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HERBERTIA

1959

THE AMERICAN PLANT LIFE SOCIETY

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All persons and organizations interested in amaryllids, and other plants are invited to become members. The annual dues vary from $3.50 to $5.00 (foreign, $4.50 to $6.00) depending on the publishing costs. At present they are $3.50 (foreign $4.50) in advance which should be sent to:

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Box 150, La Jolla, California

PLANT LIFE, VOL. 15, NO. 1, JANUARY, 1959

HERBERTIA

1959

Year Book of
The American Amaryllis Society
26th issue

GENERAL AMARYLLID EDITION

EDITED BY
HAMILTON P. TRAUB
HAROLD N. MOLDENKE

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

THE AMERICAN PLANT LIFE SOCIETY

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

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[THE AMERICAN AMARYLLIS SOCIETY—continued on page 165.]

PREFACE

The beautiful cover design of the present issue is the work of Mr. Douglas D. Craft, of the DEPARTMENT OF DESIGN, ART INSTITUTE OF CHICAGO. It is based on *Amaryllis striata* forma *fulgida.* Mr. Craft also presents an article on the same subject in this issue. We are all grateful to him for his contributions.

This 26th issue of the AMARYLLIS YEAR BOOK (HERBERTIA) is dedicated to Dr. Robert G. Thornburgh, of Palos Verdes Estates, Calif. He has been an amaryllisarian for many years, and has made outstanding contributions toward the evaluation of named *Amaryllis* clones. His work has been published in the AMARYLLIS YEAR BOOK, particularly since 1950. He has shown that the *Amaryllis* enthusiast, by a thorough study of his own collection, can make worth while contributions toward the evaluation and appreciation of the better *Amaryllis* clones. Dr. Thornburgh is a very busy professional surgeon, and finds needed recreation caring for, flowering, and evaluating his *Amaryllis.* On the basis of his accomplishments, the 1959 HERBERT MEDAL has been awarded to him, and with it go the congratulations of all of the members. Dr. Thornburg contributes an interesting autobiography in the present issue.

Again, there are various articles on *Amaryllis* in this issue. Mr. Hayward reports on de Graff's letter to Peter Barr, 1890, on the breeding of *Amaryllis;* and also on old *Amaryllis* clones. Prof. Nelson writes on *Amaryllis evansiae* hybrids; Mr. Jack Scavia, and Mr. J. Gurrud Metz contribute *Amaryllis* breeding notes. Mrs. Tebban shares her experiences with hybrid *Amaryllis;* Mrs. Pickard writes about the use of *Amaryllis* and other amaryllids in the landscape; Mr. Stewart reports on his experiences with vegetative propagation of *Amaryllis,* and concludes his article on the growing of *Amaryllis* in the greenhouse. Mr. Claude W. Davis contributes an interesting article about *Amaryllis* production in Holland based on his European trip of 1958; Mrs. Hoyt writes about growing *Amaryllis* from seeds. Dr. Joseph C. Smith contributes notes on *Amaryllis aglaiae,* the yellow Amaryllis, detailing the first flowering of this species outside its native habitat in Argentina.

The other amaryllids are not neglected. Mr. Harradine writes about *Crinum graminicolum;* Dr. Whitaker pictures an unusually large specimen of *Crinum moorei.* Mr. Hannibal reports on the *Crinum* hybrid, 'George Harwood', originated by the late H. B. Bradley in Australia; on the culture of *Crinum, Brunsvigia, Nerine* and allies; and on two *Brunsvigia* x *multifloria* hybrid clones from Australia. Mrs. Leonard Swets contributes the first detailed report on the culture of *Brunsvigia orientalis* in the United States; Mrs. Polly Anderson shares her experiences in breeding Crinodonnas. Mr. Gilmer writes about some outstanding daylilies; and Mr. Shults reports on the "optimum x-ray exposure of Hemerocallis seeds" for the purpose of obtaining mutations.

Dr. Flory reports on the chromosomes of three *Zephyranthes* species; and Drs. Flory and Flagg contribute an article on the chromosomes of three Mexican *Habranthus* species. Dr. Howard writes about *Zephyranthes* x *ruthiae* clone 'Ruth Page'. Mr. Hannibal includes notes on

the new Backhouse red trumpet Narcissus; and Dr. Cooley relates his adventures in providing daffodils for school children.

Mr. Hayward writes about *Haemanthus multiflorus* which is pictured in color. Dr. Joseph C. Smith details the culture of *Hymenocallis narcissiflora;* Mr. Burlingham shares his experiences with *Hymenocallis* in Florida; and Dr. Corliss writes of his experiences with *Hymenocallis* x *festalis* in Arizona. Miss Kell contributes a charming article on *Lycoris* in Texas; Mr. Hayward writes on *Lycoris radiata;* and Miss Vivian Grapes reports on *Lycoris* in western Nebraska.

Mrs. Menninger contributes the first comprehensive article on Nerines to appear in the AMARYLLIS YEAR BOOK. This is to be followed in the next issue by a catalog of the cultivated *Nerine* hybrids and species.

There are reports on local activities, including the 1958 *Amaryllis* shows in Louisiana and Alabama. Mrs. Fred Flick contributes AMARYLLIS ROUND ROBIN notes. There are still other contributions as shown by the table of contents.

Contributors to the 1960 issue of the AMARYLLIS YEAR BOOK are requested to send in their articles by August 1, 1959 in order to insure earlier publication of that issue. Unless articles are received on time, publication will be delayed to June or July as with some issues in the past several years. Your cooperation toward earlier publication will be greatly appreciated.

Hamilton P. Traub
Harold N. Moldenke

March 25, 1959,
5804 Camino de la Costa,
La Jolla, Calif.

CORRIGENDA

PLANT LIFE, VOL. 14, 1958

Page 48, under heading "(II)", 7th line, and 13th line, from top, for *"woelfleana"* read *"woelfleanus"*.
Page 54, 20th line from bottom, for 'Amita' read 'Anita'.

INDICES OF HERBERTIA AND PLANT LIFE

Work was started in 1958 on the complete indices of the 15 volumes of HERBERTIA (1934-1948), and the first 15 volumes of PLANT LIFE (1945-1959). Thereafter indices will be provided for each five issues of PLANT LIFE.

Since the making of these indices is a large undertaking, it will take a few years to complete them. Announcements will be made when each one is ready.

In place of an annual index, the articles in these publications are grouped under subject headings for convenient reference,—Regional activities, Speciology, etc. The originally planned index due in 1948 was delayed on account of duty on Government emergency quayule research work. The second index is due in 1960 and should not be too long delayed.

Since it is recommended that each five volumes are to be bound in one book, it would appear to be desirable to make indices on that basis hereafter. In this way it may be possible to include the index at the end of each fifth volume hereafter.

Dedicated to

Dr. Robert G. Thornburgh

Herbert Medalist—Robert Grant Thornburgh, M.D., F. A. C. S.
Plate 1

ROBERT GRANT THORNBURGH, M. D., F. A. C. S.

An autobiography

An autobiography with a horticultural slant might be difficult to piece together for one whose profession is concerned with only a small portion of the vast field of medicine and surgery. Perhaps such a record might be faintly justified if one's ancestors were occupied with the important work of horticultural pursuits.

A grandfather some six generations removed with the same name came over from Northern England and settled in Virginia. Subsequently he married in North Carolina in 1728 and settled down to farming as did his progeny down to my own great grandfather. If I have any claims to horticultural leanings by heritage, much of it must stem from my mother's side of the family. Her father brought his Alsacian wife and daughter from Germany to America eighty years ago and became a farmer. He did both experimental and practical work with fruit and nut growing on his own orchards in the Northern part of California in the fertile Napa Valley.

My mother has always been a flower lover and gardener. My earliest experiences as a child having to do with flower raising were confined to digging and preparing her flower beds. These were inevitably followed by the uninspiring job of weeding out the tares. It was then my firm conviction after several years of this during my youth that horticultural activities were anathema and inimical to my own interests. I was very much a city boy and destined to remain so.

I was born in Beatrice, Nebraska on February 28, 1906 to Verne N. and Marie (neé Grossholtz) Thornburgh. My father's business took us to Lincoln, Nebraska where my brother, Charles Frederick was born on June 7, 1909.

My boyhood interests and hobbies were greatly varied but centered the longest on music. My father was very near to me and spent much of his spare time with me in such activities as hiking, fishing, music, the proper use of tools, collecting postage stamps and the one dearest to his heart, the assiduous pursuit of the ethnology of the Amerindian with fringe interests in anthropology. In these last interests he was frequently consulted and visited by men from several educational institutions. He tragically passed out of my life by accidentally drowning when I was nearly fourteen years of age. The interest that he aroused in me for music served me well during my school days. I began to play professionally in combination with local orchestras while still a senior in High School. This preoccupation with music was to continue through my college years even during the 1933 Depression while studying medicine.

The University of Nebraska granted me a degree of Bachelor of Science in 1929. In 1934 its College of Medicine granted me the Doctor

of Medicine degree. An internship of two years was spent as House Physician at the Temple University Hospital in Philadelphia. Deciding then that I wished to become an ophthalmologist to specialize in the treatment of diseases of the eyes, the following three years and nine months were spent in a Residency as House Surgeon at the New York Eye and Ear Infirmary in New York City. This institution is the oldest training institution for ophthalmologists in the United States and is only four years younger than Moorfields in London which has the distinction of being the oldest eye hospital in the world. The New York Eye and Ear Infirmary appealed to me since it had educated many famous ophtholmologists who after leaving there had subsequently set up other institutions which are now most famous in their respective cities of Boston, Philadelphia, Baltimore, etc. The hospital records show patients who were Revolutionary War Veterans and exhibited the handwriting of many ophthalmologists both living and dead.

Desiring to enrich my knowledge of the treatment of eye disease even further, I became associated in the private practice of ophthalmology for the greater part of the next two years in New York City with Conrad Berens, M. D., an internationally known author and ophthalmologist.

During the last year in New York City much of my spare time was occupied in preparing myself for the examinations of the American Board of Ophthalmology Having then become a diplomate of this board the subsequent privilege of belonging to the American Academy of Ophthalmology and becoming a Fellow of the American College of Surgeons was a simple step. During this time my services as an instructor in ophthalmic surgery were needed at the New York Eye and Ear Infirmary where the honor of Acting Assistant Surgeon was given me. Dr. Daniel Kirby, the noted medical author of the presently two most outstanding and definitive works on cataract surgery, placed me on the Faculty of the New York University as Instructor in Ophthalmology during my last year in New York City. These last services were rendered at the Bellevue Hospital and for a time I also served on the panel of examiners for The American Board of Ophthalmology.

All of this time my nearest contacts with the products of floral horticulture were confined to hurried passing of florists in either the subways or streets or to an occasional visit to Central Park.

On June 29, 1935 I was married to the beautiful Marie Jassamine Dunn, a girl of strictly Irish heritage. Our marriage was blessed with four children. Two girls, Marie Jassamine, born February 9, 1941, Hillary Geohegan, born June 10, 1947, and two boys, Robert Grant, Jr., born January 4, 1943, and Frederick Harcourt, born February 3, 1946, now command the lion's share of our time.

My first beginning with horticulture was in a way almost second hand since after acquiring ten acres of land suitable for tillage, a part of a total of 40 acres, the land was worked in partnership with a relative who owned the remaining 30 acres. Over a period of ten years much experimentation was done in the variety of crops and many hard lessons

learned. These had little to do with the quality of the crops, which were good, but with the market and its status at the time of harvest. When one needed to plow under five acres of beautiful tomatoes because to pick them for market would lose 10 cents per crate, it seemed discouraging but it wasn't always so. Some planting of bulbs was undertaken with success but it never reached a profitable level. There it can be seen that my major horticultural interests were largely commercial.

My own intense interest in hybrid amaryllis began a good many years ago when my mother had asked me to keep one of these large bulbs for her until she could move to California. It was planted in a butter tub with half adobe soil and half peat moss to break up the soil and it was given a squirt of water from the hose whenever it happened to be convenient. When it came time to bloom the result was so startling as to be nearly unbelievable. It had developed several large offsets which all came into bloom simultaneously. Dividing the offsets and replanting did not prevent them all from blooming again the following year. This was such an easy accomplishment, and the bulbs had seemingly thriven on neglect! After that a great effort was made to get more information about such a phenomenal bulb. The name of a large commercial grower was obtained. Mr. W. E. Rice of Downey, California, whom I promptly visited. He imparted much of his hard earned amaryllis lore to me and though at first he displayed an old world reluctance to talk of his experiences, it was not long until we were fast friends. Subsequently I was to make another friend with one of the finest gentlemen I had ever had the privilege of knowing in this interest. Mr. Herman Brown and his most gracious wife were to entertain me at tea on several occasions with protracted discussions on amaryllis growing and with extensive experiences obtained in Africa. The Howard and Smith nursery in Montebello, California afforded a diverting place to visit during the month of April because of their hybrid amaryllis. It was Mr. Rice and Mr. Brown who stimulated me to begin making my own crosses and selections. Attempts to improve the strains, if such is possible, were to become a permanent interest. Soon a large plot of ground was becoming filled with seedling blooms each year. People began to visit me from other cities and I made many new friends in this special floral interest. Finally the empty field adjacent to our home began to be invaded with hybrid amaryllis crosses. When it became necessary to build a new home in the same neighborhood, the bulbs disposed of might have taken up the space of half a freight car. The finest seedlings were saved and replanted in the new location.

For many years in California my attention was given to growing and propagating camellias—a most gratifying occupation. Attempts to produce new varieties of camellias by crossing were slow and not productive of many worthy new varieties. Whereas this interest in camellias has not disappeared by any means, most of the floral interest was centered on the happy occupation of acquiring new strains and varieties of hybrid amaryllis. That it has been a rewarding experience is reflected in the great pleasure that can be shared with others. Enthusiasm

is renewed each year. When the blooming season is gone, it is difficult to recall to mind just how vivid and beautiful the amaryllis were. When the inevitable blooms again appear in the early springtime it seems almost as if it were an original experience. One is left with a feeling of incredulous astonishment each year when the blooms return as if it could not have been possible that the previous season had produced such fine specimens.

SIMON ADRIANUS DE GRAAFF TO PETER BARR, 1890

WYNDHAM HAYWARD, *Florida*

The aims and techniques of the 19th century de Graaff firm of Holland, pioneer breeders of Holland Amaryllis, both before the introduction of Amaryllis Leopoldii and afterward, are presented in the words of Simon Adrianus de Graaff of Leiden, "The Younger de Graaff", in a letter to Peter Barr, famous London bulb dealer, dated Jan. 30, 1890, which has been released for publication by Simon de Graaff's grandson, the eminent daffodil, lily and iris specialist, Jan de Graaff, of Gresham, Ore. See also Dr. Traub's "The Amaryllis Manual" published in 1958.

Mr. de Graaff points out, to avoid confusion in the minds of contemporary readers and Amaryllis students, that the present-day H. de Graaff & Sons, Inc., of New York and Lisse, Holland, has not had a member of the de Graaff family as a member of the firm in 30 years. Jan de Graaff's present family firm is the de Graaff Bros., at Noordwyk, Holland. Today's popular Van Meeuwen Amaryllis strain is the product of Messrs. C. G. Van Meeuwen & Sons, of Heemstode, Holland, a subsidiary of the H. de Graaff & Sons, Inc.

The de Graaff Bros. firm is one of the largest producers of quality Dutch bulbs in the business at this time. Jan de Graaff reports that he can still recall clearly the beautiful collection of Amaryllis in his grandfather's greenhouses prior to the old man's death. S. A. de Graaff lived from 1840 to 1914. The Amaryllis collection was broken up and sold after his death and during World War I.

The highest tribute is paid to the work of Simon Adrianus de Graaff in "Die Amaryllis" by the late Henry Nehrling of Florida, pioneer Amaryllis specialist of the Southeast, in his popular monograph "Die Amaryllis", Berlin, 1908, and also by Dr. Traub in the recently published "The Amaryllis Manual" (1958).

Nehrling writes: "Nevertheless, the most famous of all Amaryllis cultivators is the de Graaff firm, which has occupied itself with the culture of these plants for more than 100 years . . . in the year 1862 the younger de Graaff began to increase and to improve his Amaryllis collection, in that he not only employed *Amaryllis psittacina* and other species, but also bought the best hybrids and used them in his cross-breeding.

"From the time of the elder de Graaff an especially colorful hybrid was in existence which was named Amaryllis Graveana. Mr. S. A. de Graaff used it and produced from it and *A. psittacina,* the most important and advantageous of all Amaryllis, namely, Amaryllis 'Empress of India', with glowing red, white striped, very large flowers, with very broad and rounded petals. This signified a further stepping stone in the development of the Amaryllis. It was the starting point of all the big-flowered colorful, beautifully formed Amaryllis which are still abundantly characterized as the 'Empress of India Race' or strain of hybrids, in comparison with the *Amaryllis vittata* race or strain."

Nehrling ranks the Amaryllis 'Empress of India' with the immortal *Amaryllis* x *johnsonii, Amaryllis* x *acramannii* (1835) and 'Acramannii Pulcherrima' (1850), as among the most significant hybrids of the middle 19th century. He imported several specimens of this choice hybrid for his collection at Gotha, Fla., where he did his early hybridizing, around the turn of the century. Its glory was not eclipsed until long after the arrival of the giant flat faced types resulting from crosses with the famous *Amaryllis leopoldii,* found by the Veitch collector Pearce in the Andes Mts., and sent home to his firm in England where it bloomed for the first time in 1869. It was several decades later before the Leopoldii types became completely overpowering in their influence on popular Amaryllis form and fashion.

James H. Veitch of the famous British plant firm of the 19th Century, relates in "Hortus Veitchii", London, 1906, the part that the de Graaff variety 'Empress of India' played in their own Amaryllis breeding program, page 465-469. In part he wrote:

"Van Houtte and other horticulturists in Belgium and France took up the culture of these plants soon after the appearance of 'Acramannii Pulcherrima' and produced many fine seedlings remarkable for brilliance of coloring, though usually deficient in form, with narrow pointed petals of unequal size.

"The elder de Graaff of Leiden afterward surpassed Van Houtte's productions, especially with one named 'Graveana'. This fine form afterwards used by his sons in connection with a dark form of *Amaryllis psittacina* produced the fine 'Empress of India', still in cultivation." The Veitch firm started its own Amaryllis hybridizing work in 1867, around the time of the introduction of *A. leopoldii,* hence they were fortunate in having this immensely valuable germ plasm available at the very beginning of their work.

The text of Simon Andrianus de Graaff's letter to Peter Barr, as released for the first time for publication by Jan de Graaff follows:

"Leiden, Jan. 30, 1890— My Dear Barr, in reply to yours of the 28th I send you information as far as I can give. I shall put answers according to the questions.

"(1). My father was starting [to breed Amaryllis] in 1830, before that my father's uncle was since 1790 growing only *A. vittata* and Johnsonii. My father was always working for [new] colors, and took up fulgida and crocata [varieties of *Amaryllis striata*], crossing these

four varieties over and over amongst themselves, and used also *A. formosissima.** The result was that we had fine deep colors, but only small flowers.

"As soon as I started, 1862, I was looking out for large flowers, and used for that purpose varieties of *A. psittacina,* and *fulgida* [an illegible word here], crossed our small ones with the large blooms, and the large with small ones, so we got the fine forms and deep colors just as well as the waxy white Amaryllis, and of course all shades between. The only care I took was that I brought the colors together which were most acceptable. That means I did not cross scarlet with white—and never troubled about the father or mother—this includes answers for questions 2 and 3.

"(4) Now we cross only best forms with the color we want, never fall back on the species.

"(5) It can be done in four years, but not being able to give the seedlings so much room, we take six years, but this only for our strain. Leopoldii and Pardina (types) can be done in two years.

"(6) and (7) We have our bulbs in pots on the bulb shelves till we are ready for repotting, the old soil is shaken off, we do not touch the roots, but plant them, so that the old root is growing at once again. It is sure that the flowers are developing to perfection by this practice. We cut the foliage off in November and keep pots and bulbs as dry as possible during winter, never water them during that period of rest.

"(8) If we could, we should repot our Amaryllis in January, but having no room at that time, and not wanting them in bloom early, we do it in the middle of February. As a rule they are in bloom after four to six weeks.

"(9) We prefer heat from tan [bark], the pots plunged in the tan, and not too much top heat; so that the development is more natural we keep our top heat at about 60 degrees. If tan could not be used, we should take other bottom heat by tanks or sawdust. 'Empress of India' is the result of crossing a dark seedling of *A. psittacina* with a seedling my father raised, ['Greveana'], *not* the French Gravinea. We used both for father and mother, and do not know which of the two is the father or the mother. We never care for that, only looking at the result. I hope this can be of some use to you, Yours truly, S. A. de Graaff."

The questions from Peter Barr which Mr. Simon de Graaff was answering in this most revealing letter are obvious in most cases. Nos. 1, 2 and 3 were evidently about the origin and date of beginning of the de Graaff strain, and the stock used in early breeding; (4) what they currently used in breeding; (5) how long the de Graaff firm took to grow Amaryllis bulbs to maturity; (6) and (7) potting and winter dormancy techniques; (8) time of repotting bulbs; (9) what sources of bottom heat the de Graaff firm employed. Also the origin of the famous 'Empress of India'. It seems unfortunate that no illustration of

* **Sprekelia formosissima.** Luther Burbank also reported using this in Amaryllis breeding but later workers have never been able to verify their work.—W. Hayward.

'Empress of India' has been found, and the bulbs seem to be lost to cultivation.

FOOTNOTE.—Under date of Sept. 16, 1955, Jan de Graaff of Gresham, Oregon, writes as follows: "I looked up the dates of my grandfather and find that he, Simon Adrianus de Graaff was born in Zoeterwounde, Holland, Febr. 15, 1840, and died in Leiden, April 25, 1914. His father was Jan de Graaff, born in Lisse, Holland, June 25, 1797, and died Jan. 29, 1862. This Jan de Graaff, my great-grandfather, bought the nurseries near Leiden on Febr. 4, 1830, and so he would be 'The Elder' de Graaff.

"It always amused me to know that the nursery bought by Jan de Graaff in 1830 was called 'America'. I often wonder if this had anything to do with the fact that later on, my father, William de Graaff, born April 30, 1873, came to this country on his first trip abroad.—Jan de Graaff".

ELIOVSON'S SOUTH AFRICAN FLOWERS FOR THE GARDEN

L. S. Hannibal, *California*

During the last few years we have had several good books appear on South African Flora (See list at end of article), but the recent book is by far the best to date—Sima Eliovson's *South African Flowers for the Garden,* a treatise on Bulbs, Annuals, Perennials, Succulents, Shrubs and Trees: How to grow them, identify them, and use them for effect. Published by Howard B. Timmins, Cape Town (Price from Publisher $10.50, 305 pages, size 9 x 12 inches).

There are over 16,000 plant species known in South Africa. Obviously no one book or person could attempt to describe all, but after years of plant hunting, research, and horticultural experience Mrs. Eliovson has selected some 450 items as ideal material for South African Gardens. Obviously many of these plants will grow in Southern California, New Zealand and elsewhere, and a number are old friends. But there are many items not in general use, and some species are described for the first time, with notes as to culture and photographs. The *Amaryllidaceae* are well represented, with a number of plates being shown in color.

For example the following plants are described or recommended for garden use, and all are strangers to California gardens: *Clivia caulescenes* and *C. gardeni, Crinum graminicolum, Cyrtanthus collinus, C. contractus,* and a half dozen more, *Haemanthus, Nerine alta* and *N. krigei*—All should be introduced and popularized, and used in breeding.

Since many of us grow other South African bulbs, the descriptions of thirty five out of a known 168 species of Gladiolus are always a source of interest, particularly the ratings assigned the plants in order of preference. The same applies to *Babiana* since this group contains some eighty known species. In fact the one feature which will invariably

cause lengthy discussions over all of the plants is the ratings assigned them for garden usage. Conditions found in Johannesburg are not always applicable to other climatic areas, and what may do best there has sometimes been found a second rate performer in California or Australia. However, such should be anticipated since many plants are critical as to environment; then in many instances the forms which we grow here may not be the best stock or selection from the wild. So the ratings must be accepted conditionally. Otherwise the book is a must for the collector.

As an added feature there are a number of recommendations for use in landscaping for entirely South African material, and a list of nurserymen handling such material is given. The only discouraging feature over plant importations for that area are the new inspection regulations which make it practically prohibitive to export anything except seed from South Africa. We hope that this can be cleared up as it is a serious handicap to bulb collectors in the States.

Other recently published South African garden books (order through your book dealer):
K. C. Stanford, "A Garden of South Africa Flowers".
A. H. Hamer, "Wild Flowers of the Cape".
E. G. Rice & R. H. Compton, "Wild Flowers of the Cape of Good Hope".

TRAUB'S "THE AMARYLLIS MANUAL"

WYNDHAM HAYWARD, *Florida*

The appearance of Dr. Hamilton P. Traub's "The Amaryllis Manual" (Macmillan, New York, 1958, $7.50) signals a new and significant landmark in the horticultural-botanical study and appreciation of the genus *Amaryllis* L., a work of fifty years' creation, summing up the life-long private research and experimentation of a professional plantsman, a brilliant scientist, gardener and plain "dirt grower" who knows and lives with his bulbs.

Now retired and living in the friendly subtropical climate of La Jolla, Calif., with his numerous species all about him, Dr. Traub may take heart-warming pride in the results of his labors in the genus *Amaryllis*, which will serve our needs until a new edition comes along for the inclusion of new discoveries and developments. He has created another in the master-works of great plant writing, a manual to cover an entire genus probably as completely and carefully as a single author can achieve in a lifetime.

It was as a boy in the midwest that Dr. Traub undertook his first *Amaryllis* experiments and cultural studies. It was decades later in Florida that he rejoiced to see his enthusiasm and keen scientific interest bring about the formation of the AMERICAN AMARYLLIS SOCIETY in 1933, to promote and foster further serious study of the genus *Amaryllis* and allies on a world-wide scale, and began the editing of the inimitable series, HERBERTIA, the Amaryllis Year Book, which have appeared without fail each year since then.

Now a quarter century later he at long last sees his great compendium, concordance, one might say, of the genus *Amaryllis* L. appear in print, the fruit of his long and arduous studies and research, concentration, keen penetration and understanding of the problems of plant ecology, systematics, physiology, phylogeny and all the rest. Few men are so fortunate to see the great reward of their life's work tossed into their laps while they are still young in heart and mind, ambitious and vigorous toward their eternal goal and still good for years of the creative life ahead.

In a way, this is a left-handed plea to the good Doctor, to conserve his energies for at least one more outstanding work from his typewriter—next a treat-

ment of the entire *Amaryllis* family, to rank in the 20th century with William Herbert's and J. G. Baker's in the 19th, and a book of plantsmen's memoirs—telling us all the things he has done and seen and heard, and how it all came about.

We say this soberly—this is a great book. Those are words not to be bandied about in book review columns, but this is exceptional. This is a new kind of plant book, in the words of Prof. Ira S. Nelson—"to me it represents a new 'species' of horticultural books. Nowhere else have I seen in a single book information which appeals to a beginning amateur, an advanced gardener and a professional student of plant science . . . recognition of the need for reliable information at all levels is most gratifying. I hope that other authors who write about horticultural plants will follow this example. The 'Amaryllis Manual' is a new kind of book indeed which fits the needs of our new era in Horticulture."

Prof. Nelson has said it in better words and more succinctly than this reviewer could have done. He is the professional teaching horticulturist and works with young men and women and knows the kind of books they should have, the kind that will appeal to them, that will do them the most benefit. But this is not a classroom book, although it will probably be used in many plant courses,—botany, gardening and horticulture. It is a book for the bulb grower who wants all the information about *Amaryllis*, the taxonomist who wishes to know the latest in classification of the genus and its species; it is a hobby book supreme for the *Amaryllis* enthusiast, the plant devotee who wants the innermost "secrets" of his favored specialty, and for the general gardening reader who just wants to be intelligent about plants he may or may not grow, and the specialist who makes a fetish of his culture and exhibition blooms.

We venture if you are sincerely interested in plants, any plants of course, but especially Amaryllis, you will find this book as absorbing as any novel. If you are only casually interested in plants but like to read about them, you will find sheer beauty, dramatic discoveries, brilliant scientific research, amazing plant history, and a good bit of geography in this work.

Just open a few pages—the illustrations are good and plentiful, but do not overwhelm the text—the story remains the most important—some will be intrigued by the records of *Amaryllis* through the centuries down to the highly scientific industry now existing to produce showy named varieties of supreme quality types by the new vegetative propagation techniques. Here Dr. Traub has had his own major share in the scientific research and development.

Then follow absorbing pages about the types and forms of the *Amaryllis*, the main sections of the genus, doubles, pure whites, old species, and a flood of new ones which have poured into world gardens in recent decades, offering a great new supply of germ-plasm for hybridizing research. Dr. Traub and the American Amaryllis Society have had their major share in these.

There are chapters on cultural suggestions, formulae for growing "mixes" by proven veterans in the field, production of the bulbs, marketing, diseases, breeding and other phases. Possibly the most interesting to the historically minded will be the sections on the story of nomenclature in the genus *Amaryllis* L. itself, which Dr. Traub explains with his full stature and integrity as a plant scientist and researcher to back his decisions. As one who has been an interested participant in this discussion for more than 20 years, it looks to this observer that the last word has been said by Dr. Traub in his book, concerning the validation of the Linnaean *Amaryllis belladonna* L. and the generic name *Amaryllis* L., over William Herbert's interpolated "Hippeastrum." But Dr. Traub's evident determined effort to leave no stone unturned and to express the fullest possible brief for the original name has us wondering if some echoes of reaction are not still rattling around somewhere.

The chapter on nomenclature, as we have tried to point out, is well worth the price of the book, if you are interested in such things—and you will be, surprisingly so—if you but dip into it! It is a fantastic state of affairs that existed in the genus *Amaryllis* L. for 100 years until Dr. J. C. Th. Uphof wrote his original article in the 1938 HERBERTIA.

