COMMITTEE—Mr. Horace Anderson, *Chairman, 400 La Costa Ave., Leucadia, Calif. 92024*

Mrs. Morris Clint, *Texas* Mr. W. Morris, *New South Wales*
Dr. Hamilton P. Traub, *California*

SCHOOL GARDENS COMMITTEE—John F. Cooke, Jr., *Chairman, Rm. 637, 1380 East 6th St., Cleveland 14, Ohio*

Mr. W. D. Morton, Jr., *Louisiana* Mr. Wyndham Hayward, *Florida*
Mr. N. Wm. Easterly, *Ohio*

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.

COMPLETE SETS **OF HERBERTIA:**

Vols. 1-5 (1934-1938), $30.00, postpaid.
6-10 (1939-1943), $30.00, postpaid.
11-15 (1944-1948), $30.00, postpaid.

1-15 (1934-1948), $85.00, postpaid.

SINGLE VOLUMES OF HERBERTIA:

Single volumes of HERBERTIA (1934-1948), when available may be purchased at $7.00 per volume postpaid.

Only a very limited number of sets, and odd single volumes are available. The price quotations are subject to prior sale.

(B) PLANT LIFE, including numbers on various plant subjects, 1945 to date, and the **Second Series** of **HERBERTIA,** or **AMARYLLIS YEAR BOOK,** 1949 to date. It should be noted that the numbers of **HERBERTIA** of the **second series,** beginning in 1949, are in every way equivalent to those of the first series, and are devoted exclusively to the amaryllids.

A limited number of volumes of **Plant Life,** including **Herbertia,** second series, are available, all quotations subject to prior sale.

COMPLETE SETS OF **PLANT LIFE:**

Vols. 1— 5, 1945-1949, $ 25.00 postpaid
Vols. 6—10, 1950-1954, $ 25.00 postpaid
Vols. 11—15, 1955-1959, $ 25.00 postpaid
Vols. 16—20, 1960-1964, $ 25.00 postpaid
Vols. 21—25, 1965-1969, $ 25.00 postpaid
Vols. 1—25, 1945-1969, $120.00 postpaid

SINGLE VOLUMES OF **PLANT LIFE:**

Single volumes of PLANT LIFE published after 1969, when available, are $6.00 for each volume, postpaid.

Only a limited number of sets, and odd single volumes are available. The price quotations are subject to prior sale.

Make checks payable to the AMERICAN PLANT LIFE SOCIETY, and send orders to—

Dr. Thomas W. Whitaker, Executive Secretary,
The American Plant Life Society,
Box 150, La Jolla, Calif. 92037