Appendix C is a monograph in itself, with "key to the known species and their complete descriptions." The various modern commercial strains are covered fully in

preceding chapters; there is a valuable and helpful glossary and a bibliography; and a sound index. Best of all, Dr. Traub is writing to minds of intelligent plantsmen of high school and college level and beyond . . . not just "down" to a common moronic denominator as so many of our garden authors seem to be doing. All hail to Dr. Traub and his new AMARYLLIS MANUAL . . . and let us have more like it before we say farewell . . . maybe even a whole brilliant category of treatises on plants giving an "ultimate conception" of gardening.—*Wyndham Hayward, Winter Park, Florida.*

CORRIGENDA

THE AMARYLLIS MANUAL, BY HAMILTON P. TRAUB. MACMILLAN CO. 1958.

Page ix, 3rd line, after "are" insert "Mr. & Mrs. Mulford B. Foster, of Orlando, Florida;"
Page 3, 16th line from bottom, for "the Latin for" read "from Hermann's herbal phrase meaning"
Page 27, for "plena" read *"semiplena."*
Page 42, 4th line from bottom, for "rosters" read "treasures."
8th line from bottom, for "and hybrid propagation" read "introduction"
Page 61, 18th line from top, after "var." insert *"semiplena* forma"
Page 88, 3rd line from bottom, for *"plena"* read *"semiplena"*
Page 89, 4th line from bottom, for *"plena"* read *"semiplena"*
15th line from bottom, for *"plena"* read *"semiplena"*
Page 181, at end of 3rd paragraph, add "See also page 128, Chapter 10."
Page 242, 4th line from top, after "standpoint" insert, "(see Table A),"
20th line from top, for "Hann." read "Gouws"
Page 248, first footnote, 3rd line, for *"rautanensis"* read *"rautanenii"*
2nd footnote, 9th line, for *"damazinana"* read *"damaziana"*
Page 250, Table C, for *"A. damazinana"* read *"A. damazana"*
Page 250, Table C, for *"A. damazinana" read "A. damaziana"*
Page 267, change the first 6 lines to read: "4-A. AMARYLLIS AMBIGUA (Herb.) Seub., in Mart. Fl. Bras. 3(1): 152. 1847; Traub & Moldk., Amaryll. 186. 1949.
Syn.—*Hippeastrum ambiguum* Herb., Bot. Mag. sub pl. 3542. 1837; *H. ambiguum* var. *longiflorum* [=*ambiguum*]—Herb., Bot. Mag. pl. 3542. 1837; *Amaryllis ambigua* var. *longiflora* (Herb.) Sweet, Hort. Brit. ed. 3. 674. 1839; *Amaryllis solarodriflora* var. *conspicua* Hannibal, Herbertia 10: 151, fig. 106. 1943; *Amaryllis elegans* var. *ambigua* (Herb.) Traub & Moldk., Amaryll. 186. 1949.
Page 267, 5a., after "var. VITTATA" begin new paragraph with "L'Hérit. etc."
Page 271, 11a., after "var. STRIATA" begin new paragraph with "Lamarck, etc."
Page 282, 27a., after "var. BELLADONNA", begin new paragraph with "L. Sp. Pl. etc."
Page 283, 27c., for "PLENA" read "SEMIPLENA"
Page 283, above 2nd line from bottom, insert, *"Amaryllis belladonna* var. *semiplena forma albertii* (Lemaire) Traub, *comb. nov.* Syn.—*Amaryllis albertii* Lemaire, Illus. Hort. pl. 498. 1866."
Page 290, 36a., after "var. PSITTACINA" begin new paragraph beginning with "Ker-Gawl., etc."
Page 291, 37a., after "var. CORREIENSIS" begin new paragraph, beginning with "Bury, etc."
Page 296, 45a., after "var. RETICULATA", begin new paragraph, beginning with "L'Hérit., etc."

DUKE HORTICULTURAL CENTER

The Horticultural Society of New York, which was founded in 1902, has agreed to administer on behalf of the Duke Gardens Foundation, Inc., the project to be "devoted to research and to agricultural, botanical and horticultural exhibits, open to the public." The project will be located on 60 acres of the Duke Farm property two miles from Somerville, New Jersey, and 35 miles from New York City.

Headquarters for the Horticultural Society of New York and Duke Gardens Foundation, Inc. will be at the Essex House, 157 West 58th Street, New York 19, N. Y.

SUBGENERA OF **BRUNSVIGIA** HEIST.

Hamilton P. Traub

A few who are not acquainted with the biologic facts have attempted to keep the Cape Belladonna, *Brunsvigia rosea* (Lam.)Hann., separate from the genus *Brunsvigia* Heist., but this can never succeed so long as taxonomy is a science. It has been shown that the Cape Belladonna is so similar morphologically to other *Brunsvigia* species that even he who runs can see the close similarity. In addition, the chromosome number of *B. orientalis,* the type of the genus, is the same as that of the Cape Belladonna, *Brunsvigia rosea* (Lam.)Hann., 2n=22, indicating a basic number of x=11. It is not surprising therefore that there is gene exchange between the Cape Belladonna and some other *Brunsvigia* species. Such crosses have given fertile offspring, and abundant examples of such fertile hybrids in various generations after the first crosses can be found in gardens in many parts of the world (see Traub & Moldenke, Amaryll. 56-67. 1949; Gouws, in Plant Life *5:* 65. 1949; Traub, Amaryllis Manual, 236-251. 1958; Hannibal, in Herbertia *9:* 101-102; 146. 1942 (1943); in Plant Life *11:* 67-75. 1955; *13:* 92-99. 1957).

Genus **BRUNSVIGIA** Heist

in Monogr. cum ic. 1753 & 1755; Ait. Hort. Kew, ed. 2 (1811), Traub & Moldk., Amaryll. 66-67. 1949; Dyer, in Plant Life **6:** 63-83. 1950; **7:** 44-64. 1951; Traub, Amaryllis Manual, 246-249. 1958. Type species: **B. orientalis**(L.)Ait. et Eckl.

In the genus **Brunsvigia** there are two natural sub-groups, one centering around **B. rosea** (Lam.) Hann., the Cape Belladonna, with leaves ascending when young; and the other, centering around **B. orientalis,** with leaves soon spreading prostrate on the ground.

Subgenus 1. **COBURGIA** (Herb.) Traub, **comb. nov.**

syn.—Genus **Coburgia** Herb., in Bot. Mag. Lond. **47:** sub pl. 2113, pp. 4-5. 1819.

DIAGNOSIS.—Leaves 8—20, ascending when young, and only spreading on the ground with age. Type: **B. rosea**(Lam.)Hann., in Herbertia **9:** 101-102; 146. 1942 (1943). Additional species: **grandiflora** Lindl., **undulata** Leighton, **josephinae** (Red.)Ker-Gawl., **litoralis** Dyer.

Subgenus 2. **BRUNSVIGIA**

DIAGNOSIS.—Leaves 2—6 (rarely up to 8), soon spreading prostrate on the ground. Type: **B. orientalis**(L.)Ait. ex Eckl., Trop. Verz. 7. 1827. Additional species: **radula** Ait., **comptonii** Barker, **Bosmaniae** Leighton, **appendiculata** Leighton, **minor** Lindl., **striata** Ait., **gregaria** Dyer, **natalensis** Baker, **radulosa** Herb.

Some of the exhibits at the Amaryllis Show sponsored by the Men's Amaryllis Club of New Orleans, April 12 & 13, 1958.

Plate 2

1. REGIONAL ACTIVITY AND EXHIBITIONS

1958 AMARYLLIS SHOW SPONSORED BY MEN'S AMARYLLIS CLUB OF NEW ORLEANS

When it became evident that due to the damage done to the *Amaryllis* by the cold weather of the late winter and early spring of 1958, the usual large Official Amaryllis Show could not be staged by the Garden Circle and cooperating societies and clubs, the Men's Amaryllis Club of New Orleans volunteered to stage a smaller show. This was done with the cooperation of the Garden Circle.

The first Amaryllis Show sponsored by the Men's Amaryllis Club of New Orleans, Louisiana, was held April 12 & 13, 1958 in the Bienville School, 1456 Gardena Drive, and was staged by Mr. W. J. Perrin, Chairman, in a most beautiful manner. It was a grand success.

Those in charge of entry classifications were: (a) Dutch hybrid class, Mr. Tim Calamari; (b) American hybrid class, Mr. S. P. Gasperesz, and (c) specimen class, Mr. Charles A. Ramelli. This work was performed in an excellent manner. (Plate 2).

The entries were of high grade and much better than anticipated in view of the unusual cold weather in late winter and early spring.

The Gold cup was won by Mr. Milo C. Virgin for Dutch named clones, and the Gold cup for American clones was won by Mr. Andrew C. Gandolf, Jr.

The sweepstakes awards went to Mr. S. N. Cushinotto in the Dutch Hybrid class, and to Mr. Walter R. Latapie and Mr. Charles Ramelli, in the American Hybrid class.

Ribbon awards were also made in all classes to first, second and third winners. The Show was judged by five Official Accredited Amaryllis Judges.

W. D. Morton, Jr.

ANNOUNCEMENT — 1959 OFFICIAL NEW ORLEANS AMARYLLIS SHOW

Mrs. W. J. Perrin, *President, Garden Circle*

The Garden Circle's Tenth Official Amaryllis Show was scheduled for March 22-23, 1958 and plans for a bigger and better show were well under way when continual freezing spells throughout the winter months were climaxed by a severe snow-storm on February 15, the first in fifty years. The effects of this on the *Amaryllis* prompted us to call a special meeting on February 24th to discuss the practicability of staging a large show in 1958.

One of the main attractions of the show is the arrangements division. Each year there are approximately a hundred beautiful *Amaryllis* arrangements, and we had no idea how the outdoor *Amaryllis* would bloom

under the conditions. These outdoor clones and seedlings, which are usually utilized for the arrangements, would apparently not be available. With these facts in mind, and because of the magnitude of the show, open for competition to the general public as well as the garden club members, it was considered advisable to cancel the 1958 Show. So many categories were involved—horticulture (Dutch and American clones), arrangements, special schedules, invitations, etc., that the members felt that this step was necessary.

Plans for a bigger and better Official Amaryllis Show in 1959 are well under way at this writing (December 1958). This will be the Garden Circle's tenth Official Amaryllis Show, and it is scheduled for March 21-22, 1959 at McMain Junior High School, 5712 South Claibourne Avenue.

Many new features are planned. There will be two new classes, one for registered named Dutch clones and one for registered named American clones. There will be additional Awards of Merit from the American Amaryllis Society.

A new award this year for the most blue ribbons in American Horticulture will be the La Forest Morton Memorial Trophy, in honor of the late Mrs. W. D. Morton, Jr., who was prominent in gardening circles here and did so much to promote interest in *Amaryllis*.

The new Harry St. John Memorial Challenge Trophy will be awarded for the most outstanding American Specimen. A Harry St. John Bulb was sent to the White House in 1956 and Mrs. St. John (a Garden Circle member) has a letter from Mrs. Mamie Eisenhower expressing appreciation of same, and stating that it was planted in the Gettysburg Garden.

For the first time, too, the Men's Amaryllis Club of New Orleans Trophy will be given for the most outstanding Dutch Specimen in the show. There are many other cups and ribbons to be awarded.

One of the highlights of the show will be the lovely ceremony of the crowning of the Amaryllis Queen. In addition, this year there will be a charming "Amaryllis Dance" by the children of Kingsley House.

We are looking forward to many beautiful artistic arrangements (of Amaryllis only), and of course numerous horticulture specimens, a class open to the general public.

HATTIESBURG (MISS.) AMARYLLIS SOCIETY

Mrs. Sam Forbert writes that the first Official Amaryllis Show of the Hattiesburg Amaryllis Society will be held some time in April. A report on this event will be included in the 1960 Herbertia.

Mrs. Forbert reports that color slides of Amaryllis hybrids were shown at their Sept. 11, 1958 meeting. Many of these were shown through the kindness of Mr. James Terry, and Mrs. U. B. Evans who kindly lent their color slides.

AMARYLLIS SOCIETY OF MOBILE

Mrs. Hunter Kilpatrick, *Secretary,*
Mobile, Alabama

The members of the Amaryllis Society of Mobile have had many interesting experiences in the growing and cross pollination of both American and Dutch hybrid *Amaryllis.* Here in our area many people grow all their amaryllis in the ground the year round. In Winter the bulbs are heavily mulched with pine straw or oak leaves.

The crossing of the Dutch and American hybrid *Amaryllis* has become the greatest interest of many of our members. One of the most interesting crosses we have is 'Sweet Seventeen' x 'Barbados'. The flower of this cross resembles "Sweet Seventeen' in size and color and the 'Barbados' in shape.

AMARYLLIS ROUND ROBIN NOTES, 1958

Mrs. Fred Flick, *Chairman,*
Amaryllis Round Robins, Carthage, Indiana

[The following notes were extracted from Round Robin letters by Mrs. Fred Flick, who is Chairman of the Amaryllis Round Robins.—Editor]

SUBJECT:—SOIL MIXES FOR AMARYLLIS BULBS

MADGE TEBBEN, ILLINOIS:—Good friable garden soil 50%; sand, about 15%; humus, 10%; old decayed stable manure, about 25%.

Recently I have used a mixture called Ferti-Life. It is made of live stock manure and compost from the Chicago Stock Yards. It is recommended to use this in the proportion of one tablespoon to each inch of diameter of the pot that you are going to use, so a six inch pot would take six tablespoons full. I use this now instead of the humus and decayed stable manure. I still use plenty of sand and I give each a bit of horticultural lime, as our soils are so acid along Lake Michigan. I use about one teaspoon to a pot.

EUNICE FISHER, WISCONSIN:—I use compost with one-third sand.

BEN HONFELD, CALIFORNIA:—(bulbs grown outside) I use compost and cow manure mixed with soil.

EVALENA CREWS, ARKANSAS:—One third sand; one third garden soil; one third black peat; to the above I add some well rotted barnyard manure and a good sprinkling of bone meal.

RICHARD GUERDAN, MISSOURI:—To a sack of three cubic feet of fir bark, I add a four inch pot each of pulverized limestone, superphosphate, and hoof and hornmeal. You can substitute a slow acting nitrogen fertilizer for hoof and hornmeal. Then to secure maximum growth, you can fertilize once a month during the growing season with any well balanced liquid fertilizer.

LYDIA PAHLS, FLORIDA:—(Bulbs planted outside). The soil here is quite sandy, somewhat alkaline and full of coral rock. We take out the rock and some of the subsoil; and add well rotted compost. Then we add a small quantity of the commercial dry sheep manure and superphosphate. The resulting mix is still fairly sandy. Because of our heavy rains, good drainage is important, and we rely on periodic fertilizing during the growing season, to keep the bulbs well fed.

HELEN ELIAS, CONNECTICUT:—We have in our back yard, four separate heaps of compost, 10 x 4 feet in various stages. Into these heaps we put all kitchen vegetable rejects, green weeds, faded flowers, leaves from the yard, grass clippings, and on rare occasions, a dressing of cow manure. This stands for about a year and a half before we screen it through a coarse screen, to remove stones and sticks. This material has a crumbly, velvety feeling and is given just enough sand to insure good drainage, about one shovel of sand to ten of compost. To a wheelbarrow of soil, I add about ½ shovelful of bonemeal and ½ shovelful of 4-10-10 fertilizer. I store this mixture in drums in the garden house for winter and early spring use.

For the summer, the bulbs are turned out of their pots into the vegetable garden. For their dormant season, they are potted and kept in a medium warm cellar until the middle, or end of January, with only one or two scant drinks of water.

LEN WOELFLE, OHIO:—Each spring I try to make a trip into the local woods to get several gallons of rich, humusy woods soil. In this I pot most anything that needs potting earlier than garden time. I find seeds of amaryllis, sprekelia, lilium, and zephyranthes germinate wonderfully well in this soil.

OPAL R. FLICK, INDIANA:—For several years all my amaryllis bulbs have been potted in a commercial mix, Black Magic. This is a loose mix, and therefore gives perfect drainage. This summer, I have potted a few amaryllis in woods compost, as Len recommends.

EDITOR'S MAIL BAG

Mr. W. Morris, 20 Mills St., Warners Bay, New South Wales, Australia, writes under date August 18, 1958, that it is difficult to import bulbs due to quarantine regulations, and that he "would appreciate contacts with enthusiastic amateurs who might be interested in exchanges of seeds". He states that he has over 150 species of bulbs, not counting liliums, narcissi and irises, and that he has a particularly good lot of South African bulbs.

Mr. Zvi Ginsburg, of Gevim, Doar-Na, Hof Ashkelon, Israel, visited the writer in the latter part of August. He has promised to send bulbs of *Vagaria parviflora, Pancratium maritimum, "Sternbergia spofforthiana", S. lutea, Ixiolirion montanum,* and *Pancratium sickenbergii* if, and when he encounters them in their native habitat in Israel.

Mr. David James William Chandler, the Australian nurseryman, died on August 23, 1955. The late Mr. Chandler's business is being carried on by his nephew, Mr. T. H. Chandler, of Como Nurseries, The

Basin, Victoria. The executors of the estate write that "Unfortunately, a great deal of the late Mr. Chandler's specialized knowledge has died with him."

An interesting article on preserving flowers by embedding in sand by Mrs. Geneal Condon, "Blossoms that Defy the Seasons" was included in the National Geographic Magazine, CXIV: 420—427. 1958. This gives experiences with a new version of the old method of drying flowers by embedding the fresh flowers in sand.

Our colleague, Dr. Harold N. Moldenke, Director of the Trailside Museum in Westfield, N. J., has been chosen leader of the "Gardens of the Bible" Tour scheduled to leave from New York March 26, 1959 via American Airways. Highlights of the tour include visits to Israel, Jordan and Egypt as well as Italy. Further details may be obtained from Dr. Moldenke, or from the Horticultural Travel Foundation, Hotel Chatham, New York City.

Mr. L. S. Hannibal writes that "With the rather sudden passing of Mrs. A. Primo of Mobile, Ala., in January of 1957 one of the finest *Crinum* collections in the country ceased to be available to members of the American Amaryllis Society. Many of her thousands of subtropical bulbs were either unlabeled or the labels were so illegible that identification has been impossible. As a consequence the members of her family have not been able to continue the business. We regret to learn of this for this was a collection representing years of work. Her passing represents a deep and sincere loss to the society."

Dr. K. N. Kaul, Director of the National Botanic Garden, Lucknow, India, writes under date of Nov. 4, 1958, that Mr. Sydney Percy Lancaster, formerly of the Agri-Horticultural Society of Alipore, India, and more recently with the National Botanic Garden, Lucknow, is leaving India early in 1959 to reside in Southern Rhodesia with his sons.

We have learned that the Society's good friend, Robert T. Van Tress is still with the Chicago Park District as Horticulturist, and is now also Garden Editor with the Chicago Daily News. It was Mr. Van Tress who introduced the fine strain of Garfield Park hybrid Amaryllis in the 1930's through the agency of the American Amaryllis Society. (See Traub—The Amaryllis Manual, page 37, illustration 16 (page 38), and page 77.)

Under date of November 4, 1958, from Cochabamba, Bolivia, Prof. Ira S. Nelson writes that on his way to South America on the plant exploration trip he stopped off at Panama City. There he "checked on Richard William Pearce (1838?—1867) at the British Consulate to find, if possible, the site of Pearce's grave, and any other available information about him, but the records date back only to 1869, and Pearce died two years earlier." (See Traub—"The Amaryllis Manual", pp. 43—44.)

Messrs. Arthur E. Teeter and W. F. Sinjen of San Diego, Calif. visited the writer on December 13, 1958. Mr. Teeter is an educator who works with amaryllis as a hobby, and Mr. Sinjen is a landscape artist who uses amaryllids in his profession whenever they can be used to advantage.

Dr. Mason M. Turner, Modesto, Calif., of the Agricultural Research Division of the Shell Development Company, visited the editor in early January. Dr. Turner is much interested in *Amaryllis* species and hybrids as an avocation.

Mr. John M. Cage, 740 Arroyo Road, Los Altos, Calif., has been breeding *Amaryllis* for the past quarter century, and he has promised to write an article on his breeding experiences for publication in the 1960 AMARYLLIS YEAR BOOK, the 27th edition. We will all be looking forward to this treat.

We congratulate Mr. Douglas D. Craft, of the DEPT. OF DESIGN, ART INSTITUTE OF CHICAGO, and Artist for the Society, who has had one of his paintings selected for the National Show at the RINGLING MUSEUM OF ART, in March 1959.

AMARYLLIS JUDGES CERTIFICATES

Since the last report in 1958 Amaryllis Year Book (page 25), the following Amaryllis Judge's Certificates have been issued by the American Amaryllis Society:

38. Mrs. Guy Rice, 606 Gornto Road, Valdosta, Georgia.
39. Mrs. Jo Beatrice Wells, 5497 Holly Springs Drive, Houston 27, Texas.
40. Mrs. H. J. Strong, 619 Pinehaven Drive, Houston 24, Texas.
41. Mrs. Frank S. Bova, 812 West Temple, Houston 9, Texas.
42. Mrs. E. L. Bachelor, 2417 Morse, Houston 19, Texas.
43. Mrs. Amesbury Lee, 2314 Kipling #50, Houston, Texas.
44. Mrs. Creel Brockman, 152 West Texaco, West Columbia, Texas.
45. Mrs. R. M. Langford, Tifton, Georgia.
46. Mr. Guy Rice, 606 Gornto Road, Valdosta, Georgia.
47. Mrs. J. A. Fausette, Adel, Georgia.
48. Mrs. Wayne Wiseman, Adel, Georgia.
49. Mrs. T. U. Hill, Tifton, Georgia.
50. Mrs. Lamar Devane, Adel, Georgia.
51. Mrs. Dan Redd, Thomasville, Georgia.
52. Mrs. Ritchie Ross, Thomasville Road, Tallahassee, Florida.
53. Mrs. Johnie George, 309 E. Alden Ave., Valdosta, Georgia.
54. Mrs. Ashley McLeod, 1518 McLeod Road, Valdosta, Georgia.
55. Miss Kathryn Ulmer, South Patterson Street, Valdosta, Georgia.
56. Mrs. H. M. Paulk, Tifton, Georgia.
57. Mrs. William Culpepper, 217 W. Alden Ave., Valdosta, Georgia.
58. Mrs. O. S. Ware, 2001 Slater Street, Valdosta, Georgia.
59. Mrs. D. L. Gill, 511 West 20th St., Tifton, Georgia.
60. Dr. D. L. Gill, 511 West 20th St., Tifton, Georgia.
61. Mrs. Dwight M. Knight, 506 West 10th St., Tifton, Georgia.
62. Mrs. W. A. Hodges, Tifton, Georgia.
63. Mrs. W. S. Wheeler, 4506 Bellaire Blvd., Bellaire, Texas.
64. Mrs. E. O. Greiner, 3202 Hurley Road, Houston 16, Texas.

For information about taking the examination for the Amaryllis Judge's Certificate, write to Mr. W. D. Morton, Jr., 3114 State Street Drive, New Orleans 25, La.

APHIDS ON HEMEROCALLIS

Aphids appear in the "hearts" of the growing fans of *Hemerocallis* during the winter and spring at La Jolla, Calif. They very rarely arrest the growth of the plants. Winter rains, if any, do control them. During rainless periods overhead watering proves effective.—*Hamilton P. Traub*

2. SPECIOLOGY

[EVOLUTION, DESCRIPTION, CLASSIFICATION AND PHYLOGENY]

CRINUM GRAMINICOLUM

REG. F. HARRADINE, *England*

Those who have this plant and have not yet seen it in flower, have a rare treat in store for themselves. I have some thirty *Crinum* species and varieties and about half of them have shown me their flowers. I find them all rather lovely, but when this one unfolded its glorious flowers, I just gazed at it, quite amazed that such a beautiful thing could be a 'wild plant'.

Two years ago I received from Northern Transvaal, six huge, dark brown bulbs, the largest of them being some 6 inches in diameter, almost globular and weighing nearly eight pounds—much like a mangold. I gave away four of the bulbs, all of which have been lost. My two are in fine shape and the large bulb favoured me with a bud early in August. This developed very quickly, throwing up a thick stem about 10 inches high, crowned with a spathe 2 inches broad and 4 inches long. This opened up into an umbel of 14 buds which developed into flowers in a surprisingly short time, so that when the last opened the first flower was just beginning to fade, thus giving a circlet of flowers some 14 inches in diameter. As with many Crinums, the pedicel is short, less than 1 inch, the perianth-tube long, about 5 inches, arched over to hold the flower horizontally. Segments keeled deep reddish rose, fading out to the margins which are nearly white. All segments are about 4 inches long, the outer about ¾ inch wide, the inner about 1 inch wide. The flower is trumpet shaped, the segs recurving at the top, which is tipped with green. Stamens are declinate and upcurving. Anthers versatile, ⅜ inch long, ash-grey turning black.

The plant is low growing, the leaves, from a short neck, dark grey-green, 5 to 6 inches in the broadest part, which is about 9 inches from the neck, some 24 inches in fullest length, spreading, curling and falling around sides of pot. Leaves edged with fine white hairs.

As soon as the flowers have faded, the peduncle falls to the ground. In this position, the ovaries begin to swell and as the fruits develop, they look like a bunch of small cucumbers. On my specimen all 14 ovaries are swollen with seeds.

I feel that the above description does not do justice to this lovely species. It is illustrated in Flowering Plants of Africa, Part 116, Sept. 1953, Plate 1155, and the accompanying account states that this species has, for some time, gone under the name *Crinum forbesianum,* but is now considered to be quite distinct from that species, which apparently came from Portuguese East Africa. It further states that *Crinum graminicolum* is frequently found around Pretoria and neighbouring districts, scattered over small areas, in dense sour grass veldt.

102 Byng Drive,
Potters Bar, Middlesex, England

Fig. 1. Dr. Thomas W. Whitaker standing beside an unusually large clump of *Crinum moorei* Hook f. Note the extreme height and lush growth of the plants. Photo by G. A. Sanderson.

AN UNUSUALLY LARGE SPECIMEN OF **CRINUM MOOREI**

The clump of *Crinum moorei* Hook. f., plants in the accompanying photograph are growing on the grounds of the U. S. Horticultural Field Station at La Jolla, California. Four small bulbs were planted in a circle about 6 inches apart in 1939. At the present time the plants are over 6 feet high, the clump is about 4 feet in diameter, and consists of about 30 bulbs (Fig. 1). A search of the available literature indicates these are some of the largest plants recorded for this South African species of *Crinum*.

The plants have a tendency to become defoliated in late summer and early fall when the scape begins to elongate and the umbel commences to expand. Often there are as many as a dozen, large, attractive pinkish-white flowers in the umbel of each scape. An occasional scape may appear in the spring, but most of them are produced in the fall.

The clump is located in half-shade under the branches of a black walnut tree. No special effort has been made to provide additional water or nutrients other than that received by the adjacent lawn and nearby plants of the Cape Belladonna, *Brunvigia rosea.—Thomas W. Whitaker.*

TWO NEW DIPLOID DAYLILIES

Hamilton P. Traub, *California*

THE 'MARY BEVERLEY' DAYLILY

On July 13 the writer visited Dr. Thomas W. Whitaker of La Jolla, California, and he had the opportunity of seeing for the first time one of the most spectacular diploid daylily hybrids produced by Dr. Whitaker. The outstanding characters of this clone are (a) the very large fragrant, sunfast Canary Yellow (2/1) self colored flowers which were unfaded at 4 p. m. when the writer saw them (they should be even better in the East and North); and (b) the fact that the clone is recurrent in blooming habit. The first blooms were produced in early summer and now in the middle of July the second flush of bloom had appeared.

The clone is tall and there are up to 20 or more flowers per scape. The tepaltube is one inch long; the petsegs 6 inches long, 1⅞ inch wide; the setsegs are 5½ inches long, 1½ inch wide. When the tepalsegs are spread out the flower is 7½ inches across the face of the flower, but the tepalsegs are slightly recurved and thus it is actually 6½ inches across as it appears on the plant.

The clone has been named 'Mary Beverley' (Whitaker, 1959) for Mrs. Thomas W. Whitaker (Mrs. Mary S. Whitaker). The clone will be distributed in due course.

THE 'EMPIRE YELLOW' DAYLILY

On August 24, 1956, Prof. Ira S. Nelson and the writer visited the home of Dr. Thomas W. Whitaker at La Jolla, Calif., and were both

charmed with a new daylily in bloom in his garden. The plant is tall, making a vigorous clump. The well-branched scapes each have up to 30 or more flowers which are fragrant, sunfast Empire Yellow (603) selfs. The perigone is wide open—5 inches across the face. The margins of the tepalsegs are ruffled and they are somewhat reflexed. The tepaltube is 2.5 cm. long. The setsegs are 9.5 cm. long, 3.4 cm. wide; the petsegs 10 cm. long, 5 cm. wide. The plant is recurrent blooming at La Jolla, Calif. *Hemerocallis* clone 'Empire Yellow' (Whitaker, 1959).

THE 'GEORGE GILMER' DIPLOID DAYLILY

HAMILTON P. TRAUB, *California*

The writer has reduced the extent of his efforts to breed diploid daylilies but he is still attempting to breed diploids with greater resistance to adverse weather conditions—heat, drying winds, etc. Up to the present some fine yellows in this class have been obtained. The most

Fig. 2. Diploid daylily hybrid—clone 'George Gilmer' (Traub, 1959), rich saffron yellow, refined in form.

notable of these (Fig. 2) is the one that has been named in honor of Mr. George Gilmer of Charlottesville, Virginia. It has been tested for a number of years here at La Jolla, California, and at Charlottesville, Virginia. The color is a rich saffron yellow self (HCC 7 to 7/1). The color is different but in general habit it can be contrasted with 'High Noon' (indian yellow HCC 6). 'George Gilmer' has a more refined flower.

The description of the 'George Gilmer' daylily follows:

Plant 28″ or more tall; 36 or more flowers per scape; pedicels

6-7 mm. long; flowers wide open, 6½″ or more across face, tepalsegs slightly creped and distinctly ruffled on the margins, refined thick texture; delightfully fragrant, flower color sunfast, a rich saffron yellow self (HCC 7 to 7/1), setsegs elliptic, 4½″ or more long, 1½ or more wide, apex acutish to roundish; petsegs obovate, 4¼″ or more long, 2½″ or more wide, apex rounded; style rather slender, about 3—3.8 cm. shorter than petsegs, stigma small, whitish; stamens rather slender, 1—1.8 cm. shorter than the style; anthers grayish before opening, 7 mm. long, pollen orange yellow. Evergreen, recurrent blooming in California from June to October; fair propagator.

SOME OUTSTANDING DAYLILIES, 1958

GEORGE GILMER, *Virginia*

If you miss a favorite breeder of your pet plants please remember that with some 700 new hemerocallis a year I am only able to try about one in 20 and of over 50 active breeders I can sample the product of but a few. By careful selection I get about 80% of the award winners and those rated most popular.

Few varieties are not surpassed in five years and scarcely any are at the top ten years after introduction. An exception is 'Judge Orr' introduced in 1939. I know of no better early variety. It is my first in the spring. It has good color and fragrance. Its size and shape are not to be compared with midseason varieties. I know nothing as good within three weeks of the time it starts. It has a full second crop beginning in September and lasting until killed by freezing weather in November.

'California' and 'Richard' both introduced by Norton in 1948 are among my best late bloomers. 'Valesca' (Craig) is valuable for its lateness.

I wish more breeders would work for good early and late bloomers, those that repeat and to extend the life of the individual bloom. Flowers on some new varieties cover twice as long period as those of thirty years ago. But it is still a long way before they have a flowering season as long as their cousins the Amaryllis or roses and iris.

A white hemerocallis is much sought. Many of the palest have wilted and curled in the sun. 'Silver Sails' (Connell) holds up well and is nearest to white I have seen. 'Marguerite Fuller' (Kraus) 'Powder Puff' (Lester) and 'Evelyn Russell' (Russell) are three good light yellow.

'Pink Dream' (Childs 1951) was the best pink I knew seven years ago. 'Lyric' (Childs 1955) is far better. 'Evelyn Claar' (Kraus) is the pink highest in the popularity poll. It is one of the best. Other good pinks are 'Daffu' and 'Tootie' (Claar), 'Coral Mist' and 'Imperial Blush' (Hall), 'Ruth Lehman', 'Nina Rebman', 'Elegy' (Kraus) are melon pinks with yellow. 'Bon Bon', 'Cara Mia', 'Picture' and 'Garden Sprite' (Lester) are good. 'Mystic Pink', 'Pink Ruffles' and 'Alice Russell' (Russell), (the last is a melon pink and one of the loveliest I have seen), are all good.

'Adelaid Nieland', 'Crinoline', 'Flirtation Pink', 'Gallantry' (Taylor) are among the best pinks.

'Neyron Rose' (Kraus), 'Cherokee Rose' and 'Lilibet' (Lester) are tops in the rose class. 'Sunset Sky', 'Salmon Sheen', and 'Vision' (Taylor) and 'Fairy Wings' (Lester) are good pink and yellow blends.

Lavender is being developed in 'Selena Bass' and 'Quincy' (Taylor). But the outstanding one, 'Captain Russell' is a bicolor with wide light lavender petals and narrow cream sepals. It is the most distinctive daylily I have seen. It catches the eye from a distance and is lovely close-up.

The purest red in my garden is 'Citation' (Taylor). It repeats.

Fig. 3. *Hemerocallis washingtonia,* the tetraploid daylily—clone 'Wyndham Hayward' (Traub, 1959), brilliant tangerine orange (HCC-9/1) with reddish eye-zone.

Other good reds are 'Harriet Mann' (Taylor), 'Courage', 'Polished Jewell' (Craig), 'Addred' (Culpepper), 'Fairbow', 'Woodrose' (Kraus), 'Black Friar' and 'Revelry' (Lester), 'Black Absolute', best dark red (Milliken), 'Garnet Robe' (Milliken).

Flory is putting out some fine new ones. 'Florence Clary' should replace 'Jesse Shambough'. 'Frans Hals' is an improvement on 'Monteray', and 'Mollie Gloye' is a great advance over 'Gay Lark.'

At the Washington, D. C., regional meeting I was most impressed by 'Chetco', 'President Rice' and 'Bess Ross.'

This article is just one man's opinion about the best Hemerocallis. For an excellent list of 100 best daylilies see Hemerocallis Journal 1958 year book issue page 130.

THE 'WYNDHAM HAYWARD' TETRAPLOID DAYLILY

HAMILTON P. TRAUB, *California*

The diploid *Hemerocallis* clone 'E. W. Yandre' was treated with colchicine and thus the tetraploid, 'Tetra Yandre' (1958) was obtained a few years ago. This clone was selfed and 27 seedlings were obtained. The color of the flowers of these selfs ranged from tangerine orange to lighter orange and yellow, all with reddish eye-zones. One of these was particularly outstanding (Fig. 3) and it was named for Mr. Wyndham Hayward, the originator of the original diploid clone 'E. W. Yandre', which represented a land mark in the development of the hybrid diploid daylilies. It has particularly wide tepalsegs.

The description of *Hemerocallis washingtonia* clone 'Wyndham Hayward' follows:

Plant 18″ or higher; 12 or more flowers per scape, bracts greenish-whitish, aerial offsets sparingly formed; flowers almost sessile, wide open, 6½ to 7 inches across face, spicely fragrant; color near brilliant tangerine orange (HCC 9/1), with bright reddish eye-zone on petsegs, and very faint zone on setsegs; tepalsegs creped, margin ruffled; tepaltube 1.6 cm. long, 1.1 cm. in diam.; setsegs narrowly elliptic, 4″ (10.2 cm.) long, 1½″ (3.8 cm.) wide, apex acute; petsegs elliptic 4½″ (11 cm.) long, 2⅛″ (5.4 cm.) wide, apex acutish; style 2 cm. shorter than petsegs; stamens 3 cm. shorter than style; anthers grayish before opening, pollen orange yellow. Evergreen, recurrent blooming. Holotype: No. 631 (TRA), *Hemerocallis washingtonia* clone 'Wyndham Hayward', 6-1-58. La Jolla, Calif.

OLD AMARYLLIS CLONES

WYNDHAM HAYWARD, *Florida*

Old-time Hybrid *Amaryllis* clones have been unfortunately of short and fleeting life, with the possible exception of two or three forms, which are still in cultivation after a varying number of years:—*Amaryllis* x *johnsonii, Amaryllis* x *acramanii* and *Amaryllis* 'Mrs. Garfield.'

Amaryllis x *johnsonii* was described by the author in a previous HERBERTIA (1951-p. 38-40) and illustrated there from plants collected in Louisiana gardens where the bulb is known as ST. JOSEPH'S LILY. It is found scatteringly over the South from Texas to Florida, growing in established gardens, seldom or never naturalized, but giving good results under a minimum of cultural care and attention.

There is some doubt today that the clone, type or form of *Amaryllis* x *johnsonii* found in Southern gardens is identical with the original as produced and distributed throughout Europe in the early 1800's, supposedly a hybrid of *Amaryllis reginae* and *A. vittata,* from the hand of a Lancashire watchmaker named Johnson. Plates of the plant appeared in several places in the early 1800's, as *johnsonii* (plate 1 in Mrs. Bury's "Hexandrian Plants", a famous color plate book), Redoute's "Les

Liliacees'', as *A. brasiliensis* (plate 469) and as *A. carnarvonia* in Al de Candolle's ''Pl. Rar. Hort. Genev.'' plate 9. (see Fig. 4 of present article.)

Fig. 4. *Amaryllis* x *johnsonii* (syn.—*Amaryllis* x *carnarvonia* A. C. de Candolle). Reproduced from Pl. Rar. Hort. Genev. Plate 9. 1799.

Amaryllis x *acramanii* is likewise available today from the firm of Van Tubergen in Holland. The author has grown this variety from

Van Tubergen bulbs for several seasons. In the Van Tubergen catalogue for 1955 *Amaryllis* x *acramanii (A. aulica* x *A. johnsonii)* is described as follows: "nearly hardy deep crimson-red, funnel-shaped flowers in summer."

Baker in his "Handbook of the Amarylleae" 1888, lists *acramanii* on page 53 under the "forms nearest *aulicum*". He also cites a form, *A. acramanii pulcherrima,* originally described in 1850.

As bloomed in Florida for several years, the Van Tubergen bulbs of *Amaryllis* x *acramanii* grow easily, in either pot culture in the lath house or in the sandy loam of the garden in full sun.

Weathers in "The Bulb Book", says (page 277) of *acramanii* that "the color is crimson . . . the variety *pulcherrima* is figured in Moore. Bot. Mag. 1850, ii, 5; 'Chelsoni' (another named variety of the same type) in Floral Mag. t. 545, and other forms in same publication N. S. tt. 77, 167, 347 and 369."

The above would indicate the general and comparative popularity of the *acramanii* form in the middle 19th century. This can be explained when one considers the Van Tubergen statement "nearly hardy", which would doubtless mean it could be grown in the South of England outdoors "against a south wall" or with other similar protection in winter. Also it must be considered that the fine large-flowered hybrids with wide spreading tepalsegs which evolved from *Amaryllis Leopoldii* had not yet come.

Dean William Herbert makes no mention of *Amaryllis* x *acramanii* in his "Amaryllidaceae (1837) but cites a similar cross, which he calls *spofforthiae,* an "aulico-carnarvoni" cross (page 144) named from his parish seat, adding "not yet blown!" From this we can see that the custom of naming a flower before it came into bloom was a habit with early hybridizers.

It should be remembered that the early horticulturists had the usage of naming their hybrids with Latinized endings.

The Van Tubergen *acramanii* has handsome light green foliage, which goes dormant in late summer. The variety blooms in July faithfully in Florida, as it should, from its purported ancestry (a cross of spring- and fall-blooming types) *Amaryllis aulica* is the fall-blooming species, also available from Van Tubergen. It blooms in Florida in November and December, but has not demonstrated the garden stamina or staying power in the author's experience that *acramanii* has shown. The bulbs of *acramanii* outside and under lath, give an offset or two every two years, and would doubtless multiply into a good clump with proper care.

After several attempts at selfing, the *acramanii* seems completely sterile to its own pollen. Sometimes the seed pods swell, but they invariably shrivel and dry without forming seed to its own pollen. However, in the summer of 1955, one bulb of 'Shakespeare', a vivid oriental red to bright crimson Dutch variety (Ludwig & Co.,) happened to throw an out-of season bloom spike in mid-July when a second scape of

Amaryllis acramanii was in flower, too. Pollen of this 'Shakespeare', a fine modern, Dutch hybrid wide-petaled "self" of vigorous character, was applied on the two flowers of *acramanii* and they set seed. At least fifty or more seed were harvested from the mature pods in six weeks, and are being planted with care and trepidation.

This may be the first crossing of Amaryllis *acramanii* with a good type of modern named *Amaryllis* hybrid in the present century. The seedlings will be watched as it may mean a new race of summer blooming hybrids. Never previously has there been pollen from ordinary spring-blooming hybrid *Amaryllis* available in mid-July or early August to use on *acramanii.* The seed pods were large, of typical hybrid *Amaryllis* form, wide and flat, not long or slender. The development of a summer blooming line of *Amaryllis* with hybrid vigor and possibly improved hardiness to cold, is a dream to be followed closely.

Supporting the writer's experience, Herbert wrote (page 371): nine very fine crosses of *Amaryllis* "were flowering there at the same time . . . being desirous of blending again these plants which were all crossbred, different flowers were touched with pollen from their several neighbors and ticketed, and other flowers touched with their own pollen. Almost every flower that was touched with pollen from another cross produced seed abundantly, and those which were touched with their own, either failed entirely or formed slowly a pod of inferior size with fewer seeds." These crosses had *reginae, vittata, johnsonii, psittacina* and *elegans* blood in them.

The flowers of *acramanii* turn upwards at a slight angle, like those of *A. aulica.* They resemble aulica closely, but the time of blooming definitely separates them. The flower is long and tubular much like *johnsonii.*

In "Hortus Veitchii", a famous publication (1906) of the plants introduced and hybrids created by Veitch & Co., outstanding in English *Amaryllis* annals as introducer of *A. leopoldii,* which was found by their explorer Pearce in Peru, appear the following lines regarding *johnsonii:*

"A remarkable fact in connection with this hybrid, is the length of time it retained its character under cultivation and its potentiality with other species and varieties when used as a breeder, influencing the offspring to a great extent. . . . Amongst many hybrids . . . one may be singled out as of more importance than the rest. This received the name of *acramanii.*" (It was the result of a cross by Messrs. Garraway and Sons of Bristol in 1835 between *A. aulica var. platypetala* and *A. psittacina).* "It was named *acramanii* in compliment to G. Acraman, Esq., of Bristol."

"This was undoubtedly the finest hybrid yet raised, but a few years later was eclipsed by a seedling of the same firm, flowered in 1850, from *A. aulica* crossed with the hybrid *johnsonii,* and named *acramanii pulcherrima,* from a resemblance to the original hybrid."

The third veteran *Amaryllis* clone still available in the trade from Van Tubergen and for some curious reason, from Indian nurseries as well, is the fall-blooming *Amaryllis reticulata* var. *striatifolia* hybrid named 'Mrs. Garfield.' Henry Nehrling showed another *A. reticulata*

hybrid in his book "Die Amaryllis" 1908, named 'Anna Jay', a fall-blooming clone like the parent.

This variety 'Mrs. Garfield' and the natural type of *A. reticulata* var. *striatifola* have the prominent white stripe or midrib of the leaves, a variety which M. B. Foster has collected in the wild in South America, and which will to some extent perpetuate itself in seedlings. The flowers are netted lavender on lighter background, and are very charming. Culture is difficult, in the author's experience in the open or under lath house conditions in Florida, but Foster finds it succeeds well and multiplies under glass.

H. F. MacMillan, in his popular classic of the warm climate horticulturist, "Tropical Planting and Gardening", London 1948, etc., depicts a handsome plant of the hybrid *Amaryllis* clone 'Mrs. Garfield' on page 132, and comments: "a distinct and exceptionally fine variety." The illustration shows the striped leaves characteristic of the form. For some unknown reason this variety has found the Indian climate suited to its needs and is sold in quantity by several nurseries there. In Florida the growth has been too slow and unthrifty outside to be satisfactory, but this may be due to cold damage to the bulbs in winter. Under glass they do not suffer this extreme of temperature outside which suits *acramanii* perfectly.

ZEPHYRANTHES X RUTHIAE

Hamilton P. Traub, *California*

In 1958 Herbertia (page 55), Dr. Thad Howard of San Antonio, Texas, described a fine clone, 'Ruth Page' selected from the progeny of the cross, *Zephyranthes rosea* ♀ and *Z. citrina* ♂. A picture of this excellent clone was received too late for inclusion with the registration in the 1958 edition, and it is reproduced in the present issue (Fig. 16).

In the writer's garden at La Jolla, Calif., *Z. rosea* died out after a few years showing that the soil conditions, including the water applied, are lethal for it here. *Zephyranthes citrina* does quite well. The hybrid, as represented by the clone 'Ruth Page', however is a more vigorous, excellent garden plant here, increasing rapidly by offsets, like its seed parent, *Z. rosea,* and giving a showing of its beautiful pink blooms several times a year. This is a clear case of heterosis or hybrid vigor in which the particular combination of genes has given a plant which can withstand the soil conditions here that are lethal for one of its parents. If this should happen in nature, it would explain how two species by hybridization could produce a new species which might extend the range of a genus. The clone has been given an Award of Merit by the American Amaryllis Society, August 2, 1958.

Since this hybrid, as represented by the clone 'Ruth Page' will be widely grown due to its fine qualities, it is being named, *Z.* x *ruthiae,* in honor of Mrs. Ruth Page.

Zephyranthes x ruthiae Traub, **hybr. nov.**

Planta hybrida inter Z. critinam ♀ et Z. roseam ♂ parentibus intermermediis, floribus roseis.

HOLOTYPE: Traub No. 630 (TRA), cult. La Jolla, Calif., by H. P. Traub, clone 'Ruth Page'.

THE USE OF GLYCEROL IN HERBARIUM PRACTICE

Glycerol (trihydroxypropane, $C_3H_8O_3$), sometimes called glycerin, has a very great many uses. Leffingwell & Lesser (1945) list no less than 1583 uses. Carolina Biological Supply Co. (1957) recommend it for use in the drying of herbarium specimens. They point out that it is safe for use in this connection except that it must not be placed in contact with strong oxidizing agents such as potassium trioxide, potassium chlorate or potassium permanganate because this may produce an explosion. It absorbs moisture from the air, and is used therefore as a humectant. It is miscible in water, and because of its capacity for absorbing moisture it may be used as a drying agent.

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Leffingwell, G, and K. Lesser. Glycerin. Brooklyn, N. Y. 1945.

CANCER INHIBITING SUBSTANCES FROM AMARYLLIDS

According to Dr. D. B. Fitzgerald of the National Cancer Institute, Bethesda, Maryland, a number of substances have been isolated from genera of the Amaryllis Family which possess the ability to inhibit the growth of cancer cells. It is interesting to note in this connection, that early herbalists maintained that *Narcissus* possesses value in the treatment of tumors. (See Fitzgerald et al, Jour. Nat'l Cancer Inst. *20:* 763-774. 1958.)

DIPLOID HEMEROCALLIS HYBRID—'Junipero Serra'

Plant 32" tall; flower spicely fragrant; a blend, setsegs maize yellow, HCC-607, petsegs cadmium orange HCC-8 to 8/1; very faint reddish eye zone; petsegs creped, margins ruffled; sunfast and rainfast; heavy flower substance. Recurrent blooming. —*Hamilton P. Traub*

TETRAPLOID DAYLILY—'REV. TRAUB'

The plant of this clone is up to 25" tall; up to 12 flowers per scape; evergreen; recurrent blooming. Flowers are up to 7" wide, thick substance, wide open, brilliant silky cadmium orange self (HCC 8), 38 vivid orange DCN; fragrant.—*Hamilton P. Traub*

HYBRIDS IN THE TRIBE ZEPHYRANTHEAE

HAMILTON P. TRAUB, *California*

Under date of Oct. 18, 1958, Dr. P. Maheshwari, of the University of Delhi, India, writes that "Two of my students have worked on the embryology of what appears to be *Cooperia pedunculata.* Since their findings and those of Dr. Coe (1953) on *Cooperia pedunculata* are quite different, it is possible that there is some error in identification. I am sending you bulbs and herbarium specimens of the plant and shall be grateful if you could identify."

When the herbarium specimens and bulbs arrived on Dec. 20, 1958, it was possible to compare the specimens (given Traub Herbarium No. 632) with those of *Zephyranthes drummondii* D. Don (syn.—*Z. pedunculata* Herb.) which showed that No. 632 is definitely not *Zephyranthes pedunculata* Herb. (=*Z. drummondii* D. Don), but belongs to *Zephyranthes* x *lancasteri* Traub (syn.—X *Cooperanthes rosea* Percy-Lancaster), one of the hybrids made by Mr. Sydney Percy-Lancaster at Alipore near Calcutta, India, in the early years of the present century.

This concrete case showed the necessity of putting the nomenclature (including typification) of such hybrids on a firm basis so that research in embryology and other disciplines involving material of this kind may be given the desired scientific precision in order to avoid misapplication of the results.

It should also be noted in this connection that hybrids of this nature are being grown more and more as garden plants thus making it necessary to apply the correct names to avoid confusion.

The first hybrid of this kind, *Zephyranthes* x *spofforthiana* Herb. (in Bot. Reg. Lond. pl. 1746.; Baker Amaryll. 32. 1888) was reported by Herbert. *Zephyranthes* x *ajax,* a cross between *Z.* candida and *Z. citrina,* was reported in Gartenflora, plate 1469. 1899. This was followed by the report of Lancaster (1912-1913) including *Zephyranthes* crosses and also *Zephyranthes-Habranthus* crosses. One *Habranthus* hybrid has been recorded (Traub, 1951). Recently Howard (1959) reported on a *Zephyranthes* cross, and Traub (1958) described *Zephyranthes-Habranthus, Rhodophiala,* and *Habranthus-Rhodophiala* crosses.

PARENT STOCK USED BY PERCY-LANCASTER

In the early part of the present century, the *Amaryllidaceae* were relatively neglected by taxonomists, and the nomenclature was sometimes in a deplorable state. Thus it is necessary to examine the statements about the stock that Lancaster (1912-1913) used in his crosses. In the following presentation, the correct nomenclature is first given. This is followed in each case by the original description as reported by Percy-Lancaster, and the interpretation of this by the present writer.

1. ZEPHYRANTHES DRUMMONDII D. Don (in Sweet, Brit. Fl. Gard. Ser. II. pl. 328, Mr. 1. 1836); syn.—*Cooperia pedunculata* Herb. (in Amaryll. 179, pl. 42, fig. 3. 1837).

LANCASTER'S DESCRIPTION.—"*Cooperia drummondii* [=*Zephyranthes drummondii* D. Don] has primrose-scented flowers, perfectly up-

right in growth, white in color, which open in the afternoon; the foliage is ¼ inch to ½ inch wide [6—13 cm. wide], covered with a whitish bloom. The anthers are pressed close around the style below the stigma, which is large, the perianth tube is 3 inches [7.6 cm.] long."

NOTES.—The relatively wide leaves with a whitish bloom indicate that this is apparently *Z. drummondii* D. Don (syn.—Cooperia pedunculata Herb.) as indicated above, and not *Cooperia drummondii* Herb. (=*Z. brazosensis* Traub).

2. ZEPHYRANTHES BRAZOSENSIS Traub (in Plant Life 7: 42. 1951), syn.—*Cooperia drummondii* Herb. (in Bot. Reg. Lond. pl. 1835. 1836); *Cooperia oberwetteri* Lancaster, in Jour. Roy. Hort. Soc. 38: 532. 1912-1913 (err. *C. oberwetti).*

LANCASTER DESCRIPTION.—Following the description quoted under No. 1, above, he states: "In *C. oberwetti* [*Zephyranthes brazosensis*] the foliage is narrower than *C. drummondii* [*Zephyranthes drummondii* D. Don], and has less bloom."

NOTES.—Since the leaves of *Zephyranthes brazosensis* (syn.—*Cooperia drummondii* Herb.) has narrower leaves with less bloom, this apparently belongs to that species. The name *Cooperia oberwetteri* (err. *oberwetti)* proposed by Lancaster is thus superfluous and a synonym of *Zephyranthes brazosensis.*

3. ZEPHYRANTHES GRANDIFLORA Lindl. This is indicated as the synonym *"Z. carinata"* which is to be attributed to "Spreng."

4. ZEPHYRANTHES CITRINA Baker. This is indicated as *"Z. citrina."*

5. ZEPHYRANTHES TREATIAE S. Wats. This is indicated as *"Z. treatiae."*

6. HABRANTHUS ROBUSTUS Herb. (syn.—*Zephyranthes robusta* (Herb.) Baker). This is indicated as *"Z. robusta."*

7. HABRANTHUS ANDERSONII Herb. ex Lindl. (syn.—*Zephyranthes andersonii* (Herb.) Baker). This is indicated as *"Z. andersonii."*

NOTES.—If Lancaster obtained his stock from Texas, then this apparently would be *Habranthus andersonii* var. texanus Herb., or *H. texanus* (Herb.) Steud., depending on the viewpoint of the particular taxonomic worker.

PERCY-LANCASTER HYBRID ZEPHYRANTHES

Lancaster included all of his hybrids under the name, X *Cooperanthes,* under the assumption that they were all crosses between *Zephyranthes* and *Cooperia.* But we now know that some of his crosses involved *Habranthus robustus* and *H. andersonii.* Since *Zephyranthes* and *Cooperia* grade into one another in nature, and they cross with fertile offspring, *Cooperia* has been united with *Zephyranthes* (Jones, 1957). Thus the *Zephyranthes* hybrids have to be separated from the *Zephyranthes-Habranthus* hybrids, and in this process, the name X *Cooperanthes,* derived from parts of the two generic names, "Cooper + anthes", becomes a synonym of the genus *Zephyranthes.*

The *Zephryanthes* hybrids will be included here; the *Zephyranthes-Habranthus* hybrids will be included in a separate section below.

8. ZEPHYRANTHES x LANCASTERI Traub, in Plant Life 10: 46. 1954; syn.—X *Cooperanthes rosea* Lancaster, in Jour. Roy. Hort. Soc. 38: 531. 1912-1913.

LANCASTER'S DESCRIPTION.—"*Cooperia drummondii* [=*Zephyranthes drummondii* D. Don] ♀ x *Zephyranthes carinata* [=*Z. grandiflora*) ♂]. "A strong-growing plant; flower scape 12 inches (30.1 cm.) high; flower larger than *Z. robusta* [=*Habranthus robustus*] pale-green centre, pale pinky-purple above, going off into deeper colour at the edges [lectotypus]".

9. ZEPHYRANTHES x BLANDA (Lancaster) Traub, in Plant Life 10: 46-47. 1954. Syn.—X *Cooperanthes blanda* Lancaster, in Jour. Roy. Hort. Soc. 38: 531. 1912-1913.

LANCASTER'S DESCRIPTION.—"*Cooperia oberwetti* [=*Zephyranthes brazosensis* Traub] ♀ x *Zephyranthes treatiae* ♂—A small flower, white, flushed pinky-purple, base apple-green; flower-stalk green, reddish base. The flower closes early the first day, but opens a second day; seed capsule like *Cooperia* [subgenus *Cooperia*]." (Lectotypus).

10. ZEPHYRANTHES x PERCYI Traub, in Plant Life 10: 47. 1954. Syn.—X *Cooperanthes* clone 'Percy' (Lancaster), in Jour. Roy. Hort. Soc. 38: 532. 1912-1913; X *Cooperanthes* clone 'Sydney', l. c. (reverse cross).

LANCASTER'S DESCRIPTION.—*(Zephyranthes citrina* ♀ x *Cooperia drummondii* [*Zephyranthes drummondii* D. Don] ♂).—Foliage like [subgenus] *Cooperia,* ⅛ inch [1.3 cm.] wide, with a faint tinge of bloom; flower-stalk 8 inches [20 cm.], base pale red; perianth tube short, pale green; ovary green; pistil suppressed; colour of flower pale cream, centre slightly deeper; flower nodding like *Zephyranthes."* (Lectotypus).

NOTES.—Reverse cross: clone 'Sydney'; "In foliage like *Cooperia drummondii* [=Zephyranthes drummondii D. Don], covered with a heavy bloom, ¼ inch [1.9 cm.] wide; flower-stalk 8 inches [20 cm.], green, base reddish; flower like *C. drummondii* [=Zephyranthes drummondii D. Don], pale sulphur in colour, fading to a creamy-white in the sun, but keeping open for a second day; flower upright like [subgenus] *Cooperia;* perianth tube 3½ inches [8.9 cm.] long." (clone 'Sydney', lectotypus).

OTHER HYBRID ZEPHYRANTHES

11. ZEPHYRANTHES x SPOFFORTHIANA Herb. (in Bot. Reg. Lond. 1746.; Baker, Amaryll. 32. 1888).—*Zephyranthes puertoricensis* x *Z. grandiflora.*

12. ZEPHYRANTHES x AJAX (in Gartenflora, plate 1469. 1899).—*Z. candida* x *Z. citrina.*

13. ZEPHYRANTHES x RUTHIAE Traub, in Plant Life 15: 36. 1958; Howard, in Plant Life 15: 85-86. 1959.—*Z. rosea* x *Z. citrina.*

13a. *Zephyranthes drummondii* D. Don ♀ x *Z. pulchella* J. G. Smith ♂. Cross made by Fred B. Smith; Plant Life 13: 86-87. 1957.

HABRANTHUS HYBRID

One cross within the genus *Habranthus* has been reported.

14. HABRANTHUS x FLORYI Traub, in Plant Life 7: 121-122, fig. 23. 1951.—*Habranthus brachyandrus* ♀ x *H. robustus* ♂.

BI-GENERIC HYBRIDS, X SYDNEYA

The *Zephyranthes-Habranthus* crosses formerly included in X *Cooperanthes* belong under X *Sydneya* Traub (in Plant Life 10: 47. 1954). The Lancaster hybrids and one additional hybrid are listed below.

15. X SYDNEYA LANCASTRAE (Lancaster) Traub, in Plant Life 10: 47. 1954; syn.—X *Cooperanthes lancastrae* Lancaster, in Jour. Roy. Hort. Soc. 38: 531. 1912-1913; clone 'Alipore Beauty' (Lancaster), l. c. 532.

LANCASTER DESCRIPTION.—"*(Cooperia oberwetti* [=*Zephyranthes brazosensis*] ♀ x *Zephyranthes robusta* [=*Habranthus robustus*] ♂).—similar to the above [=No. 8, above in the present article] but much more robust, with stout flower-stalks; ovary brownish-green, centre of flower apple-green, yellowish-white above, going off into pinkish lilac; flower larger than above [=No. 8, above in the present article]". (Lectotypus).

NOTES.—Description of clone 'Alipore Beauty' (Lancaster):—"In foliage like *Zephyranthes robusta* [=*Habranthus robustus*], ¼ inch [6 mm.] wide, with a faint tinge of bloom; flower-stalk 8 inches [30 cm.], base pale red; perianth tube short, pale green; ovary green; pistil suppressed; colour of flower pale cream, centre slightly deeper; flower nodding like *Zephyranthes.*" [clone 'Alipore Beauty' (Lancaster), lecto typus].

16. X SYDNEYA BELLA (Lancaster) Traub, *comb. nov.* Syn.—X Cooperanthes *bella* Lancaster, in Jour. Roy. Hort. Soc. 38: 531. 1912-1913; clone 'Mary' (Lancaster), l. c. 532.

LANCASTER DESCRIPTION.—"*(Cooperia drummondii* [=*Zephyranthes drummondii* D. Don] ♀ x *Zephyranthes robusta* [=*Habranthus robustus*] ♂).—A strong grower; flower-stalk like *Z. robusta* [=*Habranthus robustus*] on emerging above ground, dull green; flower-bud white, tipped pink at apex and edges of petals; colour soft rose, outside of petals deeper pink. The flower opens late in afternoon and is faintly scented like [subgenus] *Cooperia.*" (Lectotypus).

NOTES.—Description of clone 'Mary' (Lancaster):—"In foliage like *Cooperia drummondii* [=*Zephyranthes drummondii* D. Don], covered with a heavy bloom, ¼ inch [6 mm.] wide; flower-stalk 8 inches [20 cm.] high, base brownish-green; the flower is the size of *Cooperia drummondii* [=*Zephyranthes drummondii* D. Don], only a delicate flesh-pink; perianth tube 2½ inches [6.4 cm.] long; pistil suppressed; flower upright like [subgenus] *Cooperia.*" [clone 'Mary' (Lancaster), lectotypus].

17. X SYDNEYA INDIA Traub, in Plant Life 10: 47. 1954. Syn.—X *Cooperanthes* clone 'Sunset' (Lancaster), in Jour. Roy. Hort. Soc. 38: 531. 1912-1913.

LANCASTER DESCRIPTION.—"*Cooperia drummondii* [*Zephyranthes drummondii* D. Don] ♀ x *Zephyranthes andersonii* [=*Habranthus andersonii* ♂].—This flower is a small-sized [member of subgenus] *Cooperia;* inside copper and yellow; habit of [subgenus] *Cooperia.*" (Lectotypus).

18. X SYDNEYA CASTELLANOSII Traub, in Plant Life 14: 50. 1958.—*Zephyranthes grandiflora* ♀ x *Habranthus juncifolius* ♂.

RHODOPHIALA HYBRID

One cross within the genus *Rhodophiala* has been reported.

19. RHODOPHIALA X LAJOLLA Traub, in Plant Life 14: 47-48. 1958.—*Rhodophiala bifida* ♀ x *R. chilensis* ♂.

BI-GENERIC HYBRID, X RHODOBRANTHUS

One hybrid of this nature has been reported.

20. X RHODOBRANTHUS WOELFLEANUS Traub, in Plant Life 14: 48-49. 1958.—*Rhodophiala bifida* ♀ x *Habranthus juncifolius* ♂.

CONCLUSIONS

The published results show that *Cooperia* crosses with *Zephyranthes,* the latter crosses with *Habranthus* which in turn crosses with *Rhodophiala.* Thus the facts prove conclusively that the genera *Zephyranthes* (including *Cooperia), Habranthus* and *Rhodophiala* belong together in the tribe *Zephyrantheae.*

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REGISTRATION OF NEW AMARYLLID CLONES

Registrar: Mr. W. D. Morton, Jr.

This department has been included since 1934 to provide a place for the registration of names of cultivated *Amaryllis* and other amaryllids. The procedure is in harmony with the INTERNATIONAL CODE OF BOTANICAL NOMENCLATURE (edition publ. 1956) 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 ob-

tained at $2.50 prepaid from: Dr. Thos. W. Whitaker, Executive Secy, THE AMERICAN PLANT LIFE SOCIETY, Box 150, La Jolla, Calif. A catalog of Amaryllis names, and also a catalog of the names of other cultivated amaryllids, is scheduled for publication in 1960 HERBERTIA.

Only registered clones of Amaryllis and other amaryllids are eligible for awards and honors of the AMERICAN AMARYLLIS SOCIETY. Numbers of registered clones are preceded by a prefix, an abbreviation for the genus concerned. Thus, A-390, the "A" standing for *Amaryllis;* Z-1, the "Z" standing for *Zephyranthes,* etc.

Correspondence regarding registration of all amaryllids such as *Amaryllis, Lycoris, Brunsvigia, Clivia, Crinum, Hymenocallis,* and so on, should be addressed to: Mr. W. D. Morton, Jr., Registrar, 3114 State Street Drive, New Orleans 25, Louisiana. The registration fee is $2.00 for each clone to be registered. Make checks payable to AMERICAN PLANT LIFE SOCIETY.

HYBRID AMARYLLIS CLONES

Introduced by Ludwig & Co., Hillegom, Netherlands:

'American Express' (Ludwig), Reg. No. A-421, 8-1-58. D-5a; scape 26-28"; fl. 8" diam.; oriental red (somewhat lighter than HCC-819), darker throat with violet-red reflection, lighter red stamens; 4 fls. per scape. Spring.

'Apple Blossom' (Ludwig), Reg. No. A-422, 8-1-58. D-5b; scape 22"; fl. 8" diam.; white with dawn pink (HCC-523), lower segs are lighter shade, stamens white, throat faintly greenish with dark red ring; 4—5 fls. per scape. Deciduous. Spring.

'Attraction' (Ludwig), syn.-'Red Radiance', PL. 14: 55. 1958, red. No. A-457, 8-1-58. D-5b; scape 28-30"; fl. 7½" diam.; capsicum red (HCC-715), darker in throat; 4 fls per scape. Deciduous. Spring.

'Blazing Star' (Ludwig), Reg. No. A-463, 9-15-58; D-5a; scape 22"; fl. 9½" diam.; dark vermilion red (slightly darker than Dutch vermilion HCC-717), darker throat: 4 fls per scape. Deciduous. Spring.

'Bouquet' (Ludwig), reg. No. A-424, 8-1-58; scape 25-28"; D-5a; fl. 8½-9" diam.; general effect is a fine salmon, begonia rose (HCC-619 to 619/2) with throat and stamens deeper empire rose (HCC-0621); 4 fls per scape. Deciduous. Spring.

'Bridesmaid' (Ludwig), reg. No. A423, 8-1-58, scape 22-24"; D-5b; fl. 7½" diam.; pure white with light greenish tinge in throat. 3—4 fls per scape. Deciduous. Spring.

'Brilliant' (Ludwig), reg. no. A-425, 8-1-58; scape 23-24"; D-5a; fl. 8½" diam.; vivid signal red (darker than HCC-719) with glossy dark red throat; 4 fls per scape. Deciduous. Spring.

'Candy Cane' (Ludwig), reg. no. A-426, 8-1-58; scape 26-28"; D-5a; fl. 8—9" diam.; segs are white-edged, with a white band in center, and bright capsicum red (HCC-715/3) bands between the white; stamens white. Deciduous. Spring.

'Champion's Reward' (Ludwig), reg. no. A-427, 8-1-58; scape 26-28"; D-5a, fl. 9" diam.; vivid oriental red (HCC-819) with deep glossy throat; rounded flower, segs recurvate, back of segs colored; 4 fls per scape. Deciduous. Spring.

'Cardinal' (Ludwig), reg. no. A-464, 9-15-58; scape 22-24"; D-5a; fls 8" diam.; dark oxblood red (HCC-820) with very dark currant red throat; 4 fls per scape. Spring.

'Daintiness' (Ludwig), reg. no. A-428, 8-1-58; scape 24"; D-5b; fls 8" diam.; very fine porcelain rose (HCC-620) with crimson rose (22/2) towards center of segs, throat veined soft green, stamens porcelain rose; deciduous, spring.

'Delilah' (Ludwig), reg. no. A-429, 8-1-58; scape 25"; D-5a; fls. 8" diam.; fine begonia pink (salmon) (HCC-619) with darker shading into throat; rounded blooms; 4 fls per scape. Deciduous. Spring.

'Diamond' (Ludwig), reg. no. A-430, 8-1-58; scape 25"; D-5a; fls 8½" to 9" diam.; fine geranium red (HCC-20) with dark purple red throat, inner segs slightly fringed and bearded; 4 fls per scape. Deciduous. Spring.

'Doris Lilian' (Ludwig), reg. no. A-431, 8-1-58; scape 26-28"; D-5b; fls 7½" diam.; carmine rose (HCC-21), lower segs and tips somewhat lighter (21/1), throat dark glossy carmine red; 4 fls per scape. Deciduous. Spring.

'Fantasy' (Ludwig), reg. no. A-432, 8-1-58; scape 25"; D-5a; fls 7½" diam.; delft rose (HCC-020) with faint rose stripe on segs, tips almost white to very light rose; stripes change to apple green toward center, and deeper rose in throat, with faint red ring; stamens white; 4 fls per scape. Deciduous. Spring.

'Fire Dance' (Ludwig), reg. no. A-465, 9-15-58; scape 24"; D-5a; fls 9½ to 10" diam.; Dutch vermilion (Approx. HCC-717), with dark violet red throat; very flat; 4 fls per scape. Deciduous. Spring.

'Fire Fly' (Ludwig), reg. no. A-469; 1958; scape 16"; D-gracilis type; fls. 4" diam.; clear capsicum red (HCC-715) with darker throat; 4-6 fls per scape. Deciduous. Spring.

'Five Star General' (Ludwig), reg. no. A-434, 8-1-58; scape 28-30"; D-5a; fls 9-10" diam.; signal red (HCC-719), white star center, dark red ring in throat; 4 fls per scape; deciduous, spring.

'Franklin Roosevelt' (Ludwig), reg. no. A-433, 8-1-58; scape 25"; D-5b; fls 7½" diam.; currant red (HCC-821), upper segs somewhat deeper red than lower, faint stripe in center of segs, very dark red in throat; stamens blood red; 4 fls to scape. Deciduous. Spring.

'Halley' (Ludwig), reg. no. A-435, 8-1-58; scape 25"; D-5b; fls lively poppy red (HCC-16), which is an orange red, with very dark throat, and dark stamens, segs veined a darker shade; fls flat; 4 fls per scape. Deciduous. Spring.

'Helen' (Ludwig), reg. no. A-436, 8-1-58; scape 26-28"; D-5b; fls 8" diam.; begonia pink (HCC-619 to 619/1), light carmine-rosy stripe in center of segs, and veined dark red; white ring in throat; stamens rosy red; 4—5 fls per scape. Deciduous. Spring.

'Invincible' (Ludwig), reg. no. A-437, 8-1-58; scape 24-28"; D-5a; fls 8" diam.; fine capsicum red (HCC-715) with dark red throat; 4 fls per scape. Spring.

'Liberty Hyde Bailey' (Ludwig), reg. no. A-466, 9-15-58; scape 24-26" diam.; D-5a; clear oriental red (almost HCC-819), self; 4 fls per scape. Deciduous. Spring.

'Little Sweetheart' (Ludwig), reg. no. A-470, 1958; D-gracilis type; fls 4" diam.; salmon-red with soft greenish-white star-like throat outlined with darker red streaks; 4—5 fls per scape. Deciduous. Spring.

'Love's Desire' (Ludwig), reg. no. A-438, 8-1-58; scape 24-26"; D-5a; fls 8½-9" diam.; coral pink (HCC-0619) and porcelain rose (620), with reddish stripes in center of segs, throat light greenish-white; 4 fls per scape. Deciduous. Spring.

'Lucky Strike' (Ludwig), reg. no. A-443, 8-1-58; scape 24"; D-5a; oriental red (HCC-819) with dark ox-blood red throat; 3—4 fls per scape deciduous; deciduous, spring.

'Ludwig's Dazzler' (Ludwig), red. no. A-439, 8-1-58; scape 26"; D-5a; fls 8½" diam.; pure white with nearly white throat; 4 fls per scape; deciduous; spring.

'Ludwig's Goliath' (Ludwig), reg. no. A-442, 8-1-58; scape 24-25"; dark orient red (HCC-819), and deeper throat; 4 fls per scape; deciduous; spring.

'Ludwig's It' (Ludwig), reg. no. A-467, 9-15-58; scape 26-30"; D-5a; fls 10" diam.; dark blood red (darker than HCC-820), currant red (821) throat, fls flat; deciduous; spring.

'Ludwig's Masterpiece' (Ludwig), reg. no. A-440, 8-1-58; scape 28-30"; D-5a; fls 8" diam.; dark Dutch vermilion (darker than HCC-717), deeper throat; 4-5 fls per scape; deciduous, spring.

'Ludwig Scarlet' (Ludwig), reg. no. A-441, 8-1-58; scape 25"; D-5a; fls 7½" diam.; dark blood red (HCC-820) darker in throat, inner segs slightly bearded; 4 fls per scape; deciduous; spring.

'Margaret Rose' (Ludwig), reg. no. A-444, 8-1-58; scape 26-28"; D-5a; shrimp red (HCC-616/3) striped, halo of mandarin red (17/1) on upper segs, begonia rose on lower; throat light mandarin red; stamens soft rose; fls flat; 4 fls per scape; deciduous; spring.

'Maria Goretti' (Ludwig), reg. no. A-445, 8-1-58; scape 24"; D-5b; fls 8-9" diam.; pure white, with apple green throat; 4 fls per scape; deciduous; spring.

'Miss Margaret Truman' (Ludwig), reg. no. A-446, 8-1-58; scape 26-28"; D-5a; fls 8" diam.; porcelain rose (HCC-620) with camellia rose (622) reflection; throat dark rose; 4 fls per scape; deciduous, spring.

'Mothersday' (Ludwig), reg. no. A-447, 8-1-58; scape 28-30"; D-5a; fls 8½ to 9" diam.; mandarin red (HCC-17) with violet reflection toward center; throat dark red; 3-4 fls per scape; deciduous; spring.

'Nivalis' (Ludwig), reg. no. 448, 8-1-58; scape 22-24"; D-5b; pure white with faint greenish throat; 3—4 fls per scape; deciduous; spring. Award of Merit, American Amaryllis Society, 1952.

'Peacefulness' (Ludwig), reg. no. A-449, 8-1-58; scape 28-30"; D-5a; fls 8" diam.; blood red (HCC-830), carmine glow and dark red throat; 3—4 fls per scape; deciduous; spring.

'Picture' (Ludwig), reg. no. 471, 1958; scape 16-18"; D-gracilis type; fls 4" diam.; orient red (HCC-819) with white star, and light red throat; 4 fls per scape; deciduous, spring.

'Pink Favorite' (Ludwig), reg. no. 450, 8-1-58; scape 28-30"; D-5b; fls 9" diam.; camellia rose (HCC-622), tips of segs lighter rose (622/2), darker throat; 3-4 fls per scape; deciduous; spring.

'Pink Perfection' (Ludwig), reg. no. A-451, 8-1-58; scape 24-28"; D-5a; fls 8" diam.; opal rose (HCC-022), seg tips lighter carmine rose (021/2); 4 fls per scape; deciduous; spring.

'Pinksterflower' (Ludwig), reg. no. A-452, 8-1-58; scape 25-27"; D-5a; fls 8" diam.; azalea pink (HCC-618) with poppy red reflection, throat camellia rose; 4-5 fls per scape; deciduous; spring.

'Rossini' (Ludwig), reg. no. A-454, 8-1-58; scape 24-26"; D-5a; fls 7½" diam.; carmine rose (HCC-21) with neyron rose (023) seg tips, darker carmine rose in throat; 2—3 fls per scape; deciduous; spring.

'Salmon Joy' (Ludwig), reg. no. 445, 8-1-58; scape 28-30"; D-5a; fls 8½" diam.; soft mandarin red (HCC-17/1) which is salmon-orange; throat dark red; 3—4 fls per scape; deciduous; spring.

'Shakespeare' (Ludwig), reg. no. A456, 8-1-58; scape 25-27"; D-5a; fls 8" diam.; glowing dark orient red (HCC-819), dark red throat; stamens light vermilion red; 4 fls per scape; deciduous; spring.

'Silver Lining' (Ludwig), reg. no. A-458, 8-1-58; scape 28"; D-5a; fls 9-10" diam.; red and white striped, segs white-edged, white star in center, dark red ring in throat; 4-5 fls per scape; deciduous; spring.

'Siren' (Ludwig), reg. no. A-459, 8-1-58; scape 27"; D-5a; fls 8-9" diam.; beautiful salmon rose, violet-shaded, with a lighter streak in the center of the segs; 4 fls per scape; deciduous; spring.

'Traffic Stop' (Ludwig), reg. no. 468, 9-15-58; scape 24-26"; D-5a; fls 8½" diam.; clear capsicum red (HCC-715) with slightly darker throat; 4 fls per scape; deciduous, spring.

'White Giant' (Ludwig), reg. no. 460, 8-1-58; scape 22-24"; D-5a; fls 9" diam.; pure glistening white of heavy substance; light greenish throat; 3—4 fls per scape; deciduous; spring.

'Winter Joy' (Ludwig), reg. no. A-461, 8-1-58; scape 23"; fls 8-9" diam.; vermilion red, with dark red throat; 4 fls per scape; deciduous; free-flowering; spring.

'Wyndham Hayward' (Ludwig), reg. no. A-462, 8-1-58; scape 28-30"; D-5a; fls 8½-9" diam.; dark oriental red (HCC-819), with dark blood red throat, contrasting with the lighter red stamens; 4 fls per scape; deciduous; spring.

Introduced by W. S. Warmenhoven, Hillegom (P. J. Komen, Anna Paulowna) Holland:

'Anna Paulowna' (Warmenhoven), reg. No. A-492. Glistening light salmon red with deep red throat; scape 26"; 8" across face.

'Beacon' (Warmenhoven), reg. No. A-493; introduced 1954. Deep frosty salmon with clear well defined ¾" band of glistening white down center of each tepalseg; scape 26"; 10" cross face.

'Beau Joliat' (Warmenhoven), reg. no. A-494. Rosy red; scape 22", 3½" across face.

'Bordeaux' (Warmenhoven), reg. no. 495. Clear light orange-scarlet blending to deep scarlet in throat; scape 28"; 10" across face.

'Cherokee' (Warmenhoven, 1954), reg. no. A-496. Clear sparkling metallic red with orange cast; scape 26"; 8" across face.

'Christmas Joy' (Warmenhoven), reg. no. A-497. Red; scape 24"; 3½" across face.

'Flower Record' (Warmenhoven), reg. no. A-516. Deep scarlet; scape 23"; 3" across face.

'Joan of Arc' (Warmenhoven), reg. no. A-498. Pure glistening white with green in throat; scape 24"; 7½" across face.

'King of Stripes' (Warmenhoven), reg. no. A-499. Frosty pale pink to white with two broad undefined lines of carmine (shading to vermilion in throat) on each tepalseg; scape 24"; 5" across face.

'Leading Lady' (Warmenhoven), reg. no. A-500. Wide open pure white with green throat; scape 20"; 7" across face.

'Lucifer' (Warmenhoven), reg. no. A-501. Medium dark red of great substance; scape 19"; 8" across face.

'Moreno' (Warmenhoven), reg. no. A-502. Medium dark red with slight tinge of rose in throat; scape 26"; 8" across face.

'Mount Tacoma' (Warmenhoven), reg. no. A-503. Pure white with faint green tinge in throat; scape 24"; 7" across face.

'Mysterie' (Warmenhoven), reg. no. A-504. Rose red blending to deep red in throat, midribs and tips of tepalsegs are rose; scape 20"; 7" across face.

'Orange King' (Warmenhoven), reg. no. A-505. Light red; scape 18"; 8" across face.

'Prince of Orange' (Warmenhoven), reg. no. A-506. Orange, blending to scarlet deep in throat; scape 19"; 8" across face.

'Queen of Whites' (Warmenhoven), reg. no. A-507. Glistening waxy-white with faint tint of green in throat; scape 25"; 9" across face; blooms flat with slight curve at tips.

'Queen's Page' (Warmenhoven), reg. no. A-508. Clear salmon orange; scape 20"; 8" across face.

'Salmonette' (Warmenhoven), reg. no. A-509. Clear salmon with deeper salmon throat; scape 24"; 8" across face.

'Scarlet Beauty' (Warmenhoven), reg. no. A-510. Scarlet blending to medium red; dark red in throat; possesses glistening velvety sheen; scape 24½"; 9" across face.

'Scarlet Triumph' (Warmenhoven), reg. no. A-511. Clear scarlet, approaching nearly to light red, leathery substance; scape 24"; 10" across face.

'Star of Bethlehem' (Warmenhoven), reg. no. A-512. Salmon pink with white toward margins, forming a star; scape 24"; 3½" across face.

'Striped Beauty' (Warmenhoven), reg. no. A-513. White with orange-scarlet bands that cover large part of tepalseg giving the appearance of a white border; scape 20"; 6" across face.

'Sweet Seventeen' (Warmenhoven), reg. no. A-514. Frosty salmon rose on white, flesh pink in throat; scape 20"; 9" across face.

'Violetta' (Warmenhoven), reg. no. A-515. Medium to deep rose with a light rose throat, and light rose midribs; scape 22"; 8" across face.

Introduced by M. Van Waveren & Sons, Leeuwenstein Nurseries, Hillegom, Holland:

'Clown' (Van Waveren), reg. no. A-406. Basic color white, with white stripe down center of tepalsegs, remaining part of tepalsegs marked with vivid red veins; scape 22-26"; 8-9" across face.

'Fulda' (Van Waveren), reg. no. A-407. Orange-scarlet; 3—4 blooms to 26-28" scapes; 9—10" across face.

'House of Orange' (Van Waveren), reg. no. A-408. Rare attractive flaming orange; scapes 26-28" tall; 3—5 flowers per scape; 8" across face.

'Kathleen Ferrier' (Van Waveren), reg. no. A-393. Pure white with creamy throat; scapes 26-28" tall; flowers 8—10" across face.

'Modern Times' (Van Waveren), reg. no. A-396. Deep blood red self; scapes 26-28" tall; flowers 8—10" across face.

'Morning Kiss' (Van Waveren), reg. no. A-409. Salmon pink; scapes 26-28" tall; flowers wide-open, 8—10" across face.

'Northern Queen' (Van Waveren), reg. no. A-410. Salmon-orange, slightly tinged carmine-red toward center of tepalsegs; outside pure salmon rose with white streak; scapes 26-28" tall; flowers 8—10" across face.

'Queen of Scarlets' (Van Waveren), reg. no. A-411. Brilliant scarlet; scape 24" tall; 4—5 flowers per scape; flowers 8" across face.

'Red Champion' (Van Waveren), reg. no. A-412. Deep brilliant red; scape 22" tall; 4 flowers per scape; flowers 8—9" across face.

'Red Guard' (Van Waveren), reg. no. A-413. Deep scarlet; scape 24" tall; 4—5 flowers per scape; flowers 9" across face.

'Red Lion (Van Waveren), reg. no. A-414. Dark red; scape 22" tall; 4 flowers per scape; flowers 8" across face.

'Rose Queen' (Van Waveren), reg. no. A-415. Old rose color slightly darker in throat; scape 24" tall; 3-4 flowers per scape; flowers 8" across face.

'Royal Velvet' (Van Waveren), reg. no. A-394. Warm deep red to purple; scapes 22-24" tall; flowers 8" across face.

'Salmon Beauty' (Van Waveren), reg. no. A-395. Salmon pink self; scapes 18-24" tall; 4 flowers per scape; flowers 8" across face.

'Salmon Giant' (Van Waveren), reg. no. A-416. Coppery salmon pink; scapes 26-28" tall; regular-shaped flowers, 8—10" across face.

'Salmonea' (Van Waveren), reg. no. A-417. Delicate light pink; scapes 22-24" tall; 4 flowers per scape; flowers 8—9" across face.

'Scarlet Leader' (Van Waveren), reg. no. A-418. Deep scarlet red with darker red spot deep in throat; trumpet-shaped; scapes 26-28" tall; 4 flowers per scape; flowers 8—10" across face.

'Scarlet Pimpernel' (Van Waveren), reg. no. A-419. Pure scarlet self; scape 26" tall; 4 flowers per scape; flowers 8—9" across face, rounded in shape.

'Senator Wallace' (Van Waveren), reg. no. A-420. Rose, shaded white; scapes 24" tall; 4 flowers to scape; flowers 8" across face.

'White Abundance' (Van Waveren), reg. no. A-397. Pure white, throat at first slightly greenish turning to pure white; scape 26" tall; 4 flowers to scape; flowers 8" across face.

Introduced by G. C. Van Meeuwen & Zonen, Heemstede, Holland:

'Albino' (Van Meeuwen, 1948), reg. no. A-517. Pure white; scape 22" tall; flower length 5"; 7" across face.

'Alcyone' (Van Meeuwen, 1952), reg. no. A-518. Deep dark red; scape 22" tall; flower length 5"; 7" across face.

'Camelia' (Van Meeuwen, 1953), reg. no. A-519. Salmon rose, partially double; scape 24" tall; flower length 4"; 8" across face.

'Cleopatra' (Van Meeuwen, 1953), reg. no. A-520. Pure salmon; scape 20" tall; flower length 5"; 7" across face.

'Fabiola' (Van Meeuwen, 1953), reg. no. A-521. Bright red; scape 24" tall; flower length 5½"; 8" across face.

'Faust' (Van Meeuwen, 1949), reg. no. A-522. Shiny Dutch vermilion; scape 32" tall; flower length 5½"; 8" across face.

'Friendship' (Van Meeuwen, 1956), reg. no. A-523. Salmon with a white glow; scape 28" tall; flower length 5"; 7" across face.

'Giant Goliath' (Van Meeuwen, 1953), reg. no. A-524. Deep vermilion; scape 28" tall; flower length 6"; 9" across face.

'Julia' (Van Meeuwen, 1950), reg. no. A-525. Orange red; scape 24" tall; flower length 5"; 7½" across face.

'King Gustav VI' (Van Meeuwen, 1956), reg. no. A-526. Bright red; scape 32" tall; flower length 6"; 8" across face; named in the presence of His Majesty, the King of Sweden.

'Purple Queen' (Van Meeuwen, 1949), reg. no. A-527. Dark red to purple; scape 22" tall; flower length 5½"; 7" across face.

'Queen of Sheba' (Van Meeuwen, 1958), reg. no. A-528. Pink with a camellia pink cast; darker in throat; scape 24" tall; flower length 5½"; 7" across face.

'Queen Superiora' (Van Meeuwen, 1948), reg. no. A-529. Dark red; scape 22" tall; flower length 5½"; 7" across face.

'Queen of the Pinks' (Van Meeuwen, 1957), reg. no. A-530. Soft camellia pink; scape 24" tall; flower length 5½"; 7" across face.

'Queen Rose' (Van Meeuwen, 1949), reg. no. A-531. Light red to rose white, star in center; scape 22" tall; flower length 5"; 7" across face.

'Tristan' (Van Meeuwen, 1955), reg. no. A-532. Dark purple red; scape 24" tall; flower length 6"; 8" across face.

'Valendam' (Van Meeuwen, 1956), reg. no. A-533. White edged rose pink; scape 22" tall; 7" across face.

"White Christmas' (Van Meeuwen, 1956), reg. no. A-534. Pure white even in throat; scape 24" tall; flower length 5½"; 8" across face.

'Zenith' (Van Meeuwen, 1956), reg. no. A-535. Three lower tepalsegs (setsegs) white; three upper tepalsegs (petsegs) deep dark rose changing to white in center; scape 24" tall; flower 5½"; 8" across face.

'Gracilis Boegschoten' (Van Meeuwen, 1946), reg. no. A-536. Red; scape 18" tall; flower length 3"; 2-3" across face.

Introduced by S. P. Gasperez, 1219 Short St., New Orleans, La.

Correction, Plant Life 1958, page 54, for 'Amita' read 'Anita'.

HYBRID BRUNSVIGIA CLONES

Registered by L. S. Hannibal, Fair Oaks, Calif.

Small offsets from several *Crinum* and *Brunsvigia* hybrids were received from G. K. Cowlishaw some ten years ago. These plants had been registered with the Royal Horticultural Society of New South Wales. Due to the slow growth of the bulbs and erratic flowering habits complete descriptions have been delayed until the fall of 1958.

The hybrid *Brunsvigia* clones are later generation hybrids obtained in Australia and elsewhere between the Cape Belladonna, *Brunsvigia rosea* and *Brunsvigia grandiflora, B. josephinae* and possibly other *Brunsvigia* species.

Brunsvigia x multiflora clone 'Betty Cowlishaw'. This is a well formed *B. x multiflora alba* type of plant with radial umbel. The tepalsegs are well reflexed, and medium wide, lance tipped and slightly ruffled. Our Australian friends have never had much success with *B. x multiflora* 'Hathor' as a seed parent due to high summer humidities, and consequently have experienced many more difficulties in producing wide seged white multifloras than the breeders in California. As a consequence this hybrid represents top achievement for 1948 Australian standards, but has been surpassed since. B-1.

Brunsvigia x multiflora clone 'Sunset'. The umbel to this plant exhibits a dozen or more medium-small well reflexed flowers arranged in a radial pattern. The throats are a deep yellow on the interior and copper red on the exterior. The tepalsegs are a rich pink with a *B. x parkeri* type of bright pink eye near the tip of each tepalseg. This plant is typical of throwbacks to the original *Eubrunsvigia* parentage employed by J. C. Bidwell. Colors are not as vivid or as deep as L. S. Hannibal's 'Stormy Sunset' series but the floral shapes and pattern of the G. K. Cowlishaw plant show a close relationship to the latter. B-2.

HYBRID CRINUM CLONE

Registered by L. S. Hannibal, Fair Oaks, Calif.

Crinum clone 'George Harwood': An H. B. Bradley seedling which first flowered after Bradleys death. The plant appears to be a Powellii type of hybrid, being a cross of *C. moorei* on a red flowered form of C. bulbispermum. The foliage is typically *C. moorei* in type, being some four feet long. Scape erect, 40 inches in length. Flowers about 12, large, chalice shaped, a deep wine red not unlike the color of *C. x* 'Ellen Bosanquet'. C-1.

Typical of *C. moorei* the plant requires shade. Offsets form quite slowly and the plant does not flower until these are fully matured. G. K. Cowlishaw reports that it was only by chance that these bulbs were saved since the Sydney bridge now crosses the land where Bradley had his garden.

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.]

Narcissus cantabricus var. *petunioides* A. Fernandes, Kew Bull. 381. 1958.—Bulb ovate, 2 cm. long, 1.3 cm. wide, surrounded by brownish tunics; leaves 3 or 4, semiterete, twisted, generally recurved, up to 30 cm. long, long-attenuate at the base, longer than the scape; scape cylindric, about 15 cm. long, twisted and therefore more or less curved; spathe sheath-like at the base, scarious, pale-brown, about 3 cm. long; flower oblique, the pedicel about 5 mm. long; perigonium white, bright-yellow in drying, about 3.3 cm. long, the segments 5—6 mm. wide at the base, subequaling the corona; corona about 12 mm. long, resembling the corolla of *Petunia*, crenate along the margin; stamens and style long-exserted.

It is related to var. *kesticus*, from which it differs in its 3 or 4 twisted and recurved (not 2 erect) leaves, its shortly pedicellate flowers which are white (not greenish-white), its broader segments, and especially in the Petunia-like corona.

Latace R. A. Phil., Anal. Univ. Chil. 93: 274. 1896.—Plants bulbous, scape-bearing; flowers umbellate, included by a diphyllous spathe; perigonium monophyllous hypogynous, divided about the middle into six reflexed lobes as in *Hyacinthus orientalis;* stamens arising from the throat, three sterile, cylindric, thickened, exactly as in *Leucocoryne*, the three others fertile, exserted, with filiform filaments and linear anthers dehiscing longitudinally; ovary subglobose; style elongate; stigma simple.—Close to Leucocoryne, differing in the short tube of the perigonium, the exserted stamens, and the elongate style. I have paid respects to the plant in the name.

Latace volkmannii R. A. Phil. l. c.—Bulb about the size of a hazelnut, that is, with a diameter of 13 mm., covered by bright-brown membranes, the interior ones showing clearly the veins of the aborted leaves which come to a point. There are 2 normal green leaves about 1.25 mm. wide. Their length cannot be determined because their end is frayed. The scape is 22 cm. in length and 1.75 mm. wide. The spathe is white, scarious, about 8 mm. long, ovate. The umbel is composed of 7 flowers, whose pedicels are very delicate and of unequal length, the longest being 18 mm. long. The perigonium, whose color is not known, is 8 mm. long; the diameter of the tube is 2.25 mm. The segments are lanceolate and 6 mm. long when fully extended. The fertile stamens are a little shorter than the segments, while the sterile ones are half as long. The style is 4 mm. long.—The plant was collected

by the late Volkmann in the summer of 1861-1862 in the Cordillera of Doña Rosa, in the province of Coquimbo.

J. D. Hooker writes me that Mr. Baker, to whom he sent one of my sketches of a flower of *Latace,* thinks that it is only a species of *Nothoscordum* (in spite of the monophyllous perigonium!), which I believe few botanists will agree with except those who unite the genera *Leucocoryne* and *Nothoscordum* into one genus.

Leucocoryne montana R. A. Phil. l. c. 269.—Leaves linear, narrow, 3 mm. wide, obtuse; scape 4-flowered; peduncle elongate; perigonium 30 mm. long, narrowly tubular; segments of the limb white, narrow, 3 mm. wide, slightly surpassing the tube in length; sterile stamens yellow, narrow, half as long as the segments.—Found on the mountain Campana de Quillota by Augustus Borchers in the year 1884.—The scape measures at least 20 cm. in height, the spathe 28 mm., the peduncles eventually 55 mm. long; the diameter of the perigonium is 3 cm.—There are 2 described species with a much smaller number of flowers than are found in the umbel of *L. alliacea* (Gay VI, p. 123).

Leucocoryne narcissoides R. A. Phil. l. c. 271.—Scape 2-flowered; segments of the perigonium-limb spreading, lanceolate, much surpassing the tube in length; sterile stamens cylindric, short, scarcely half as long as the tube.—Found above the valley Cachinal de la Sierra, lat. 26°4′, at an altitude of 2000 feet.—The scape is 2-flowered; the segments of the perigonium are wide-spreading, lanceolate, much longer than the tube; the sterile stamens are cylindric, nearly half the length of the tube.

Leucocoryne pauciflora R. A. Phil. l. c. 269-270.—Leaves and spathe narrowly linear; umbel 2-/or 3-flowered; peduncles short, equaling the perigonium-tube which is 9 mm. long; segments of the limb ovate-lanceolate; sterile stamens yellowish, half as long as the segments.—Found near Montenegro, not far from Santiago, in October, 1884, by Augustus Borchers.—I have seen three specimens, all alike. The bulb is covered with reddish membranes as in *L. ixioides,* and of the same size. The scape attains a length of 23 cm. There are 3 leaves whose width is almost 1.5 mm. the spathes are to 23 mm. long, the peduncles 10 mm. The capsule is much smaller than that of *L. ixioides,* which is 16 mm. in length and 5 mm. in width; in *pauciflora* it is only 9 mm. long and 4 mm. wide.

Leucocoryne exypetala R. A. Phil. l. c. 270.—Spathe reflexed?; umbels 3—6-flowered; peduncles equalling or surpassing the perigonium-tube; segments of the perigonium narrow, somewhat acuminate; sterile anthers scarcely one-third as long as the segments, attenuate at the base.—Found at Pabellon, near Copiapŏ, by Francisco San Ramon, Caldera. I have seen six specimens, which have all their spathes reflexed. The peduncles attain a length of 22 mm., the tube of the perigonium 8.5 mm., the segments are 15 mm. long and 5 mm. wide; the sterile anthers are 4 mm. long. The form of the perigonium segments is very specific.

Leucocoryne appendiculata R. A. Phil. l. c. 270-271.—Spathe 1-flowered (or few-flowered?), equaling the pedicel; segments of the perigonium ovate-lanceolate, the inner ones slightly smaller than and the outer ones twice as long as the tube; stalk of the sterile anthers about one-third as long as the segment, cylindric, filamentous at the apex.—Bulb collected near Caldera by Paul Ortega and is said to flower in the beginning of September.—The bulb cannot be distinguished from that of *L. ixioides.* There are 3 leaves, opposite the scape, linear, barely 3 mm. wide, fleshy, somewhat fluted above and somewhat keeled beneath, shorter than the scape. The scape is 20 cm. tall, sturdy. The 2 spathes are equal and 35 mm. long, green, only membranous at the tip. The tube of the perigonium is 13 mm. long, its larger segments 26 mm. long, the smaller ones 23 mm.; the width is 10 mm. The sterile anthers are 7.5 mm. long and their appendage barely 1 mm. long.

Leucocoryne violascens R. A. Phil. l. c. 271.—Leaves and spathe narrowly linear (as in the remainder); umbels about 6-flowered; peduncle 2 or 3 times as long as the tube of the perigonium; segments of the perigonium white or pale-violet, after drying deep violet, lanceolate, long-acuminate; sterile stamens one-third as long as the segments.—Collected near Colina in October, 1887.—The bulb is not different from that of *L. odorata.* The scape attains a length of 45 cm. The leaves are practically the same length, 3 mm. wide, odorless. The leaflets of the spathe

are narrow, the same length as the peduncles which are 20—30 mm. long. The tube of the perigonium attains a length of 10 mm. and is at length nigrescent, the segments are 24 mm. long and 6 mm. wide. It is peculiar that the very white perigonium turns a marked violet on drying. The narrow form of the perigonium segments which end very gradually in a very large point distinguishes quite well this species and approaches that of *L. oxypetala.*

Leucocoryne foetida R. A. Phil. l. c. 272. —Giving off very strongly the odor of onions; leaves and spathe narrowly linear; umbels 3—5-flowered; peduncles 13 mm. long, equaling the tube of the perigonium; segments of the perigonium white or pale-violet, ovate-lanceolate, acuminate, 29 mm. long, 9—10 mm. wide; sterile stamens pale-reddish, about one-fourth or one-fifth as long as the segments, filiform.—Frequent near Quilpué, a village not far from Valparaiso.—The bulb is about half the size of that of *L. odorata,* which aside from this fact appears very much like it. The scape is only 25 to 30 cm. long and is purple at the base; the leaves are almost the same length as the scape and are 2 mm. wide. The spathes are as long as the peduncles. The flowers maintain their color in drying. The juice has the odor of garlic and therefore is much stronger than that in *L. alliacea.* Our species is distinguished from *L. ixioides* and *L. odorata* by the smaller number of flowers in the umbel, from *L. montana* by the shortness of the peduncles, and from *L. pauciflora* by the shortness of the sterile stamens.

Leucocoryne incrassata R. A. Phil. l. c. 272-273.—Umbel about 7-flowered; pedicles longer than the tube of the perigonium, unequal; segments of the perigonium oblong-lanceolate, equaling the 11 mm. long tube; sterile stamens oblong, thick, about one-third as long as the segments.—Found near Vallenar in February, 1883, by Belisario Rojas.—The spathe measures about 30 mm. long, the pedicles about 2 to 4 cm. The sterile stamens are very much enlarged as in *L. macropetals,* in which the tube of the perigonium is short. This is a unique species in that it flowers at the end of summer; the others bloom in the spring.

Leucocoryne connivens R. A. Phil. l. c. 273.—Scape few-flowered; spathe equaling the pedicels; segments of the campanulate limb narrow, 16 mm. long, scarcely 5 mm. wide; sterile anthers connivent.—It grows near Talca.—A bulb brought from Talca has produced flowers in the botanical garden. It has 3 leaves, somewhat furrowed, to 2 mm. wide. The scape is 22 cm. long, bearing only 3 flowers, and like the leaves is a vivid green. The spathe is dry, purple at the base, the remainder mottled, 2 cm. long, practically the same length as the pedicels, which are unequal, one being shorter than the rest. The flowers are erect and odoriferous at night, drooping and odorless during the day. The tube is green, 10 mm. long, the limb campanulate, the segments are half as long as the tube, somewhat furrowed, white; the mid-nerve of the 3 outer ones is green. The sterile anthers are 9 mm. long.

Leucocoryne coquimbensis R. A. Phil. l. c. 273-274.—Leaves narrow, linear, equaling the scape or slightly surpassing it; umbel up to 5-flowered; bracts scarious, linear-subulate, equaling the perigonium-tube; segments of the hypocrateriform perigonium obliquely ascending and forming a funnel, violet-colored, oblong, rounded or acute, crenate or sublacerate, the throat white; staminodes thick, acute, yellow.—Collected near Coquimbo in September, 1893.—When first encountered this species was mistaken for *L. purpurea,* but it is distinct on account of the large size of the almost white perigonium and the yellow staminodes. The leaves are narrow, linear, and when fully developed surpass the scape, they are at least 28 cm. in length, 2 mm. wide, green. The sturdy scape is 2 mm. thick and is up to 35 mm. long; it produces an umbel of 2—5 flowers, protected by 2 scarious bracts, which are linear, pointed, and reach up to the middle of the perigonium. The pedicels are unequal, in the opened flower they are longer than its tube. The perigonium is of a violet color, with the base of the limb white and the tube greenish; the divisions of the limb are obliquely ascending, apparently joined together in a funnel, oblong, rounded or acute at the apex, the margin very slightly crisped, rarely also laciniate. The tube measures up to 11 mm. in length, the divisions 18 mm. long, and the diameter of the funnel up to 26 mm. in the larger flowers. The staminodes are yellow, conic, and measuring 4 mm. in length.

THE CHROMOSOMES OF THREE MEXICAN **HABRANTHUS** SPECIES *

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Habranthus has been considered as essentially a South American genus. The Texas *H. andersoni* var. *texanus* Herb. (or *H. texanus* Herb. ex Steud.) was long thought to be the lone North American representative, and there has been doubt as to its being indigenous (see Flory, 1938). The genus has been considered as being composed of species with either 12 or 24 comparatively large chromosomes; or, where numbers differed from these they could be attributed to known hybridity, or to aneuploiddy (Flory, 1948).

In recent years a number of amaryllidaceous species, several of them previously undescribed, have been collected in Mexico. Mrs. Morris W. Clint has been particularly active in collecting and studying these Mexican plants, and she is most generous in sharing her collections and information concerning them. Several of the recently collected Mexican taxa are apparently *Habranthus* species. The present paper is a report on the chromosome numbers of three of these Mexican species which are closely allied with and are now considered as belonging to *Habranthus.* Some other cytological observations are mentioned, and other pertinent considerations are treated briefly. It will be noted that the chromosome numbers of these species differ from those previously reported for others in the genus. A more complete karyotype analysis and phylogenetic treatment of all available *Habranthus* taxa is being given elsewhere (Flory and Flagg, 1958).

Habranthus immaculatus Traub and Clint (2n=22)

This species was first collected in the State of Guanajuanto, Mexico, in 1954, and was described in 1957 (Traub and Clint). The plants worked with here carry our No. 13162-55 and are Mrs. Clint's No. 610. The somatic chromosome number of the species is 22 (Plate 3, A). The following types may be distinguished:

4 long; median constrictions
4 slightly shorter, but long; submedian constrictions
6 medium length ones; submedian constrictions; and
8 short; submedian constrictions.

Of the last eight, two are shorter and more nearly median than the others.

The number is the same as found in many species of the family. The species of *Amaryllis,* for example, have 22, or higher multiples of eleven, chromosomes. In *Amaryllis,* however, the long chromosomes with median centromeres are not found, as a rule, and there are other differences (Ficker, 1951; Schmidhauser, 1954) from the chromosomes in the

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Chromosomes at somatic metaphase are shown for three *Habranthus* species. A. *Habranthus immaculatus*, 2n=22; B. *Habranthus concolor*, 2n=36; and C. *Habranthus* sp. (13462-56), 2n=108. All figures are camera-lucida drawings made at an initial magnification of ca. X2500, and reduced to approximately X1250 in reproduction.

Chromosomes in each of the three figures were shortened and spread by action of the following pretreatments for the indicated times: A. Colchicine, .2%, 6 hours; B. Paradichlorobenzene (saturated), 5½ hours; C. Colchicine, .2%, 3½ hours.

Plate 3

Habranthus immaculatus complement.

Habranthus concolor Lindl. (2n=36)

This species was originally described by Lindley in 1845. It was moved to *Hippeastrum* by Baker (1878), and later the same author (1888) transferred it to *Zephyranthes*. The plant was probably never in cultivation, and had not been collected for many years until Mrs. Clint reported it from several locations in the states of San Luis Potosi and Aguascalientes, Mexico (Clint, 1955). The accession number of the present plants is our No. 13183-54.

The present authors have not flowered this species. The two excellent specimens pressed and sent by Mrs. Clint for this study, have stamens of four slightly, but distinctly, different lengths and the stamens and style are fasciculate-declinate-ascending. The bulbs, the width of the leaves, and the whole general appearance of the plants would indicate this to be an *Habranthus* species. Both Mrs. Clint and Dr. H. P. Traub have indicated their belief that this should be placed in *Habranthus*. Because of the tangible and intangible character distinctions, and with the support of the two mentioned students of the group, we are considering this species as an *Habranthus*. The perigone usually is slightly declined, although an occasional erect perigone is suggestive of *Zephyranthes*.

Habranthus concolor has 36 somatic chromosomes. (Plate 3, B) They are made up of the following types:

4 long; median constrictions
4 long; submedian constrictions
4 medium; subterminal, approaching submedian
18 medium to short, graduated; submedian
6 short (2 shorter than others); median constrictions

Actually, as in the metaphase figure drawn (Plate 3, B), there may only be three of the long, median chromosomes—at least in some complements. Translocations may occur—to shorten some chromosomes and lengthen others—as apparently occurs in some other *Habranthus* species (Flory and Flagg, 1958). Since there are slight graduations among the longer chromosomes, it may be that further study will show the 12 longest to be made up of four groups of three each—rather than three groups of four each, as suggested above.

Most *Habranthus* species studied have one or two pairs of long chromosomes with median centromeres, and most *Zephyranthes* species have their longest chromosomes with submedian constrictions (but some, as *Z. pulchella* J. G. Smith and *Z. grandiflora* Lindl., have a pair with nearly median constrictions). Chromosome types of this species would, accordingly, be more suggestive of *Habranthus* than of *Zephyranthes*, but this evidence is not critical. The number would fit in with the most common euploid series (based on x=6) in both genera.

Habranthus sp. (2n=108)

The plants studied here carry our accession number 13462-56, and are from two bulbs received from Mrs. Clint (her No. 565-A), originally

collected from the Zimipan-Jacala area, Hidalgo, Mexico. These glaucous leaved plants produce white flowers and appear to be a new and undescribed species of *Habranthus.*

A typical somatic metaphase figure is drawn in Plate 3, C showing 108 chromosomes. Earlier counts for this species had indicated a somewhat lower number, but several unbroken cells with fairly well spread elements now show the higher count (2n=108) to be the correct one.

Long chromosomes with medium centromeres, long submedian ones, medium lengthed submedian ones, medium subterminal ones, and short chromosomes with median and with submedian centromeres are present here. The exact proportion of each has not been determined. It is apparent that there are fewer long chromosomes and more medium lengthed and short ones, and also that those with submedian centromeres are most prevalent in all groups. In other words, the types and the proportions of each type approximate those observed in other *Habranthus* species.

Summary

Somatic numbers, and brief descriptions, are given for the chromosomes of three Mexican species considered as belonging to the genus *Habranthus.* Two of these were recently collected for the first times: *H. immaculatus* having 22 chromosomes, and *Habranthus* sp. (No. 13462-56—undescribed) with 108 chromosomes. *Habranthus concolor,* first collected over a hundred years ago and long considered a species of *Zephyranthes,* has 36 somatic chromosomes. All three numbers are new to the genus. Chromosome types and general morphology are consistent, for the most part, with those encountered in other species of *Habranthus.*

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THE CHROMOSOMES OF **ZEPHYRANTHES INSULARUM, Z. PUERTORICENSIS** AND **Z. NERVOSA** *

W. S. Flory

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Traub (1958) recently brought considerable clarification to the confusion in nomenclature involving the three species listed in the title of this paper, as well as *Zephyranthes tubispatha* (L'Heritier) Herb. ex Traub, *Z. commersoniana* Herbert and *Habranthus robustus* Herbert ex Sweet. As Traub indicated, one source of evidence upon which he based his views was cytological data furnished by the present writer. A recent brief abstract mentioned the chromosome numbers involved (Flory, 1958a). The details of the cytological work are largely unpublished and are being presented here for the three species listed. Material of *Z. tubispatha* (L'Hert.) Herb. ex Traub and of *Z. commersoniana* Herbert has not been available. The chromosomes of *Habranthus robustus* have been described elsewhere (Flory, 1938; Flory and Flagg, 1958), and hence are only briefly mentioned in this paper for comparative purposes.

METHODS

All chromosome studies were made on mitotic divisions occurring in root tip cells. Excised root tips were treated from three to four hours in an aqueous solution of .2% colchicine. Following pretreatment the tips were fixed in 1:3 acetic-alcohol for about 24 hours, and then squashed in either aceto-carmine or acetic-orcein. Observations were made from these preparations and all drawings were made at an original magnification of X2500. The figure legends indicate the magnifications as reproduced.

Where pretreatment chemicals, such as colchicine, are used, varying degrees of chromosome contraction are encountered, sometimes within the same root tip. Shortening of the chromosomes following pretreatment makes for ease of counting and facilitates the observations of some details. It hinders the observation, however, of satellites, of constrictions, and of the most reliable comparison of the chromosome lengths of different taxa.

The ratio obtained by dividing the length of the short arm of a chromosome by its total length (S.A./T.L. ratio) has been used as a means of comparing chromosomes, or groups of chromosomes. This ratio gives the proportionate part that the short arm length is of the total length.

OBSERVATIONS

Zephyranthes insularum Hume ex Moldenke, 2n=28

This species was first described by Hume (1939) with Moldenke (1952) supplying the description in Latin. It has 28 somatic chromo-

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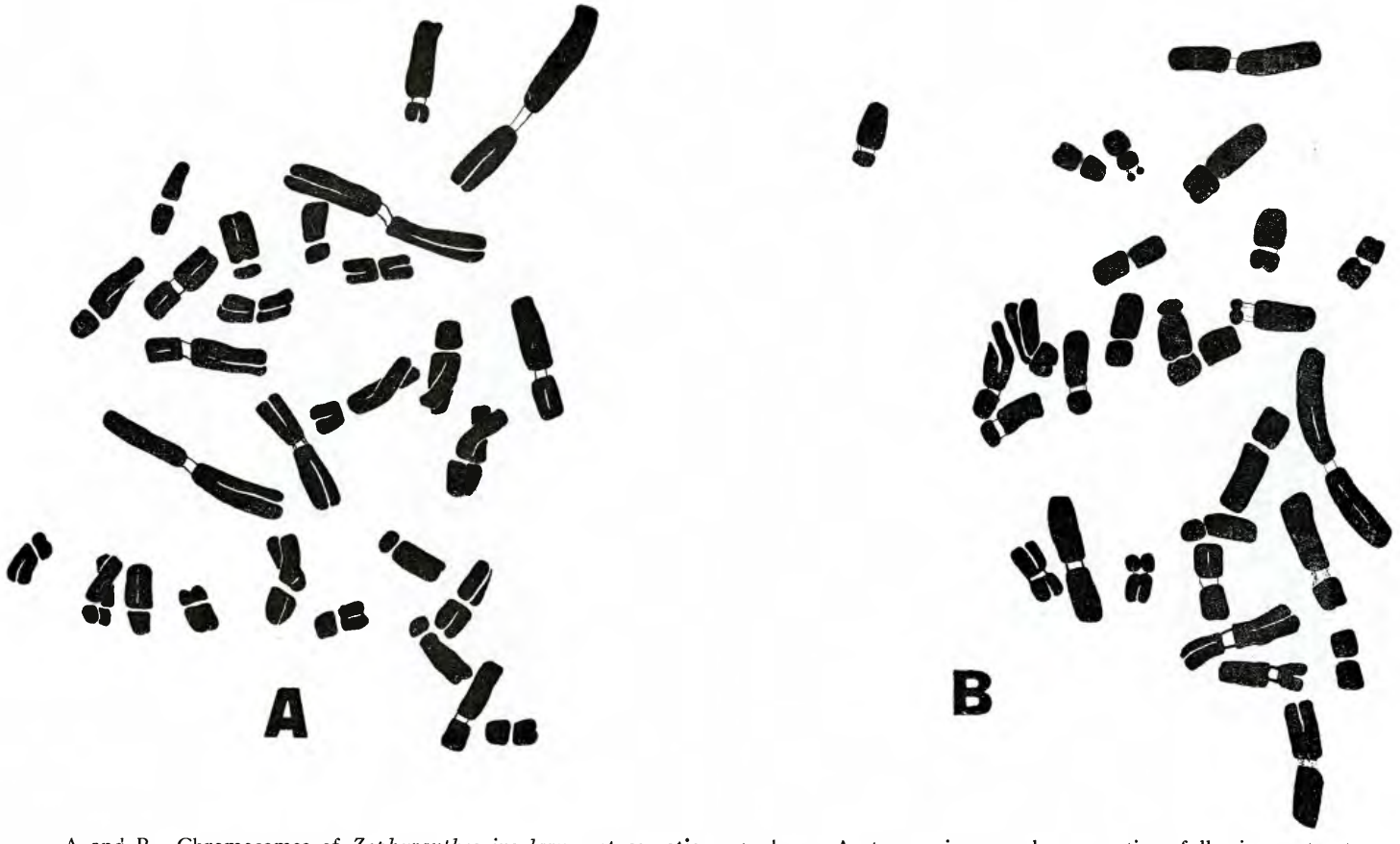

A and B. Chromosomes of *Zephyranthes insularum* at somatic metaphase. Aceto-carmine squash preparations following pretreatment with .2% colchicine for 4 hours. Original magnifications X2500. Reduced to X1500 in reproduction.

Plate 4

somes and since there are some slight deviations apparent from cell to cell two metaphase figures are shown (Plate 4, A and B).

The members of one chromosome complement have been arranged, from left to right, in approximate descending order of their lengths (Fig. 5, A). The chromosomes of six somatic metaphase figures have been measured. Similar chromosomes have been grouped, with average length data being presented in Table 1, along with indices arrived at by dividing the length of the short arms by total chromosome lengths (S.A./T.L.).

Table 1. The chromosomes of **Zephyranthes insularum** and of **Z. nervosa,** arranged in groups based on length and centromere position.[1]

Z. insularum				**Z. nervosa**		
	Number	Lengths in microns	**S.A./T.L.**	Number	Lengths in microns	**S.A./T.L.**
	3	14.5	.45	2	12	.45
	3	8.5	.39	2	11	.44
	3	7	.25	2	8.5	.35
	4	6.5	.35	4	8	.31
	3	6	.46	4	7	.34
	6	5	.25	4	6	.47
	3	4	.49	4	5.3	.42
	3	3.5	.43	2	4	.40
Total:	28	186.5		24	176.2	

[1] Centromere position—as indicated by the ratio of the short arm divided by total chromosome length (S.A./T.L.).

It will be noted that there is considerable variation in length and in morphology of the several chromosome groups. The longest are more than four times the length of the shortest ones. Members of the longest group, of the two shortest groups, and of one intermediate group have almost median centromeres (with S.A./T.L. ratios of .45, .49, .43 and .46, respectively). Chromosomes in the other intermediate lengthed groups have either more sub-median (ratios of .39 and .35), or nearly subterminal (S.A./T.L. ratios of .25) centromeres. Observation of the several figures (Plate 4, A and B; Fig. 5, A) reveals that in several of the chromosome groups there is some discrepancy in the total length, and also in centromere position, when chromosomes of the same approximate type are compared. This is especially evident, perhaps, when groups with the longer chromosomes are considered (Fig. 5, A).

Zephyranthes puertoricensis Traub, 2n=25

This taxon, named by Dr. H. P. Traub in 1951, was the first *Zephyranthes* species described from Puerto Rico. Bulbs received from Dr. Traub proved to be practically identical cytologically with the form carried in the writer's cultures as "*Z. tubispatha.*" Bulbs under the name of "*Z. tubispatha*" had been secured from several different private and commercial sources over a period of twelve years. Root-tip cells of "*Z. tubispatha*" had consistently shown 25 chromosomes at metaphase

Chromosomes of *Zephyranthes* taxa at somatic metaphase. Aceto-carmine squash preparations after .2% colchicine for 4 hours. Original magnifications X2500. Reduced to X1725 in reproduction. Plate 5, A. *Z. puertoricensis*. Plate 5, B. *Z. nervosa*. Plate 5, C. *"Z. tubispatha."*

Plate 5

(Plate 5, C). In *Z. puertoricensis,* also, there were found 25 somatic chromosomes (Plate 5, A), and these proved to be very similar morphologically to those of *"Z. tubispatha,"* from Jamaica (compare B and C, Fig. 5).

After a review of the nomenclature, and consideration of the cytological similarities just mentioned as well as the morphological likenesses, Traub (1958) has concluded that the two belong to the same species. Ker-Gawler's (1813) misapplication of the name of a different South American species to this entity, led to a confusion in nomenclature that persisted for almost a century and a half. A five-step summary is given below of Traub's (l.c.) discussion of the history of the nomenclature involved and its clarification.

Amaryllis tubispatha L'Héritier de Brutelle (Sert. Angl. 9, 1788) A red-flowered species, from Argentina.

"Amaryllis tubispatha Ker-Gawler" (Curtis's Bot. Mag., pl. 1586, 1813) A white-flowered species, from Jamaica. Herbert 1821 and 1837; Sealy, 1954 as *"Zephyranthes tubispatha."*

"Zephyranthes tubispatha" of commerce is the Jamaican form to which Ker-Gawler erroneously applied the name *"Amaryllis tubispatha."*

Zephyranthes puertoricensis Traub in Plant Life 7: 37-38. 1951. A white-flowered taxon from Puerto Rico. The same as Ker-Gawler's *"Amaryllis tubispatha."* Also the same as *"Z. tubispatha"* of commerce.

Zephyranthes puertoricensis Traub is the correct name for *"Z. tubispatha"* Herbert, which is the erroneously labeled *"Z. tubispatha"* of commerce.

The average lengths for the chromosomes of the several different types encountered in *Z. puertoricensis,* as well as the S.A./T.L. ratios for these types, are presented in Table 2, as based on measurements from four typical metaphase figures. A representative complement is arranged for chromosome comparison in Fig. 5, B. The longest chromosomes are seen to be approximately three times the length of the shortest. As with *Z. insularum,* chromosome groups are found with near-median, with sub-median, and with near-subterminal centromeres, but with differing proportions of the several types occurring in the two species. On the basis of length and of arm ratio there are six different groups of chromosomes. One of these groups seems composed of a single member (the middle chromosome, Fig. 5, B).

Similar data is also presented in Table 2 on the chromosomes of the bulbs earlier received under the name of *"Z. tubispatha."* These data are based on average figures from six different slide preparations, involving three bulb accessions. It is evident that the chromosome groups, the approximate length of the members in the different groups, and the S.A./T.L. ratios are all identical or very similar to those for *Z. puertoricensis* chromosomes. The chromosome which apparently occurs alone is also the thirteenth one, or the one of intermediate length. The chromosome picture for *Z. puertoricensis* and for *"Z. tubispatha"* is practically identical. The slight difference in lengths could very well be due to variations in contraction following pretreatment.

Table 2. The chromosomes of **Zephyranthes puertoricensis** and of **"Z. tubispatha,"** [1] arranged in groups based on length and centromere position.[2]

Z. puertoricensis			**"Z. tubispatha"** [1]		
Number	Length in microns	**S.A.** / T. L.	Number	Length in microns	**S.A.** / T. L.
3	10.6	.45	3	11.6	.48
3	7.6	.42	3	9.4	.43
6	7.2	.36	6	7.6	.34
1	5.8	.38	1	6.8	.35
4	5.4	.26	4	5.8	.28
8	4.4	.45	8	5.0	.44
—	—		—	—	
Total: 25	160.4		25	178.6	

[1] This is the Jamaican form apparently identical with and the same as **Z. puertoricensis;** not **Z. tubispatha** (L'Hérit.) Herb. ex Traub.
[2] Centromere position—as indicated by the ratio of the short arm divided by total chromosome length (S.A./T.L.).

Zephyranthes nervosa (H. B. K.) Herbert, 2n=24

Small bulbs of this species from Venezuela, raised from seeds collected by Dr. Tobias Lasser within the type locality, and supplied by Dr. H. P. Traub, proved to be of very difficult culture. They were not flowered by the writer. Before all bulbs were finally lost, a few actively growing root tips were secured and the following chromosome description resulted from a half dozen or so clear metaphase figures observed in preparations from these tips.

The 24 somatic chromosomes of *Zephyranthes nervosa* (Plate 5, B) do not show as wide a range of variation as was found in *Z. insularum.* The longest chromosomes of *Z. nervosa* are about three times the length of the shortest. While a number of the chromosomes have centromeres located at near-median positions, the others have sub-median centromeres and no subterminal ones—with one very short arm—were observed in this species (Fig. 5, D). Length and arm ratio data for the several chromosomes groups of this species, averaged from measurements of two metaphase figures, may also be found in Table 1. The chromosomes of this species appear to be more evenly paired, as to length and arm ratios, than are those of *Z. insularum* and *Z. puertoricensis.*

Habranthus robustus Herbert, 2n=12

Herbert (1837) suggested that this species from Buenos Ayres was the same as *Amaryllis tubispatha* L'Herit. (=*Z. tubispatha* (L'Herit.) Herb. ex Traub) collected by Commerson, also at Buenos Ayres. Traub (1958) has effectively shown the error of Herbert's suggestion, in view of the numerous morphological distinctions separating the two species. Only one of these two species has been available for cytological study. It seems pertinent to point out that previous studies (Flory, 1938) have shown *H. robustus* to have 12 long chromosomes, among which six pairs may be clearly distinguished, with a combined length at somatic metaphase (in preparations without pretreatment) of about 204 microns. The twelve chromosomes of one metaphase figure have been arranged in order

of length (Fig. 5, E) for comparison here with the chromosomes of the *Zephyranthes* species being reported on cytologically.

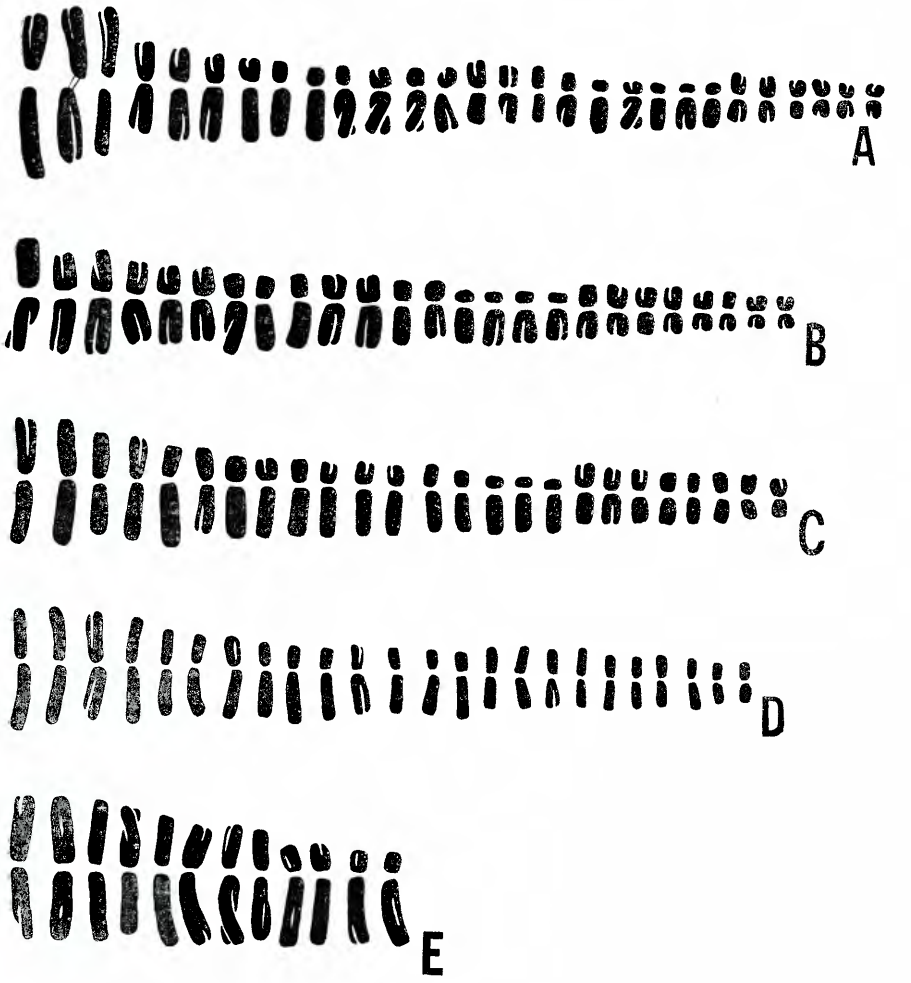

Figure 5. Chromosome complements of several taxa, drawn at somatic metaphase. In general, chromosomes are arranged from left to right in order of decreasing length. Aceto-carmine squash preparations following .2% colchicine for 4 hours. Original magnification X2500. Reduced to X1250 in reproduction. Fig. 5, A. *Zephyranthes insularum*. Fig. 5, B. *Z. puertoricensis*. Fig. 5, C. "*Z. tubispatha*." Fig. 5, D. *Z. nervosa*. Fig. 5, E. *Habranthus robustus*.

DISCUSSION

The geographic distribution of the three species being dealt with is of interest and of possible phylogenetic importance. *Zephyranthes*

puertoricensis occurs in Puerto Rico and also some 600 miles to the west, across the Caribbean Sea, in Jamaica. *Zephyranthes nervosa* occurs in Venezuela about 500 miles south of Puerto Rico, and also separated from it by the Caribbean. The exact native home of *Z. insularum* is not known; Hume obtained it from Cuba and found it growing in Key West, Florida along with *Z. rosea* which is also from Cuba. It was presumed that its home was in Cuba (Hume, 1939)—which is just north of Jamaica, or at least some place in the West Indies (Traub, 1958).

It has been mentioned above, that in *Z. insularum* some chromosomes vary somewhat in length and also in centromere position from all others in the complement. One explanation of this is the possible occurrence of translocations. Another possible explanation is that this might be a hybrid taxon, with some chromosomes being contributed by one species, while the others are derived from a second species.

In *Z. puertoricensis* we have the rather unusual situation of an odd number of 25 somatic chromosomes, occurring quite consistently in cells of the same plant and in accessions from different sources. The occurrence of this same anomalous condition in the taxon long carried as "*Z. tubispatha* Herbert", provides—along with their morphological similarities—a good basis for believing the two identical. This aneuploid is probably a pentasomic tetraploid (4x+1), since there is reason for believing 6 to be the basic number in the genus. Presumably the aneuploid condition arose through the occurrence of an aneuploid (n+1) gamete, which united with a normal (n) gamete. The data in Table 2, as well as Figs. 5, B and 5, C, indicate that at the present time the complement of this species is not made up of exactly five sets of four plus a sixth set of five chromosomes—although this condition is approached. Translocations could account for the deviating chromosomes encountered here. It is probable that ready vegetative propagation, such as occurs here by bulblet offsets, tends to promote the survival of this and of other cytological variants (see Flory, 1958b).

Baker (1888) reduced *Z. nervosa* to synonomy with the species now known as *Z. puertoricensis*. Traub (1958) has pointed out the differences between the two species, and how Baker erred. The present study shows the differences which exist in chromosome number and morphology between the two taxa.

While this work points out cytological differences which occur between *Z. insularum, Z. puertoricensis* and *Z. nervosa,* it may also be used as a basis for noting some chromosome similarities. For instance, consider the chromosomes of the three taxa on the following grounds:

	Number	Total length (microns)
Z. insularum	28	186.5
Z. puertoricensis	25	171.3[1]
Z. nervosa	24	176.2

[1] Average of 10 figures, four of *Z. puertoricensis* and six of "*Z. tubispatha.*"

The numbers do not vary greatly, and the total length of all chromosomes at metaphase is essentially the same for all three species, especially when possible differences in contraction are taken into account.

It is not too difficult to imagine that the ancestral forms of any two of these species, or those of perhaps all three of them, may have played at some time on the same evolutionary stage during the period when the species developed. Neither cytological or morphological facts, nor geographic distribution, would seem to deny this possibility.

SUMMARY

Somatic chromosome counts of 28, 25 and 24 are reported for *Zephyranthes insularum, Z. puertoricensis,* and *Z. nervosa,* respectively. Measurements and descriptions are given for the several chromosome types encountered. The cytological observations strengthen Traub's clarification of the nomenclatural confusion in which these species have been concerned. Suggestions are made of factors possibly having a bearing on the evolution both of the species and of their karyotypes.

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SPREKELIA — 'HARRISON'S ORIENTRED'

HAMILTON P. TRAUB

Recently Mrs. Morris Clint and others have made determined efforts to collect from the wild and also from gardeners the various forms of *Sprekelia formosissima.* So far more than a dozen lots have been collected by Mrs. Clint which she has shared with the writer. The various forms will be described as they are studied in detail.

One of the outstanding clones noted so far was obtained by Mrs. Clint from Mr. Frank Harrison of Rancho del Cielo, in Mexico. This clone has been named 'Harrison's Orientred'.

Bulb fairly large with a long neck. Leaves linear, acute, light green, up to 7 or more, furrowed on the upper side, 1.5 cm. wide, 50—51 cm. long. Scape hollow, flattish, produced from side of bulb-neck, 22.5 cm. long, 8 x 11 mm. in diam. at base, 6 x 7 mm. in diam. at apex. Spathe monophyllous, 8.7 cm. long, united for 3.5 cm. toward the base, free portion above fenstrate, reddish-colored; bracteoles very much smaller. Pedicel 5.2 cm. long. Ovary 1 cm. long, 8 mm. in diam. Perigone of typical *S. formosissima* shape, bright orient red (HHC 819), tepalsegs with a greenish-whitish stripe in lower 2/3, top setseg shortly greenish-whitish toward the base, the two side setsegs greenish-whitish on upper margins for ¼ of their widths, and margined whitish up to about 2/3 of the margin length. Stamens and style fasciculate, declinate ascending, greenish-whitish in extreme lower part, rest orient red. Stamens of four sets of lengths, the longest subequaling the bottom petseg, and the two side petsegs. Style longer than tepalsegs, stigma trifid, lobes slightly recurved.

AMARYLLID NOTES, 1959

HAMILTON P. TRAUB

In the past a number of varieties have been recognized in *Amaryllis striata* Lamarck, Encyc. Bot. 1: 125. 1783. All of these, with the possible exception of var. *fulgida* are not sufficiently distinct to rank even as forms.

Amaryllis striata forma *fulgida* (Ker-Gawl.) Traub, *comb. nov.* (syn.-*Amaryllis fulgida* Ker-Gawl., in Bot. Reg. 3: pl. 226. 1817.

Note.—This is a more vigorous form with a 4-flowered scape, and beautiful nasturtium red flowers.

The forms that have been recognized as varieties, including *A. striata* var. *crocata* (Ker-Gawl.) Traub & Moldenke, Amaryll. 116-117. 1949; *A. striata* var. *acuminata* (Ker-Gawl.) Traub & Moldenke, l. c. p. 117; and the variety *citrinum* Baker, Amaryll. 51. 1888, are not sufficiently distinct and are reduced to the type, *Amaryllis striata* forma *striata*.

[**LYCORIS RADIATA—HAYWARD**, continued from page 80.]

damage or disease, and they will bloom every year if the mother bulbs are dug and separated; if not all in a planting, at least most of them, especially those most seriously crowded.

"I never saw a bulb set seeds. The China type seems to have lost this faculty. But they multiply rapidly by offsets in good culture, will stand cold and freezing weather in North Florida safely, growing right along despite the cold and showing no injury. In North Florida I recommend planting them in beds about 4 to 6 inches apart, and let them stay in the ground several years before disturbing the crop. This will make a better show of blooms. When dug and held out of the ground in storage the bloom may be lost.

"*L. radiata* makes its foliage in the Fall and winter, the leaves die off in late spring, and the bulbs are dormant nearly all summer, blooming in mid or late summer."

3. GENETICS AND BREEDING

AMARYLLIS EVANSIAE AND HYBRIDS

IRA S. NELSON

Amaryllis evansiae Traub et Nelson was first described in Baileys (4: 85-88, figs. 30-31. 1956); and it was illustrated there and in Bulletin No. 1 (1956), Louisiana Society for Horticultural Research. The species was collected by writer under the sponsorship of that Society in Bolivia in 1954.

Fig. 6. Left to right, *Amaryllis evansiae;* hybrid *A. evansiae* x *A. striata* forma *fulgida;* and *A. striata* forma *fulgida.* All side view.

Amaryllis evansiae is very interesting since it is the first known in the genus to show marked variations within the species. In all the other 47 species, variation within the species is slight, even in *Amaryllis belladonna* L. which has a very wide range from Mexico, West Indies southward to Bolivia.

Such characters as leaf shape and length, bulb size and shape, and so on, are fairly uniform in *Amaryllis evansiae.* However, as shown in Figs. 6 & 7, the flower shape varies considerably. Although the

stigma is usually capitate (obscurely 3-lobed), a distinctly 3-lobed stigma (with short rounded lobes) has been observed in a few individuals. The flower color varies considerably from very pale yellow, chartreuse (very light green) and pastel shades. All of this lends support to the hypothesis that this species is of relatively recent origin and not sufficient time has elapsed to allow for a stabilization of all of the characters.

Fig. 7. Left to right, *Amaryllis evansiae,* hybrid, *A. evansiae* x *A. striata* forma *fulgida;* and *A. striata* forma *fulgida.* All front view.

Amaryllis evansiae is readily propagated from seed and it is hoped that nurserymen will soon list it for sale in their catalogs. Because of the variation within the species superior sorts should be selected and propagated vegetatively. Both wide and narrow-segmented selections should be made in at least three color groups—near white, yellow and pastel pinks.

Hybrids between *A. evansiae* and the following species and hybrids were made during the 1955 and 1956 flowering seasons: *A. belladonna* (red); *A. belladonna* (pink); *A. striata; A. reginae; A. pardina;* Dutch hybrid (white); and Mead hybrid (near white).

Two major objectives were in mind when these crosses were made. One was the production of small-flowered sorts in a wide range of colors and the other a large yellow-flowering Amaryllis. The first of these hybrids to bloom is the *A. evansiae* X *A. striata* cross.

This hybrid bloomed in late January 1958. In general appearance it resembles *A. evansiae* but has the trifid stigma, long stamens, obscure paraperigone and pollen color of *A. striata.* Its scape is slightly taller than those of either parent, thus showing hybrid vigor, but the flower size is intermediate (Figs. 6 & 7).

The flower color of this hybrid is light shell pink with a pale green throat inside and cream-colored outside. This combination of pastel colors makes it a desirable addition to the growing list of Belladonna Division (D-3) Amaryllis.

While *A. evansiae* is a splendid species and worthy of a place in any collection, it conceivably may have even more value as parent stock for new hybrids types in the future.

EXPERIENCES IN BREEDING CRINODONNAS

Mrs. Polly Anderson, *California*

Crinodonnas seem to come few and far between, but over a period of ten years I have been able to get 28 seedlings of the true cross of *Brunsvigia* by *Crinum,* from several hundred attempted pollinations and thousands of resulting seeds.

My first crosses were on the very late flowering, small, bright rose and white Cape Belladonna, *Brunsvigia rosea minor.* This variety is always small flowered and short and many shades brighter in color than the common Cape Belladonna and fully a month to six weeks later in flowering. The Pink *Crinum moorei* blooms about the same time for me, whereas a lighter form, nearly white, blooms earlier, about the same time as *C. powellii.* Out of several hundred seed from this *B. rosea minor* by Pink *C. moorei,* only 2 had the persistent foliage and characteristics of the *Crinodonna* cross. In four years the first one bloomed (before any of the sister seedlings of pure Cape Belladonna, *Brunsvigia rosea* did). The flower is not anywhere nearly as attractive as *Crinodonna corsii* clone 'Fred Howard' as it is smaller and has kept its tubular shape instead of opening up its face, but the color is a nice creamy flesh color. The non-hybrid sisters bloomed when 5 and 6 years old and were similar to *Brunsvigia rosea minor,* the Cape Belladonna, with deep color petal tips and white throats, thus they were either self pollinated, or as Mr. Hannibal suggests, they were stimulated to produce parthogenetic seeds.

The next year I had some *Brunsvigia* x *multiflora* bulbs from Mr. Hannibal to use as seed parents including a'so 'Hathor' and *B.* x *multi-*

flora alba. Again I used *Crinum moorei* pollen on all of these, using the pollen of the lighter form on the white brunsvigias and the pollen of the pink *C. moorei* on the hybrid *Brunsvigia* forms. These many crosses resulted in 26 true hybrids out of a thousand or more seedlings, not a very high percentage. These are just starting to bloom now. These are very nice open faced shapes, one rather large white on 3½ ft. stems had 16 blossoms and large healthy looking foliage. Another is a light shade of pink, 2½ ft. tall with 8 flowers, and the one just blooming now is nearly white with a pink picotee edge when first opening, which later spreads inward a bit and softly blends into the white. This also is 2½ ft. tall and has 10 flowers. These seem to bloom more quickly and finish sooner than the *Brunsvigia rosea* forms. It was noted that the white one sent up another scape, which will more than compensate for the short duration of bloom. Strangely, the foliage of these hybrids is much more attractive than that of either parent. It is truly evergreen and in very good shape at blooming time, whereas the foliage of the *Crinum moorei* parent is at its very worst at blooming time with dead papery leaf tips and bulb coverings and thus very messy looking. Even at its best the *C. moorei* foliage, being light green, thin textured, broad, spreading and wavy, is not as attractive as the neat, close growing, deep green, narrower, foliage of the hybrid with heavy substance.

This year I am using pollen of the very deep almost wine colored *Crinum* 'Ellen Bosanquet' on the deepest colored forms of *Brunsvigia* x *multiflora* and on the deep colored Cape Belladonna, *Brunsvigia rosea* seedlings obtained as parthenogenetic offspring (the hybrids are not). I think the *Crinodonna corsii* clone 'Fred Howard' is about as good as obtainable in the pure pink color class; so I want to work for the deep colored crinodonnas and the pure white ones, and bicolors.

Some of the pure Cape Belladonna, *Brunsvigia rosea* type seedlings resulting from these hybrid crosses are interesting. The pure white ones are pure thruout, and do not have the apricot throat that their seed parents 'Hathor' and *Brunsvigia multiflora alba* do, and the flowers are small, neat, tailored types, unlike the lovely ruffly flowers of 'Hathor', and are fewer flowered than the *Brunsvigia* x *multiflora alba.* It's an interesting and pretty sight, in the bed of seedlings to see the tips of the spathes poke up out of the ground. The pale green tips always turn out to be white flowers, the pink tipped spathes generally are light pink or rose and the red or deep wine colored tips denote darker flowers and vivid bicolors. Then as they grow, sometimes 3 to 6 inches overnight, the stems repeat the color of the spathes and it's easy to forecast the color of the flowers.

Besides the hybrids with *Crinum,* I have been crossing the white *Brunsvigia* x *multiflora* forms with each other and have also pollinated some of them with pollen of an almost yellow form of 'Hathor' which Charlotte Hoak selected from some 'Hathor' clones at Orpet's nursery

[**BREEDING CRINODONNAS—ANDERSON,** continued on page 81.]

FIRST DECADE OF HEMEROCALLIS WASHINGTONIA

HAMILTON P. TRAUB, *California*

[PART 1, SECTIONS 1, 2 & 3]

The basic chromosome number in the genus *Hemerocallis* is x=11. All of the 15 species discovered in the wild have a somatic number of 2n=2x=22 and are thus diploids. The only exceptions are a few *infertile* triploids 2n=3=33. When self- and/or inter-fertile *colchicine-induced* tetraploids, 2n=4x=44, were produced in the 1940's (Traub, 1949; 1951; Buck, 1949; Schreiner, 1951), these did not cross with the diploids to produce fertile offspring. With this reproductive *isolating barrier* between the tetraploids and the diploids, it was necessary to consider the former as a distinct species which was named, *Hemerocallis washingtonia* (Traub, 1951). This apparently happens to be the *first named* colchicine-induced plant species on record.

It should be noted that all tetraploid *Hemerocallis* produced later that actually interbreed, or may potentially interbreed, with the evolving species under cultivation, are automatically a part of the species, *Hemerocallis washingtonia.*

It is unique up to the present when one can officiate at the birth of a colchicine-induced perennial plant species and then also report on its development through the first decade of its existence when the population has already reached several thousands of vigorous interbreeding individuals (Fig. 8). It is planned to publish such a report for each succeeding decade for an indefinite period.

The writer's first report on tetraploid *Hemerocallis* appeared a decade ago (Traub, 1949). Additional notes on *Hemerocallis washingtonia* were reported a little later (Traub, 1951). The present report is a brief summary of the 1949—1959 breeding results, particularly those obtained by the writer from 1952 through 1958 which have not been reported heretofore.

Important contributions in this field have also been made by Robert Schreiner, of Salem, Oregon, and W. Quinn Buck, of Arcadia, Calif., who also started their work in the 1940's. The contributions of these workers will first be briefly reviewed before presenting those of the writer.

Tetraploids of Robert Schreiner.—In a private communication dated Dec. 10, 1958, Mr. Schreiner states that he started his project for inducing polyploidy in *Hemerocallis* in the 1940's. He writes as follows: "I did treat quite a few small *Hemerocallis* seedlings . . . and the results were to me of interest but not of too much concrete accomplishment. Out of these treated plants we flowered in 1947 several tetraploid clones that were pure tetraploids and not chimera type plants with mixed, 2n=44 and 2n=22 tissue. One of these I thought was fairly distinct so we named this clone 'Brilliant Glow', and we offered this in our daylily catalog in 1951. This is the year of introduction. It seems to me that there was an extremely high incidence of sterility in these new drug-induced polyploids . . . and so I cast about trying to inter-cross them with the few other tetraploid clones I had. I obtained a few seeds but

the few plants I did succeed in raising were not of any great appeal or value as garden plants. I did keep one clone that I still grow which was obtained from a cross of a polyploidized red seedling of 'Autumn Red' (Nesmith, 1941) with 'Brilliant Glow'. This original tetroploid plant I lost in the shuffle of moving from Minnesota to Oregon. The seedling I still grow and use a bit experimentally is not a free seed setter." Mr. Schreiner also states that three or four years ago he obtained a plant of the tetraploid, 'Tetra Starzynski' (Traub, 1949), the type of *Hemerocallis washingtonia,* which he used in crossing with 'Brilliant Glow' (Schreiner, 1951) and also with his own red seedling tetraploid. He explains that "I have a few seedlings of these two crosses that I saved primarily because they are tetroploids and not so much for their own garden value."

Having an early start, Mr. Schreiner will undoubtedly be able to make further valuable contributions towards the development of the tetraploid daylilies in the coming years.

Tetraploids of W. Quinn Buck.—The writer knows from personal experience that W. Quinn Buck, of Arcadia, Calif., has made important contributions toward the development of the tetraploid daylilies. In his first report (Buck, 1949), he mentioned the colchicine-induced tetraploids of 'Soudan' (Stout, 1932) and 'Kanapaha' (Watkins, 1941), which were later named 'Tetra Soudan' (Buck, 1959) and 'Tetra Kanapaha' (Buck, 1959), respectively. Since that date he has produced other colchicine-induced tetraploids, including 'Tetra Blossom' (Buck, 1959), a very large light yellow; 'Tetra Aurantorosea' (Buck, 1959), dark orange salmon; 'Tetra Arcadia' (Buck, 1959), maize butterfly, late; 'Tetra Prima Donna' (Buck, 1959), a pastel polychrome; 'Tetra Krishna' (Buck, 1959), ox-blood red over orange ground; 'Tetra Red Bird' (Buck, 1959), bright red; and 'Tetra High Noon' (Buck, 1959), a fine yellow. Through exchanges he has obtained 'Tetra Starzynski' (Traub, 1951), a bronzy-rose; 'Tetra Apricot' (Traub, 1951), a clear apricot; and 'Tetra Yandre' (Traub, 1959), light brownish-red, with very wide tepalsegs, wide open.

All of these he is using in his many crosses, and he now has a very large number of tetraploid hybrids from which to select high quality clones for naming. His named hybrid tetraploids include 'Ralph Cornell' (Buck, 1959) and 'Sue Booth' (Buck, 1959). Others are in the evaluation stage and will be named in the near future.

Mr. Buck has encountered some sterility in his breeding work with tetraploids, but is making progress toward eliminating this as far as possible. Thus still other outstanding contributions in the field of tetraploid daylilies will be forthcoming from Mr. Buck in the coming years.

Tetraploids of Hamilton P. Traub.—The following is a brief summary of the breeding work carried on with tetraploids up to the present time. A more detailed report will be made later on.

The initial experiments up to 1951 for the induction of *Hemerocallis* tetroploids have been reported previously (Traub, 1949, 1951). From

1952 to 1954, the work was carried on at Arcadia, Calif., on a sandy

Fig. 8. Upper, block of *Hemerocallis washingtonia,* tetraploids, 2n=44, at La Jolla, California. Note very large flower in center foreground, and several flower scapes in background more than 6 feet tall.

Lower, showing block of several thousand tetraploids destroyed, and another block in near background. Note Pacific Ocean in far background.

soil, and in a region subject to occasional light winter frosts; and since

the fall of 1954, the experiments have been pursued at La Jolla, Calif., on a clay soil, in a frost-free location on the Pacific Ocean. Typical scenes are shown in Fig. 8.

The summary of the writer's experiments include the following sections: (1) colchicine-induced tetraploid parents; (2) pollen storage, pollination & hybrid tetraploids; (3) selfing tetraploids; (4) obtaining triploids by crossing tetraploids with diploids; (5) artificial and natural selection; (6) cultural methods, including collection and sprouting of seeds, transplanting of seedlings to field; and (7) the evaluation of tetraploid seedlings for garden value. Part of the results, through the third section, will be included in the present 1959 issue; the remaining sections will be concluded in the AMARYLLIS YEAR BOOK issue of 1960 PLANT LIFE.

1. COLCHICINE-INDUCED TETRAPLOID PARENTS

The first step in the breeding of tetraploids consists necessarily of choosing the kind of diploids, 2n=22, that are to be changed into tetraploids, 2n=44, by treatment with colchicine.

The diploids were chosen so as to include the various characteristics desired in the tetraploids—*deciduous* clones for the North, *evergreen* clones for the South and to a lesser extent for the North since many evergreen clones can be grown in the North; vigorous plant with many flowers per scape; desirable flower shape and color, and so on. The clones chosen were of two kinds with reference to the chromosome complement—(a) Diploid plants close to the wild species with a relatively homozygous chromosome complement (see Traub, 1958), which are usually self-sterile when tetraploidized, but may some times be cross-fertile; these are known as *autotetraploids*. (b) Diploid hybrids with relatively heterozygous chromosome complements (see Traub, 1958), which are usually self- and cross-fertile when tetraploidized; but there are notable exceptions. This class is known as *allotetraploids*.

AUTOTETRAPLOIDS.—The late A. B. Stout obtained seeds of *Hemerocallis lilioasphodelus* var. *rosea* (Stout) Traub * from the wild in China in the 1930's. From these seedlings he selected the clone 'Rosalind' (Stout, 1941) for its pastel pink flowers (see Fig. 9). It was selected for the present program for the same pastel pink flowers. When this clone was treated with colchicine, contrary to expectancy, the tetraploid form proved to be self-fertile, and seeds were set to self-pollination, and the seeds germinated. Unfortunately, the original colchicine-induced tetraploid had *very brittle* foliage and was lost in culture, but the seedlings survived. They also have *brittle* foliage but to a *lesser* degree, and are difficult to grow. In the greenhouse the foliage is more brittle than when the plants are grown outdoors. The flowers are a deep pastel pink in all cases. One was named 'Tetra Rosalind' (Traub, 1953); see Fig. 9. The rest of the series are known as 'Tetra Rosalind' sibs. It has been

* **Hemerocallis lilioasphodelus** var. **rosea** (Stout) Traub, comb. nov. (syn.—**H. fulva** var. **rosea** Stout, Addisonia 15: pl. 484. 1930.

almost impossible to set seeds by self- or cross-pollination among the sibs, but when the pollen is applied to other tetraploids abundant seeds are usually obtained. Thus these are very valuable in transmitting the genes for pastel pink to the other tetraploids. The progeny from such crosses do not have the brittle foliage, and the plants show marked hybrid vigor.

It should be noted that in this case the polyploidizing of a plant close to the wild *Hemerocallis* species with a relatively homozygous chromosome complement appears to be a very drastic step biologically,

Fig. 9. Right, from top to bottom: *Hemerocallis lilioasphodelus* var. *rosea,* diploid (2n=22) clone 'Rosalind' (Stout, 1941). Left, from top to bottom: *Hemerocallis washingtonia,* tetraploid (2n=44), clone 'Tetra Rosalind' (Traub, 1953).

and the tetraploids may not be an immediate biological success. It should be noted that even under special care, the original tetraploid was lost, and only the seedling selfs from it have survived and then also only under special care. It is doubtful if such plants could survive in the wild unaided by man in the struggle for existence. This leads one to suspect that if such tetraploids did actually arise in nature over long periods of time, they would most likely have been lost. Such mortality among naturally occurring polyploids would account for the absence of

tetraploids among the *Hemerocallis* species collected in the wild. However, under culture, the colchicine-induced tetraploid was protected long enough so that crosses with other tetraploids could be made and thus the genes for pastel pink flowers were preserved on the tetraploid breeding level. The numerous hybrids obtained by crossing it with other tetraploids show marked hybrid vigor and produce abundant seeds.

ALLOTETRAPLOIDS.—With a few exceptions, the named diploid *Hemerocallis* clones are the result of many generations of cross-breeding so that these hybrids apparently have heterozygous chromosome complements and do not come true from seeds. When these hybrids are treated with colchicine, the allotetraploids obtained are usually more or less self- and cross-fertile, but there are notable exceptions.

Some of the typical hybrid diploids selected for polyploidizing will be briefly mentioned. 'Mayor Starzynski' (Traub, 1939) was selected for its ideal plant habit, with well-branched, many-flowered scapes, and recurrent blooming. This gave 'Tetra Starzynski' (Traub, 1951), the type of the tetraploid colchicine-induced species, *Hemeracallis washingtonia.* The diploid clone 'Elaine' (Traub, 1938) has large light pastel pink flowers, and it gave rise to 'Tetra Elaine' (Traub, 1953) which was unfortunately lost in culture. However, before it died, a cross with 'Tetra Yandre' (Traub, 1959) was obtained which was named 'Tetra Elyandre' (Traub, 1959); see Fig. 11. Thus the genes for pink pastel flowers were saved for further crossing on the tetraploid level. The diploid 'General MacArthur' (Traub, 1942), with good sized brilliant red flowers, gave rise to 'Tetra MacArthur' (Traub, 1953) which was lost in culture. Again, before it died, a cross with 'Tetra Starzynski' gave 'Tetra Arthustar' (Traub, 1959); see Fig. 10. Thus again the genes of this red clone were preserved for use in further breeding on the tetraploid level.

The diploid 'E. W. Yandre' (Hayward, 1939), a land mark in daylily breeding by Mr. Hayward, with very large, wide-open, almost flat flowers, and extra wide tepalsegs (Fig. 11), gave rise to 'Tetra Yandre' (Traub, 1959), see Fig. 11. This was a biological success in every way.

In a similar manner other diploid clones, treated with colchicine, gave rise to other tetraploids. In addition the writer made exchanges with Mr. W. Quinn Buck and obtained in return, 'Tetra Kanapaha' (Buck, 1959), 'Tetra Blossom' (Buck, 1959), and 'Tetra Soudan' (Buck, 1959), which were used to some extent in the breeding work.

2. POLLEN STORAGE, POLLINATION & HYBRID TETRAPLOIDS

The method of pollen storage has been previously described (Traub, 1936; 1958) and served to make pollen of any desired clone available during the flowering season since all of the clones are recurrent blooming in this location. In this way the breeding program has been markedly speeded up.

Pollinations were made in the morning before 9 o'clock and the crop of seeds set from crosses in the majority of cases was excellent. This is undoubtedly due to the foundation stock used. For instance, in the reds,

the breeding work started with 'Tetra Arthustar' (Fig. 10) which set a record for seed production. So many seeds were obtained that it was not possible to find space for all the seedlings on the available land as will be shown under Section 5, below. In connection with pollinations it is worth while to mention that the pigments of some of the reds and brownish-reds are permanent dyes, and the worker should not wear his best clothes when pollinating.

Some of the first generation hybrids have been mentioned in Section

Fig. 10. *Hemerocallis washingtonia* (tetraploid, 2n=44) clone 'Tetra Arthustar' (Traub, 1959), from a cross of 'Tetra MacArthur' (Traub, 1953), and 'Tetra Starzynski' (Traub, 1949). Note the large vigorous clump and the floriferous habit. Upper right inset, individual flower of 'Tetra Arthustar'.

1. These and other crosses will be briefly mentioned here: 'Tetra Yandrelind' (Traub, 1959) ['Tetra Yandre' x Tetra Rosalind'] 'Tetra Arthustar' (Traub, 1959), fig. 10 ['Tetra MacArthur' x 'Tetra Starzynski']; 'Tetra Elyandre' (Traub, 1959), fig. 11 ['Tetra Elaine' x 'Tetra Yandre']; 'Tetra Yandrestar' (Traub, 1959), fig. 11 ['Tetra Yandre' x 'Tetra Starzynski'], and so on.

In this way the genes of the original colchicine-induced tetraploids were combined in a first generation progeny. In all cases, the hybrids

showed hybrid vigor (see Traub, 1958), that is, the plants were tall growing, with large flowers of thick substance. Apparently most of the *Hemerocallis* breeders do not fully appreciate that the rapid development of the diploid daylilies also has been due in great measure to heterosis or hybrid vigor. This has been defined as the "phenotypic character expression caused by bringing together in the hybrid the dominant favorable genes of both parents."

Each of the first generation hybrids (F_1) was crossed with each of the others. This gave rise to the second generation (F_2). Some back crosses were also made, including pollinating 'Tetra Arthustar' with tetraploid 'Garnet Robe' pollen; and pollinating each of the first generation (F_1) hybrids with 'Tetra Rosalind' pollen. The purpose of this was to increase the proportion of desirable red and pink flower color genes in the vast gene pool.

When this stage is reached and it is necessary to go on to the third and later hybrid generations, it can be easily seen that it would no longer be possible to keep detailed records of parentages unless one has unlimited funds and planting space, and also numerous assistants to keep the records. The objective of keeping records in these breeding experiments has been to obtain data on the inheritance of characteristics in *Hemerocallis,* and this has been attempted within reason by selfing hybrids as indicated in section 3, below. This purpose is wholly different from that of breeding tetraploids for hybrid vigor.

In the main breeding project, the objective is then to make rapid progress toward excellent garden hybrids by means of heterosis or hybrid vigor. The method was adopted long ago (Traub, 1940) of mixing pollens on the basis of flower colors—yellow, orange, pink, carmine, scarlet, crimson, salmon, black, etc.—from the best clones and applying each kind to the best plants having similar colors. This procedure was applied with the tetraploids and resulted in very rapid improvement in the progeny so that even in the third and fourth generations, it was possible to make outstanding selections for garden plants. It would have taken many years longer to reach a comparable stage in the breeding program had the pedantic method of making single crossings been used.

Selections made to date include numerous outstanding clones. Only a few will be listed here. The basis of evaluation will be discussed in section 6, below.

Tetraploid yellows and oranges.—Of the many fine seedlings in this color section (see Fig. 12), only a few have been named so far. 'Magdalena Luethi' (Traub, 1959), lily-shaped flowers of indescribably waxlike empire yellow, delightfully perfumed (Fig. 12). 'Elizabeth Traub' (Traub, 1959), wide-open, immaculate saffron yellow, spicely fragrant. 'Wyndham Hayward' (Traub, 1959), wide-open, almost flat, brilliant tangerine orange with reddish eye-zone (Fig. 3). 'Cabrillo' (Traub, 1959), clear velvety orange, fragrant. And many others not named.

Tetraploid pinks, light reds and salmons.—'Tetra Carmine' (Traub, 1959), fine carmine pink; 'Tetra Rose' (Traub, 1959), clear light rose;

'Tetra Salmon' (Traub, 1959), soft salmon pastel. Others not named.

Tetraploid medium and dark reds.—First among these is the Pacific Series. When one certain red-flowered seed parent was used with pollens from selected red-flowered parents, hundreds of seedlings were obtained that were uniformly large brilliant reds so nearly alike that it was

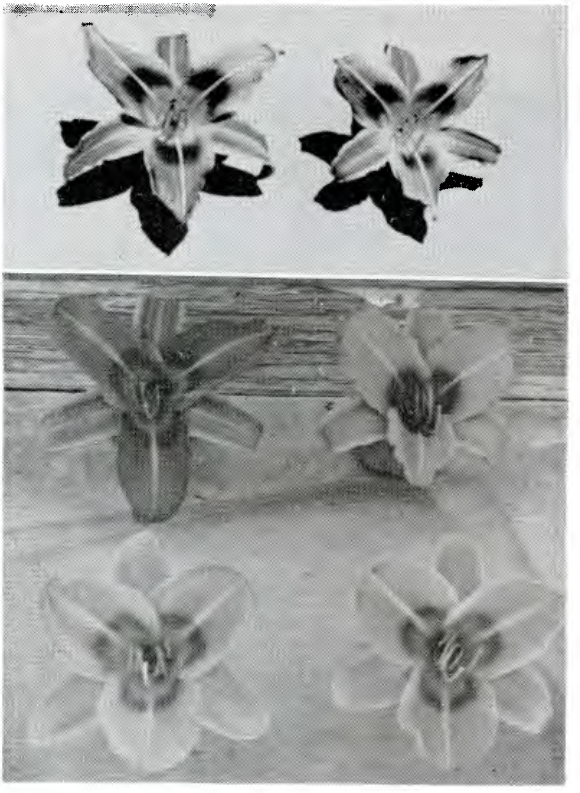

Fig. 11. Top, left to right: *Hemerocallis washingtonia* (tetraploid, 2n=44), clone 'Tetra Yandre' (Traub. 1959), and *Hemerocallis* (diploid, 2n=22) hybrid clone 'E. W. Yandre' (Hayward, 1939).

Center, left to right: *Hemerocallis washingtonia* (tetraploid, 2n=44), clone 'Tetra Elyandre' (Traub, 1959) and sister seedling, unnamed.

Bottom, left to right: *Hermocallis washingtonia* (tetraploid, 2n=44), clone 'Tetra Yandrestar' (Traub, 1959) and sister seedling.

hardly possible to single out clones for naming. Thus it was decided to consider these as a series to be known as the Pacific Series,—'Pacific One', 'Pacific Two', and so on.

Other outstanding reds include 'Tetra Crimson' (Traub, 1959), near chrysanthemum crimson; 'Tetra Scarlet' (Traub, 1959), bright scarlet;

'Tetra Black' (Traub, 1959), very dark red; 'Copernicus' (Traub, 1959), large bright red; leaves very broad. And many unnamed seedlings.

3. SELFING TETRAPLOIDS

Selfing colchicine-induced tetraploids.—It has already been indicated that by selfing the colchicine-induced autotetraploid of the diploid 'Rosalind' (Stout, 1941), seedlings were obtained, including 'Tetra Rosalind' (Fig. 9) and its sibs, which had foliage less brittle than the

Fig. 12. Outstanding yellow tetraploid daylilies, *Hemerocallis washingtonia* (2n=44): upper left, clone 'Magdalena Luethi' (Traub, 1959), with lily-shaped flower, wax-like empire yellow (HCC-603).
Upper right and lower two: outstanding unnamed tetraploid yellow daylilies with wide open-shaped flowers.

original which died in culture. Attempts at further selfing here have been unsuccessful so far, but attempts will be made to obtain seed set by applying hormones after self-pollination.

Under allotetraploids above, 'Tetra Starzynski' was mentioned. When this was selfed, many seedlings were obtained which were quite similar in plant and flower shape characteristics. The flower color ranged from apricot yellow, bronzy-rose to reddish. Two of these were named, 'Tetra Apricot' (Traub, 1951), and 'Tetra Peach' (Traub, 1951). In

this case there was no reduction in size of plant. Further selfing was somewhat more difficult but the progeny were similar to the parents, and for this reason the project was discontinued since the selfs bred true for all practical purposes.

Also under allotetraploids above, 'Tetra Yandre' was mentioned. This was selfed in order to obtain brighter colored progeny. In this case selfing was facilitated by growing the plants in the greenhouse, and twenty-seven selfs were obtained. These ranged all the way from very dwarf plants to medium sized and some plants that were equal to the parent in vigor. The flower shape was uniform, flat, open-faced as in the parent, but the dwarf plants had somewhat smaller sized-flowers. The flower color ranged from light pastel yellow, to light brownish yellow and brilliant tangerine orange; all had reddish eye-zones. The clone 'Wyndham Hayward' (Traub, 1959), a brilliant tangerine orange (Fig. 3), is one of the selections made. Thus selfing has given some concrete results. Attempts at further selfing of the progeny has failed so far but here again attempts will be made with the aid of hormones.

Selfing after crossing tetraploids.—The first attempt in this category was with 'Tetra Arthustar', described above, which proved quite self-fertile. The selfs were uniformly good reds similar to the parent but were not as good as crosses between this clone and similar reds. The selfing was not carried beyond the first generation because there was not sufficient time and land available to carry on the experiment, but it may be taken up again later.

In another experiment, the selfing is now in the second generation with the objective of obtaining information about the inheritance of characteristics in tetraploid *Hemerocallis*. The cross chosen is 'Tetra Yandrelind' ('Tetra Yandre' x 'Tetra Rosalind'). The first generation selfs have flowered. The second generation selfs have been planted out, but have not flowered as yet. When these bloom the results will be reported in the AMARYLLIS YEAR BOOK.

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[PART 2, SECTIONS 4, 5, 6 & 7 WILL BE INCLUDED IN PLANT LIFE, VOL. 16. 1960.]

[LYCORIS RADIATA—HAYWARD, continued from page 146.]

and Japan are known, but the study would be worth while. The bulbs of *Lycoris radiata* and *L. aurea* are found in the lower South where they are really almost native, so well they have become naturalized. They are slightly different in form and character from the same species as grown in Japan for export to United States bulb dealers since World War II.

Lower Florida, below the line of Palatka, seems to be less well adapted to the successful growing of *L. radiata* than the upper part of the state and around the Gulf Coast. However, the largest commercial planting of *Lycoris radiata* so far found in the South is at Green Cove Springs, Florida, which is well up the peninsula on the St. Johns River some 25 miles south of Jacksonville. There they are a minor crop with William J. Leseman, well known gladiolus cut flower grower who has made a specialty of several small bulbs of this kind for the trade for a number of years. Among his special bulb crops have been *Zephyranthes grandiflora* and *Leucojum aestivum* clone 'Gravetye Giant'. He grows or has grown these by the many thousands.

So far as known he is the only dealer in the East supplying commercially graded and carefully grown *L. radiata* bulbs by the thousands. The bulbs can be obtained from farm wives in other southern states by the hundred or bushel, but including large and small, slabs, splits and only a few sound, commercial round bulbs, such as the trade demands.

Mr. Leseman was kind enough to supply the following notes based on his experience growing *Lycoris radiata* for many years.

"I have handled this item for more than 30 years. I find it is not possible for me to predict if any particular bulb will bloom or not in a given year. Without going deeply into planting particulars, which are as usual in the bulb line, I would say that they like to make their own shade, by growing luxurious foliage closely together in clumps or in mass plantings.

"They need plenty of moisture and good drainage when growing. Good drainage is very important. The stock that I am growing came from Holland originally, as I recall, but is similar in every way to the commonly grown Southern form. Probably the Dutch growers imported them from China. I find the main point in their culture is to let the foliage dry off completely and to let the bulb dry off too, if one wants a good bloom.

"I have tried all sorts of land and soil types, rich in humus and otherwise and without any particular benefit to the bulbs one way or another. The best results that I have experienced came when I planted a large quantity of the bulbs in a large lath house or fern shed, covered with white cloth on all sides (muslin) and the top and ends as well. Nearly every bulb made fine growth and a good bloom under those conditions.

"With proper culture and care, which I am not always able to give them, we find them good, hardy, strong bulbs, practically free from

[LYCORIS RADIATA—HAYWARD, continued on page 64.]

[BREEDING CRINODONNAS—ANDERSON, continued from page 68.]

in Santa Barbara. The resultant seeds from these crosses have been a most interesting study. Some are pure white, some almost a transparent milky white, and some white seeds are completely covered with brown specks. Sometimes some pink and red seeds show up in the pod too, but I figure they have been contaminated by pollen from pink flowers 'sneaked in' by a bee; but I wont know till they bloom. I have segregated all these seed as to color and planted each batch separately. The shape of the seed varies too, some round, some oval and most of them, due to crowding perhaps, are pressed into eight sided cones, the shape being similar to a cut diamond with many facets, coming to a point at the bottom and rounded on top.

At the time of this writing, these whites are just beginning to bloom and are as varied as can be; ruffles and apricot throats, pure whites and tailored whites, creamy colors and some with pink edges, but most of them are yet to bloom in the next few weeks.

AMARYLLIS BREEDING NOTES, 1958

JACK SCAVIA, *California*

In the past 12 years since the writer started collecting amaryllis there has been a great improvement in the hybrids offered on the market.

Fig. 13. Hybrid *Amaryllis*—hybrid white clone crossed with *Amaryllis psittacina*—produced by Jack Scavia.

While the Dutch growers, particularly Ludwig, have offered more and better named clones, the general level of seedlings offered is vastly superior to those of the mid 40's. In the writers case, vegetative propa-

gation is practical only when increasing some radically improved form; propagation by seeds from crosses using parents with extreme differences in color, size, form, time of bloom, etc., often produces seedlings with unique characteristics. There are always some seedlings that resemble one parent, some the other and many totally different; many have to be culled out, but usually a few are worth keeping for breeding, or rarely, for vegetative propagation.

Using a near white as the seed parent and the species, *Amaryllis psittacina,* as the pollen parent produced many interesting seedlings, two of which are worth further developing. One has the form of the seed parent, plus vertical stripes and featherings of red (Fig. 13); the other has the form of *A. psittacina* with more white than the species shows.

Fig. 14. Hybrid semi-double *Amaryllis*—hybrid double seedling crossed with the clone 'Helen Hull'—produced by Jack Scavia.

Crossing a red (natural mutation) with 10 tepalsegs with pollen from the double clone 'Helen Hull' produced, along with many singles or 6 tepalseg types, a number of multi-tepalseg forms. A few of these are scarlet selfs, with 10 tepalsegs opening flat, five overlapping five, 10 anthers and 1 style (Fig. 14).

One of the most interesting aspects of various forms of doubles amaryllis is the unfixed quality of the flower. Many mutations have one bloom with 8, 10, 12, or 18 tepalsegs while other blooms on the same scape are natural, with only six. In the case of some double forms, the anthers are often part of the tepalsegs, lacking filaments and rarely of the same number; often the stigma is deformed or even absent. Perhaps, when the bulbs produce the same number of anthers as tepalsegs, with a perfect stigma and each bloom on the same peduncle is identical, the cross may be called stable or fixed.

MIXING POLLENS IN AMARYLLIS BREEDING

J. GURRAD METZ, *California*

My interest in Amaryllis breeding dates back approximately sixteen to eighteen years when I acquired a few Mead Reginae strain, *Amaryllis* x *degraaffara,* bulbs. In the following years I increased and improved my collection by additions obtained from Mrs. Sherman's rather fine collection of Diener reds, and Mr. Lemon's collection of seedlings of good

Fig. 15. Hybrid *Amaryllis*—red with irregular white markings obtained by J. Gurrad Metz. Photo by Jack Scavia.

form, mostly variegated colors. The resulting seedlings from cross-pollinating within this collection proved to be average.

In 1953 I purchased a few bulbs of the Ludwig Leopoldii strain, *Amaryllis x pearceara.* When the bulbs came into bloom, I decided on a new method of pollinating. I selected four bulbs in bloom that were noteworthy in color, form, and so on. The pollen was then removed individually from the flowers of the first three bulbs, and applied likewise, as a single application to each of the three arms (lobes) of the stigma of the four bulbs in bloom. This pattern was repeated until all four blooms had been pollinated. The final result was that twelve crosses instead of the usual four had been made.

I also tried another method. I selected three or four of the most desirable blooms, removed the anthers, and placed them together on a piece of waxed paper. The pollen was then removed from the anthers and mixed thoroughly with a toothpick. This mixed pollen was used to pollinate several different selected clones then in bloom. I found out later that Dr. Traub (1940) had used a similar method in breeding *Hemerocallis.* I resorted to the above methods of pollinating because the usual method of making single crosses is altogether too slow. I feel that not only time is saved in using the new methods but also greater

opportunity is presented for obtaining the greatest possible number of recombinations of color, form, and so on.

The illustration (Fig. 15) shows one of the worth while clones that were obtained by the use of these methods. It is a red with irregular white markings.

Literature cited

Traub, H. P. Daylily Breeding in Subtropical Florida. HERBERTIA, vol. 7. 1940. See pp. 152-154.

OPTIMUM ROENTGEN (X-RAY) DOSAGE FOR HEMEROCALLIS SEEDS (ABSTRACT)

Mr. Graf Shults of Baltimore, Maryland, an enthusiastic *Hemerocallis* breeder harvested 9,000 plus *Hemerocallis* seeds from his choice hybrid stock in 1957. At Johns Hopkins University, Baltimore, Maryland, these were weighed out into units of 20 grams each and exposed to varying dosages of X-rays through the courtesy of Dr. Carl P. Swanson and Dr. William H. Kammer in order to determine the optimum roentgen (X-ray) exposure for maximum potential mutations in the living material. The unit of exposure was as follows: (a) the voltage applied was 250,000; (b) the intensity was 20 milliamperes; (c) the dose rate was 21.3 R/sec.; and (d) the filter used was 1 millimeter aluminum. The roentgens (X-rays) applied to the 11 lots ranged from 500 to 5,000 roentgens as indicated in the following table:—

Lots	Number seeds	Roentgens	Seeds germinating	per cent germination
1 (control)	850	No exposure	180	21.17*
2	850	500	175	20.58
3	850	1,000	130	15.29
4	850	1,500	128	15.05
5	850	2,000	93	10.94
6	850	2,500	73	8.58
7	850	3,000	63	7.41
8	850	3,500	50	5.88
9	850	4,000	44	5.18
10	850	4,500	40	4.70
11	850	5,000	12	1.41

* 90 per cent germination is not unusual if planted in fall or immediately after harvesting.

The treated seeds were planted by Graf Shults on June 15, 1958 on wet newspaper covered with peat; the peat was covered with white sand, and the beds were protected with wire-screen. The counts were made on Sept. 2, 1958.

On the basis of this experiment, it is suggested that the optimum X-ray dosages for maximum potential mutations in *Hemerocallis* seeds are 3,000, 4,000 and 5,000 roentgens.

ZEPHYRANTHES RUTHIAE CLONE 'RUTH PAGE'

THAD M. HOWARD, M.D., *Texas*

This hybrid clone was the product of a series of crosses involving *Zephyranthes citrina* and *Z. rosea* made in the summer of 1952, in hopes of creating an intermediate orange-flowered *Zephyranthes* hybrid. Hybridity was evident in some of the seedlings from the beginning, and these flowered two years later, in 1954. Although the elusive orange flowers did not materialize, it was apparent that two distinct rose-flowered hybrids from these crosses had considerable merit. The best hybrid of the two was christened 'Ruth Page' (Fig. 16) in honor of a former school teacher of mine and was Registered in 1958 HERBERTIA. The second hybrid was named 'Eubank'. The remaining seedlings were maternal forms of *Z. rosea* and did not flower until several seasons later.

Fig. 16. *Zephyranthes* x *ruthiae* clone 'Ruth Page'.

'Ruth Page'—This is a new *Zephyranthes* hybrid clone resulting from crossing *Z. citrina* ♂ x *Z. rosea* ♀. An extremely vigorous clone, it shares many characteristics with its seed parent, *rosea,* but is half again as large in its floral parts, and the foliage is more upright. It bears no resemblance to *citrina,* its pollen parent. The flower is rose-pink with a white throat. The smoothly textured segments are faintly veined with darker rose lines, creating a curious "checkered" effect. The thin flat foliage is dark glossy green, reddish tinged at the base, and upright. The flower is characterized by a long slender declining style and prominently trifid stigma. The pedicel is 1¼ to 1½ inches long, and the green tube is ½″ long. The flower itself is 2½-3 inches across the face, and very graceful. Mature bulbs are nearly an inch in diameter. Offsets are freely formed.

Although the writer made many attempts at crossing the yellow *citrina* with the pink *rosea,* the first results were failures. It was found that seedlings from *citrina* produced only maternal forms. It was more difficult to get *rosea* to set seed, and when it did set seed, the seeds were produced in scant numbers with only a small percentage of the seed being viable. Many of the seedlings lacked vigor and did not survive, but it was apparent that two of them had hybrid vigor. It would seem that nature had made *Z. rosea* very miserly with her seed, and had placed many obstacles in the path of the hybridizer.

Of the two hybrids, one had foliage similar to *rosea* in color, while the second had darker foliage tinged red at the base and made numerous offsets. A year later it had a sizeable family, and by the time it bloomed there were ten offsets present! The first bud of this new hybrid was watched with much interest and high hopes, but the hopes quickly vanished when, instead of the sought-for orange color, the developing bud assumed a deep rose-red hue, typical of *Z. rosea.* Nevertheless, the opening was anxiously awaited. A grasshopper had been anxious too, for the flower was found toppled that morning, with the large insect greedily munching on the stem. The grasshopper was immediately killed, and the flower placed in water to complete its development. It was noted that the flower was intermediate in size between *rosea* and *grandiflora* but more graceful and smoother in texture than either, but it was not until the following year when the mother bulb and many of the offsets flowered in the garden that I realized its true merit. It set seeds, though not necessarily in any abundance, both when selfed and when pollinated by other species. It was obvious that this was a hybrid not only good in its own right, but one that might serve as the basis for many other new hybrid generations. Later results proved this assumption to be correct. By using various species as pollen parents, I have succeeded in achieving my goal—an orange hybrid. In addition, I have obtained shades of pink, rose, salmon, and apricot, from the seedlings of 'Ruth Page'. By contrast, the sibling 'Eubank' has increased at a painfully slow pace. Though as large as 'Ruth Page', it is of a paler hue with a prominent green throat and of slightly different form. It too seeds freely.

Perhaps a word may be said for the "maternal" siblings that were produced alongside 'Ruth Page' and 'Eubank'. They did not flower until five years later, and when they did, they proved a puzzlement. They are much smaller in all parts than the common forms of *rosea,* with deeper colored, more pointed segments. What is more, they rarely produce flowers with the normal number of segments, most of them having several extra segments. Perhaps they are hybrids themselves or perhaps they are only variants that one might expect to find among *Z. rosea* as found in their native habitat.

BACKHOUSE RED TRUMPET NARCISSUS

W. O. Backhouse, son of the well known Mrs. R. O. Backhouse of pink daffodil fame, submits this photo (Fig. 17) of his special strain

of red-trumpet daffodils. The color is HCC 15/1 or 16/1; fire red or poppy red.

He has been breeding to obtain red cups for some thirty-five years, employing the red eye of poeticus material and gradually working it into semi-trumpets and then trumpets. Poor trumpet shape and other undesirable features as well as the recessiveness of the red color gene has made his project a difficult one. However he had one advantage over most breeders, he was a plant breeder by profession and did much to-

Fig. 17. Hybrid Narcissus—red-cup clone originated by W. O. Backhouse in England.

ward improving Argentine wheats and other South American agricultural products. During the last few years he was associated with a large fruit corporation down in the Patagonia area, but the unsettled conditions in the country finally caused him to return to England.

The trumpets of his recent red daffodils have finally improved in form, and the example is really show material with a good deep yellow perianth except for one disappointing feature, a relative short scape. Never-the-less this is a real achievement and Mr. Backhouse is to be sincerely complimented for his efforts.—*L. S. Hannibal.*

[**PLANT LIFE LIBRARY**—continued from page 164.]

struggle for survival between the newcomers and the original species. The author concludes with an exposition of the role of conservation in preserving variety in plant and animal species. Highly recommended.

TIME, LIFE AND MAN, by R. A. Stirton. John Wiley & Sons, 440 4th Ave., New York 16, N. Y. 1959. Pp. 558. Illus. $9.00. This excellent new text on the methods and principles of paleontology by an outstanding authority is designed primarily for an introductory course. The first five chapters deal with general principles. A chapter each is devoted to history of paleontology, and classification. Seventeen chapters are concerned with a chronological presentation of the sequence of life from the Pre-Carbrian to the Pleistocene. Special chapters are devoted to selected subjects such as foramifera and oil, highlights in the evolution of plants, and animals, dinosaurs, ammonites, birds and man. Highly recommended.

PLANT CLASSIFICATION, by Lyman Benson. D. C. Heath & Co., 285 Columbus Av., Boston 16, Mass. 1958. Pp. 688. Illus. $9.75. This stimulating elementary text on the classification of vascular plants by an outstanding authority is designed for college students and the educated public. The flowering plants are considered under the headings of vocabulary for describing plant characters, the process of identification, preparation and preservation of plant specimens, and the basis for classification. The gymnosperms and pteridophytes receive similar treatment. In addition there is a section on the association of species in natural vegetation. Highly recommended.

THE STRATEGY OF THE GENES, by C. H. Waddington. Macmillan Co., 60 5th Av., New York 11, N. Y. 1958. Pp. 262. Illus. $4.00. This stimulating book by an outstanding authority is concerned with the two fundamental problems of theoretical biology,—(a) the nature and organization of biological processes which results in things having definite and characteristic structures, and (b) how evolution brings into existence organisms so well adapted to the requirements of their life. This is required reading for all who are seriously interested in biology, particularly geneticists and students of evolution.

THE SLOANE HERBARIUM, revised & edited by J. E. Dandy. Published by British Museum, London, England. 1958. Pp. 246. Illus. This is an annotated list of the horti sicci comprising the Sloane Herbarium, now at the British Museum, with biographical accounts of the principal contributors together with some information about these specimens; indices to geographical localities and botanical names; and facsimilies of handwriting. It is based on records compiled by the late James Britten, with an introduction by Spencer Savage, and is now revised and edited by J. E. Dandy. The book is not a catalogue of specimens in the Sloane Herbarium but is a guide to its contents. The publication of this book should stimulate renewed interest in this Herbarium which contains various type-specimens, particularly of Linnean species.

PLANT BUYER'S GUIDE, 6th ed., by H. Gleason Mattoon. Massachusetts Hort. Society, Boston, Mass. 1958. Pp. 298. $15.00. This completely revised new edition of the Plant Buyer's Guide brings the subject up-to-date. The expanded guide is now world-wide in scope, and lists double the number of plant sources, with a consequent increase in the number of species included. The book is organized into three main sections: (a) sources of stock, by states and foreign countries; (b) special lists: African Violets, Begonia, etc.; and (c) available plants, alphabetically by genera and species. To keep the guide up-to-date in the future, supplements will be issued periodically. Highly recommended.

NOMENCLATURE OF PLANTS, by H. St. John. Ronald Press Co., 15 East 26th St., New York 10, N. Y. 1958. Pp. 157. $2.50. The author points out that an effective way of training botanical students in nomenclature is by having them take part in the doing of it, and the nomenclature case method has been adopted for this reason. Several hundred actual cases are outlined that may be assigned to students. Highly recommended to students of systematic botany.

[**PLANT LIFE LIBRARY**—continued on page 168.]

4. AMARYLLID CULTURE

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

EXPERIENCES WITH BRUNSVIGIA ORIENTALIS

Mrs. Leonard Swets, *Riverside, California*

Being very fond of unusual bulbs and especially amaryllids I ordered seeds of *Brunsvigia orientalis* (L.) Ait. ex Eckl., under the synonym *B. gigantea* Heist. ex Schult. f., from the late Miss Kate Stanford in Stellenbosch, South Africa.

Fig. 18. Flower scape of *Brunsvigia orientalis* (L.) Ait. ex Eckl. as grown at Riverside, Calif., Oct. 7, 1945. Photo by Mrs. Leonard Swets.

On June 27, 1934 I planted them in a flat. They grew very slowly. When the bulblets were about 2 years old, I planted them outdoors. Cool weather did not seem to hurt them as several winters the temperature did go down to 25 degrees. In September 1945 three of the bulbs bloomed for the first time, and they were well worth the long wait. The flowers are spectacular and hard to describe (Fig. 18). Without foliage the stalk rises in a few days to about 20—24 inches in a form of a candelabra, 16 inches or so in width, 20 to 30 flowers in a scape. The color is a lovely coral in the form I have. In a few weeks the whole flower fades to a straw color. When fruits are ripe the whole stalk becomes detached and rolls away if you don't watch.

I have given away many seeds, but so far have not heard of anyone blooming it. The bulbs have not multiplied at all. The leaves are

produced after blooming, 4—6 very large, and they lie flat on the ground, somewhat like *Haemanthus coccieus,* but are large and exotic looking. I tried growing a few bulbs in pots but the foliage grew smaller and none of them bloomed. In early spring the plants go dormant. I rest them until the end of August then water deeply. They bloom here in late September or October.

GROWING AMARYLLIDS IN NORTH FLORIDA

Beckwith D. Smith, *Jacksonville, Florida*

The purchase of the John T. Weisner collection of named Dutch and hybrid *Amaryllis* in 1957 by the writer was reported in 1958 Herbertia, page 71. These bulbs were dug in April of 1957, but due to an overgrowth of chickweed and a heavy infestation of slugs the leaves had little chance to survive or develop, and due to a very rainy spring the roots had all rotted off without exception. Therefore, when they were transferred to Jacksonville into a different growing medium, it took all their strength to recuperate and produce new roots and leaves. So, this year, I was unable to do anything with them in the way of further crossing due to their lack of vigor, and it will be another season before any material advance can be made. Very few of the bulbs produced flowers and none were up to par. However, the growing beds were rearranged this year, with a view to affording better growing conditions, particularly with respect to internal drainage. More sand was incorporated and more granulated peat was added to make higher beds, and, of course, sheep manure and bone meal added in moderate amount for a steady diet. I am happy to report that most bulbs have now recovered, and an examination of numerous ones indicate they have set out new root systems; consequently, more leaves are showing. Since the bulbs are almost normally large, averaging three inches wide, I am looking for good blooms during the spring season of March and April, 1959.

In seedlings of my own Dutch hybrid crosses which bloomed this year, two only are outstanding. One is a large orange color with almost luminous green throat, hard to describe. Flower, eight inches wide, petals overlapping, reflexing after the first one or two days to a rather flat, flaring face. The bloom is quite graceful. The other is a seedling of 'Nivalis', selfed, and also presents a large bloom of similar size, brilliantly white and of good form and substance. Neither of these seedlings have been named. It is my opinion that they should be bloomed another season to determine if their character remains stable.

During April, this past spring, I ran into a most odd situation on the fringe of my own neighborhood. Mrs. Smith and I had gone for a drive on one Sunday afternoon, and she called my attention to a growth of near-white Mead *Amaryllis* in the yard of a home several blocks away from our house. Since they were large flowers for the Mead strain, our curiosity was aroused and we stopped and inquired of the owner if he would be agreeable to selling some of them. It developed that he

wanted a solid red of Dutch origin, and having blooming bulbs of these. we made a trade, plus a little cash outlay on my part. At any rate, I came away with six big bulbs.

The blooms in this man's garden were varied in their nearness to a pure white, some having a darker pink or red stripe, and some veined with a very light degree of color. The bulbs I obtained were large, as I have said, none of them being less than four inches in diameter, and each had one or two bloom scapes, foliage long and heavy and with vigorous root systems. He had a sandy loam soil in which the bulbs were grown, and he reported he used chicken fertilizer to make them grow.

All bulb plants were immediately potted up in seven inch pots, and within a short period of time began to bloom. Five bloomed out with light stripes, all being good material for pollinating. The sixth bulb took another week to bloom. At first I thought it would be like the other. It put up one scape which showed the characteristic color, and I began to lose interest. However, it produced a second scape, and upon the opening of the four blooms showed partial change. Each bloom was a pure glistening white, with just a touch of light green in the throat. The flower measured a full eight inches and was most startling to observe.

All of the blooms of five of the bulbs were pollinated with pollen from 'Ludwig's Dazzler'. The blooms of the white Mead plants were selfed on two blooms and the other two were also pollinated with pollen from 'Ludwig's Dazzler'. All set seed satisfactorily, the pure white one produced about twenty five seed, and these are now growing in a row in the garden. It remains to be seen what will be developed in the next two or three years.

In later discussion with the gentleman, it was ascertained that he knew utterly nothing about pollinating the flowers, nor of any method of propagation other than, as he said: "they just grew and multiplied naturally". He had been growing this stock of bulbs for several years and stated he had never before observed a plant to produce white blooms without a trace of color. I demonstrated to him the method of pollinating to obtain seed, and he was most grateful.

This change in color was a paradox for me as for many years I had struggled with the problem of trying to develop a pure white Mead through selective interbreeding, with minimum success. A further note on this most interesting plant is that the leaves are much thicker and wider than on the usual Mead plants, the color being a dusty, bluish green of most attractive hue. The circumstances of finding this bulb leads me to wonder if other *Amaryllis* growers have ever encountered a similar situation?

More of my seedlings of Dutch hybrids will come into bloom next spring, and if North Florida does not have a too severe winter, perhaps there will be more to tell and perhaps pictures to be obtained if some of them are worthy of note. We live in hope always. Next year is always going to be a "better bloom year"—so we wait the new spring of 1959 with great expectations.

EXPERIENCES WITH HYBRID AMARYLLIS

Mrs. Fred Tebban, *Illinois*

A couple of years ago I wrote an article for Herbertia in which I told of two experiments I was trying out in amaryllis culture. One was the use of fluorescent lighting to promote growth while wintering the bulbs indoors, and the second was foliar feeding during the summer while the *Amaryllis* were summering outdoors. I thought there might be some who would be interested in the results of these experiments so I will tell you of my conclusions.

The fluorescent lighting has proved a wonderful aid in growing the *Amaryllis* indoors after the dormant period is over and growth begins, in late February or early March. Since our springs are so late here the growing bulbs cannot be placed outdoors until after Decoration Day. This means they must grow indoors for more than three months in most cases. I have placed the fluorescent lights over the plant tables and keep them lighted from twelve to fourteen hours each day. They are about sixteen inches above the tops of the pots so that the leaves will not grow too tall and weak. I do find, however, that this foliage grown under the fluorescent lights must be hardened by being placed first in shady locations before exposed to the direct rays of the sun. This prevents the burning and ruin of the foliage. After a few days they can be placed where the direct rays of the sun fall on the plants although I try to arrange for some afternoon shading all during growth. The operation of the fluorescent lights has proved to be quite inexpensive too, as they are much cheaper to operate than the incandescent type.

As for the foliar feeding program, I have almost entirely discontinued it. In most cases it produced fine, husky foliage, but no more bloom than other methods, and in a few cases did great harm when the fertilizer used drained down among the scales of the bulbs and caused decay. The bulb scales in some bulbs seem to grow more tightly than in others but in the bulbs where the scales would permit the liquid to settle at the base of the leaves, much harm was done so I feel that foliar feeding of amaryllis is not worth the time and effort expended on it.

This year in my fertilization program I have used a new animal compost in my potting soil. This comes from the stockyards and is used in place of stable manure and guaranteed not to burn. I am also using a fish emulsion which I think very good indeed, and have used muriate of potash in solution several times over the summer. I think this solution of muriate of potash has done much to stimulate growth in the bulbs that always are slow to start growth and next year I shall use it earlier and perhaps more often than I have this season.

I was much interested in reading Reg. F. Harradine's article on *Amaryllis forgetii* in the 1957 issue of Herbertia. About five years ago Mrs. Edith Strout sent me a small offset of *Amaryllis foraetii* and told me there were very few of these in the United States. This offset has grown very well and is now a bulb more than two inches in diameter but has never bloomed for me. After reading Mr. Harradine's article I have

kept mine "dust dry" since June first, and find that a first leaf tip is now showing above the long neck of the bulb. I shall watch for the sign of a bud tip showing soon for the bulb is certainly larger than many he describes as having bloomed.

Two or three new Dutch Hybrids were added to my collection also, of the Ludwig strain. 'Pinksterflower' was very nice indeed and will long be a favorite of mine. 'Fantasy' proved not much different from 'Candy Cane' and 'Daintiness' not too different in shade from the other Dutch pinks I have. Thus far 'Tristan', Van Meeuwen strain, is my darkest red and very nice in both form and color. I have a few of the Japanese bulbs just appearing on the market and a few from India but these are probably no better than our American hybrids. To date none of these have produced bloom so I am not in a position to evaluate them.

AMARYLLIS STRIATA FORMA FULGIDA

DOUGLAS D. CRAFT, *Illinois*

In the fall of 1956 the writer received, from Mr. Wyndham Hayward of Florida, two healthy, medium sized bulbs of *Amaryllis striata* forma *fulgida*. Mr. Hayward's instructions were to plant in a "fertile, light leaf mold type, sandy loam" with "good drainage." Mr. Hayward also stipulated that this Amaryllis "wants half to full sunshine." The writer planted these in a soil formula consisting of one part Fertilife (an organic compost sold by the Chicago Stockyards), one part soil containing much leaf mold, one part fine beach sand, one part small round polished river gravel, one third part of charcoal the size of small gravel and one heaping tablespoon of bonemeal. The soil mixture was very sandy and friable in texture.

Both bulbs were planted in the round, wooden tubs supplied by most seed supply houses. A tub selected was nine inches in diameter and eight inches in depth. A two to three inch layer of small cobblerock was used at the bottom of the tub. A layer of small gravel was added. Cut sphagnum moss was then added to encourage more root growth until the tub was half full of drainage material. The remainder of the tub was filled with the soil mixture described above. Bulbs were then set in the soil which was sifted about the slightly spread roots. The bulbs practically rested on top of the soil with perhaps one-quarter inch of the bases of the bulbs buried. They were lightly watered and set in a sunny south window to root and to grow.

After the first blooming in the Spring of 1957, liquid manure the color of dark tea was fed every other week. It is possible that feeding could have been oftener and in lesser strength, but the writer lets the soil dry somewhat between waterings. Too much water has encouraged rot on other *Amaryllis* in the past. Six or more weeks after flowering or when roots are firmly established, a tomato food chemical fertilizer high in phosphorous and potash, 3-12-13 formula, was used interspersed with

the liquid manure. This, according to Mr. Kaiser at the Garefield Conservatory, encourages bulb and bud growth necessary for following bloom. A well rounded teaspoon per tub was used at six weeks intervals. This fertilizer was scratched dry into the soil about an inch and one-half from the bulbs and watered well into it. Caution should always be used in the application of any chemically compounded fertilizer as it has been known to cause root and plant injury through burning of the root system. D. D. T. was watered into the soil about three times during the year and plants were sprayed with a 50% Malathion solution at least twice during the year as an insect control and general disinfectant.

Fig. 19. *Amaryllis striata* forma *fulgida* as grown by Douglas D. Craft in Chicago, Ill.

Amaryllis striata forma *fulgida* (Fig. 19; see also Cover Design) bloomed three times for the writer during the year . . . spring in the house, July on the fire-escape porch, Thanksgiving in the house. It produced three scapes in the spring, two in July, and two at Thanksgiving time. It has not bloomed during the spring of 1958 as yet but in the interim of various blooming, it has produced approximately eight

to a dozen young offsets a few of which have been given to interested friends.

In this locality, the summer rains if not too heavy and violent seem to help this beautiful *Amaryllis* to thrive. With the before mentioned care, this *Amaryllis* is recommended to all those interested in Amaryllis and especially those interested in the species. It is especially recommended if you must raise your *Amaryllis* in pots because of climate and space conditions as does the writer. Its bloom is a beautiful shade of pale orange and indeed it is one of the most graceful and flaring flowers in our collection. It should be one of the first species added to a collection whether that collection be of hybrids or species.

It should also be remarked that this *Amaryllis* seems to be one of the evergreen species. From December to the end of February or its dormant stage with the writer, water was given only enough to keep the leaves from shriveling and the roots from drying out. This would average about once a month. The dormant period would seem to vary with its last blooming period.

POSTSCRIPT—"ROOTONE with fungicide", a root hormone put out by the American Chemical Paint Company, Ambler, Pennsylvania, dusted on bulbs at planting time seems to encourage strong root growth.

DAFFODILS FOR SCHOOL CHILDREN

J. S. Cooley, *Maryland*

This past year the Beltsville Garden Club put on a project of giving a bag of mixed *Narcissus* bulbs to each pupil in the elementary school. The bulbs were grown and packaged by two of the members of the Garden Club. The total number required was about 600 packages. Six of the school mothers distributed the bulbs at a stated time during school hours. Each pupil receiving a bag of bulbs was expected to plant them and to exhibit the flowers at a meeting of the Garden Club some time during the next spring.

The display of the flowers at the Garden Club meeting in the following spring attested to the success of the project. The children were highly enthusiastic over the showing made by their flowers.

In this project, the children had a chance to plant, cultivate, fertilize, watch the growth and bloom of their plants in their own little gardens. We are hoping that the interest in plant life thus started may be the beginning of a life long gardening avocation. We commend a daffodil project such as this to garden clubs generally.

AMARYLLIDS IN LANDSCAPE DESIGN

Mrs. A. C. Pickard, *Houston, Texas*

Gardens have varied significance to different people. Privacy, retreat, way to health—all are words often used in defining the need for gardens. For those who are creating living beauty are living life to its fullest.

The American home owner's garden is becoming almost as essential as his dwelling. It is no wonder that a recent survey placed gardening among top American hobbies. As gratifying as it is to see this desirable trend toward horticulture and gardening, there is much evidence that more interest is placed on planting instead of planning; this is the failure to recognize the importance of garden design.

The real challenge in designing a garden is to decide first what is desired or needed. Then, by knowing their best position, character and relation to each other, plant materials may then be worked into the picture. Plant materials in the overall design must have form, scale, texture and color. The coarse texture of broad leaved evergreens, and the finer textured smaller leaved foliage give the much desired airy effect. Contrasting foliage and textures also lend interest to the overall garden design. Seasonal color added for accent of points of interest will complete a pleasing picture for the average gardener.

Most of us dream of a carefree garden. At least one that will not require making over every year. We also want "something different" of a few flowers that are not found in every garden. Into this picture *Amaryllis* and related bulbs can be used. For most gardeners, a reasonable degree of similarity in life expectancy should exist in all of the plants in a given grouping, simply because you do not want to be bothered by replacing deceased members every year or two. Eager spreaders and bashful shrinkers should be avoided in the same partnership. *Amaryllis* bulbs as a class are quite free from these faults. Even the newly developed Dutch hybrids are adequate to a wide variety of climatic conditions and if properly planted will thrive with a minimum amount of care almost indefinitely.

Fascinating colors in flower sizes from dwarf to mammoth are available in the hybrid *Amaryllis*. To achieve the finest in our gardens, much thought should be put on color as well as on design and arrangement. Don't be afraid to mix colors. They are usually separated by green foliage or planted among green foliage plants. The attractiveness of the very dark reds is brought out by planting a grouping of white or light shaded ones near them. Here the companionable variegated foliage plants could soften the effect.

The number of plants to use in grouping depends upon the size of the garden. Too many different kinds make a confused and unsatisfactory composition. The pleasing shades of pink *Amaryllis* fulfill every gardeners desire for magnificient effect. Spot-light the entrance or terrace where they will be enjoyed at very close range. A grouping of the spectacular shades of rose and fuschia-pinks which are available in the named *Amaryllis* clones with an underplanting of white Sweet Alyssum are breathtaking in their beauty. If you already have shrubbery masses you might add a group of the lovely salmon colored *Amaryllis* with a lesser number of whites. Do not forget that while all the colors mentioned may play the part of leading stars in the parade, they

need a supporting setting to make the picture complete. White, pink and rose hues are charming when combined with plantings of *Adinatum pedatum* (Maidenhair fern). This fern reaches a height of not more than two feet and the attractive rhythmic designs will fascinate even a casual viewer, especially where the garden is to be enjoyed at night.

Spacing the plants has a great influence on the finished effect and the effect is more finished when kept in scale. By planting some intermediate statured hybrids, as *Amaryllis striata* forms and graceful clones that are small and delicate along the border, a delightful color will flow from one end of the bed to the other. If space allows, you may be gay and lavish in the use of some of the lesser *Amaryllis* relatives—*Rhodophiala, Habranthus, Zephyranthes* and *Lycoris*—to extend the blooming season. Further extending the use of *Amaryllis* is the rather large group that enjoys our semi-tropic climate. They are the varied species of Crinums which lend a note of tropical beauty wherever planted. Their broad strap-shaped foliage is large and handsome and from the base of the strong bulbs, scapes rise three to four feet high with umbels of lily-like blossoms. You may be selective in your choice of color—from white through varying shades of rose, pink and wine. The *Crinum* species and hybrids may be used as specimen landscape material and they are not too exacting as to culture. They do need growing space for their theme song is "Don't Fence Me In". The lovely X *Crinodonna corsii* clone 'Fred Howard' (syn.—*Amarcrinum)*, a bi-generic hybrid of the Cape Belladonna, *Brunsvigia rosea,* is a valuable plant in my garden. It is more of a dwarf plant with large heads of very fragrant clear pink flowers all summer and fall.

Space will not allow mention of many more treasures related to *Amaryllis* that add special interest to the garden. The choice from available plant materials is surprisingly wide. This may be used to add the finishing touches to the garden including permanent borders and ground covering. If you are not already on familiar terms with *Amaryllis* hybrids, including some near relatives, join the ranks and get acquainted.

Good design, carefully chosen plants and meticulous garden housekeeping can make the smallest or shadiest city garden a source of profound interest and satisfaction and a thing of beauty.

HYBRID AMARYLLIS IN THE GREENHOUSE

J. F. Stewart, *California*

[Concluded from page 89, **Plant Life, Herbertia Edition,** 1958.]

The dormant season in the glasshouse, late fall and early winter, demonstrates the unpredictability of hybrid Amaryllis. Some will go completely dormant early, some late, some go semi-dormant but retain part of their leaves, and some continue growing right on through. Dormancy in full-grown bulbs probably is to be desired, and can usually be induced by cutting off the leaves and stopping watering. Young bulbs

should be kept growing all year around. Fertilizing should be stopped but spraying continued during dormancy.

As soon as there is indication of new growth, by the appearance of a bud or a new leaf, the regular culture should be resumed. Root growth should, and usually does, start before leaf or bud appearance. Frequently this is not so, particularly in the case of newly imported bulbs, which are raised in hot houses and are soft and delicate, and it is advantageous, or even necessary, to apply bottom heat. This we do by setting the pot deep in the hot-bed, and lifting it as growth is established. The extent of root development can be judged by the stability of the bulb. One without roots can be easily displaced, but one with good roots remains solidly anchored. This testing should be done carefully.

The normal blooming season in our glasshouse is during March and April, about two months earlier than outdoors, but there is sure to be at least one bulb in bloom at all times except possibly for a period of a week or two during late December or early January. This is being written during late December and nothing is in bloom at the moment, but there is one scape a foot high and several buds well started. Beginning in about two weeks there will be a continuous display of a varying number of gorgeous blooms. Anticipation is a grand emotion. Perhaps the world's most glorious Amaryllis will appear this year, or if not this, possibly next.

Growth activity can be stimulated by increasing the heat at the root zone, but our attempts to force blooms during the dormant season have been entirely unsuccessful. Any flowers we have had at Christmas time have been fortuitous.

After potting the soil should be kept moist until the bulb is well established, then watered only when the soil surface starts to dry out. The soil surface should be cultivated occasionally, but not when wet, to keep it loose, and for better appearance. Apply water at the edge of the pot with a slowly running hose or a sprinkling can with the sprinkling cap removed, to avoid washing the soil. Keep water from the tops of the scales and the axils of the leaves. Arrange the pots on the benches so that there is a clear space of a few inches between them to allow for good ventilation, growing room for the leaves, and accessibility for watering, cultivating, spraying, etc.

A spraying program should be established, using fungicide and insecticide at regular intervals, even though there might be no indication of infestations. Prevention is much more easily accomplished than cure. We are getting what now seems to be fair, but not complete, fungus control by a thorough application every four to six weeks of a commercial Bordeaux type of material containing 2¾% copper and some oils, soaking the soil surface at the same time. This material does not seem to damage the foliage at the dilution used, does not clog the sprayer, nor leave an unsightly residue. For insect control we are using a commercial spray, containing malathion, lindane, chlordane and thiocyanate, which is very effective. This is also effective against mealy bugs, but at the required strength for this it is quite liable to damage the tenderer

foliage. These two sprays are alternated, and applied soon after the pots are watered, so that the material will be undisturbed for as long as possible. A record of all spray procedure should be kept, showing dates and kinds of material used, as well as results.

Although the tissue of hybrid Amaryllis bulbs, including the roots and leaves, has a tendency to turn red as it deteriorates after physical damage, or damage by sprays, this does not necessarily indicate trouble, but there is a fungus, *Stagonospora* Leaf Scorch, which causes a red deterioration and is a most serious problem. Every effort should be made to control it when it appears. We have experimented to a limited extent with formaldehyde, mercuric chloride, and Bordeaux mixture as bulb dips. Any of the dilutions of formaldehyde used have damaged the bulbs, but it is possible that weaker solutions would be effective without bulb damage. The little experimenting with mercuric chloride seems to indicate that it might have possibilities, although the bulbs treated did show some set-back. A serious objection to mercuric chloride is its dangerous nature. Its fumes are a deadly poison and it should be handled only by those who are familiar with its characteristics. We still have a lot to learn about bulb dipping. Bordeaux mixture seems, at present, to be the best bet, both as a spray and a dip, and we expect to continue using it until some more effective, and safe, treatment is found.

Fertilizing potted stock is somewhat of a chore, since it is all hand work, must be done carefully, and requires a lot of leaning and stretching. The newly planted bulbs, whether dormant or active, are not fertilized for two or three months, or until they are established and growing well. From then on they are given 5-10-10 every six to eight weeks except during dormancy, about two teaspoons to a six or eight inch pot. Slip the small pointing trowel down flat against the inside face of the pot and, by turning it slightly and sliding it along, force the earth back to make a groove about an inch deep and most of the way around the pot. Distribute the fertilizer in this groove, replace the earth, and water it. It is usually recommended that no fertilizing be done in dry soil, but we have seen no signs of any damage having been done that way. We do not fertilize when the soil is too wet, but merely because it is bad practice to work wet soil. Fertilizers, being strong chemicals, should be kept from direct contact with the plants. Fertilizer left on the soil surface will mold. It should be covered or worked in. We have not used much liquid manure in the glasshouse, but do use some liquid ammonia as a booster at blooming time. Household ammonia is satisfactory at about one teaspoon to a quart of water.

For work in the glasshouse we use a ten inch brick-trowel, a brick-mason's small pointing trowel, and a small hand cultivator. There are also two galvanized twelve quart pails, a couple of demoted stainless steel stew-pans, a set of measuring spoons, liberated from you-know-who's kitchen, and some miscellaneous tin cans. The ten inch trowel is used for mixing and handling soil, for which it is much better and stronger than the ordinary garden trowel, and for some digging. The pointing trowel, a constant companion and a very pleasant tool to use, is handy for lifting seedlings, preparing pots for fertilizer, small cultivating,

working around and checking the propagating beds, and so on. The hand cultivator was originally three pronged but has been remodeled by having the long center prong removed, and the two short ones bent closer together until they are about ½″ apart. This is used in the pots, flats, seed beds, or wherever some scratching is needed. The tools are wiped clean and dry after use, to prevent rust, and because I like to see them shiny. There are some pieces of old bath towels hanging at convenient places for this and for hand wiping. There is a water valve with a hose connected at all times. A large thermometer, given to us by our plumber, hangs in a position to be readable from the doorway. We have a laboratory thermometer for checking the hot-bed temperatures.

Controlled breeding is best accomplished in the glasshouse. Since hybrid Amaryllis are of such diversified lineage, it seems impossible to predetermine the result of any specific mating, but cross-breeding should follow some plan, and complete notes be kept, so that any successful crosses can be repeated, and any information developed will be available for future use. A record should be kept of each cross, a marker with a serial number attached to the flower, which number should be kept with the seeds and bulbs until they have bloomed, and a complete history of the development kept in the notebook.

If the pollen is not to be used for breeding, the anthers should be removed from the flower before they have opened, and destroyed. If to be used, the anthers should, as soon as ripe, be transferred to a small container, such as a wide mouthed bottle or vial, being careful to protect the stigma from contact with any pollen. If the tweezers is used for picking the anthers, then the instrument should be cleaned in alcohol after each operation, to prevent mixing of pollen. Using brushes for pollination entails so much cleaning, or so many brushes, that we have adopted the procedure of making our own by attaching a wisp of cotton to the split end of a small stick, or applicator, about the size of a match but longer, with the aid of just a touch of glue. We keep one of these in each container, being careful not to misplace them, and destroy them at the end of their usefulness. When the stigma is ready for pollen it will have opened out and turned upward. It is at this time that it should be touched by the pollen laden cotten and a marker attached to the flower at once, since there might be a different cross on each flower of the scape.

Remove the seed pods from the stems when they start to split open, strip the seeds from the pods after the latter have ripened a short time, and store seeds in marked containers. Ordinary paper bags, grocery store kind, are the best thing we have found for this. They are left open until the seeds are cured. Fresh seeds stored in air tight containers will sweat, mold and sprout. Plant them as soon as possible, as germination seems to be best from fresh seeds, although we have raised many bulbs from year-old seeds.

There are a few remarks to offer in conclusion. Don't undertake such an extensive program that the great amount of work will tend to

dull the joy. Work with high grade material, and for high grade results, rather than quantity. It takes just as much work and expense, and just as many years, to raise an unsatisfactory bulb as it does the very best, and, I blushingly admit, most of us like to do a little quiet, and I hope not too obvious, preening over the gorgeous results of our own efforts.

CULTURE OF HYMENOCALLIS NARCISSIFLORA AND ALLIES

JOSEPH C. SMITH, *M. D.*

Southern California seems to be an ideal area for growing *Hymenocallis narcissiflora.* The writer started with a collection of sub-flowering sized bulbs ranging from three-fourth an inch to two inches in diameter and grew in one season bulbs that produced one and two flower scapes the following season.

It is reported from other parts of the country particularly from Florida that this species is difficult to maintain in a flowering condition when planted in the open ground. In this part of California it can be grown continuously in the ground, however, for reasons discussed below it is probably better to lift the bulbs annually. It goes dormant in the late fall and resumes growth in the spring about April when the soil is sufficiently warm. This is an average of about seven months of active growth and five months of dormancy.

Others conplain that their bulbs split into many sub-flowering sized bulbs and that these split again before they can grow them into a flowering sized bulb. It seems natural for this species to split each growing season, and the secret of success is to provide optimum growing conditions so that two or three of these splits return to flowering size the same season. Thus a large bulb may split into halves or thirds, and these new bulbs regain flowering strength as well as provide a number of smaller offsets for propagation purposes. Occasionally a large bulb will not split, but will produce a dozen or more small offsets while maintaining its own size. Again another bulb will produce no offsets at all or the whole bulb may turn into a cluster of offsets. There seems to be no way of predicting which will happen although more of the bulbs seem to maintain their size under the best cultural conditions.

The writer has had the best results in building up the size of the bulbs when they are planted in deeply tilled sandy loam to which is added a generous supply of peat moss. Regular watering and fertilizing are most beneficial. A standard brand lawn fertilizer was sprinkled on top of the soil in a dry form, care being taken not to get it lodged between the leaves. The writer burned most of the foliage off that way once early in the season by using ammonium sulfate, but produced a very excellent crop of bulbs that year. Good drainage is an essential. A deeply tilled sandy loam will drain adequately and the added peat will retain sufficient moisture between irrigations. The pH usually found during the growing season is 5.5 except following irrigation when it goes to 6.5 due to the local alkaline water of pH 7.5. It is possible

that warm days and cool nights play a part in the growth of this species. The night temperatures in this part of California are seldom higher than seventy degrees and are often only sixty to sixty-five degrees during a large part of the growing season.

It seems advisable to dig the bulbs each autumn in order that the soil may be tilled and the bulbs separated. At planting time they are spaced eight inches apart and no cultivation is given during the growing season other than to pull out weeds. A top dressing of pulverized manure is applied twice a season. Commercial production of these bulbs is feasible since offsets can be turned into flowering sized bulbs in two growing seasons.

Cuttage methods of propagation have been tried but this is hardly necessary with most clones, except possibly with 'Sulfur Queen' and *H. amancaes.* Bulbs that are accidentally cut in digging usually produce offsets in storage so no pieces are thrown away. Bulbs may be cut into halves or quarters in the ground after they have become well established and these will then produce a number of offsets of a size that will require two additional growing seasons to make flowering sized bulbs.

During the past season the writer had bloom the entire months of April and May from bulbs planted on the eighteenth of March. The second scapes which bloomed three to four weeks later than the first ones were responsible for prolonging the season. If a portion of the bulbs had been held back and planted at appropriate intervals the season could have been much longer. 'Sulfur Queen' flowered as well as the white forms. *Hymenocallis narcissiflora* is easily grown as a summer flowering bulb in the garden in any part of the country that has at least a five month growing season. In other regions it can be started as a pot plant indoors and transferred to the garden after flowering as they usually flower soon after being planted. One can not have too many of these fragrant flowers.

VEGETATIVE PROPAGATION OF HYBRID AMARYLLIS

J. F. Stewart, *California*

In the Amaryllis Society "Year Book" for 1935 were published two very comprehensive articles on this same subject, one by Ida M. Luyten, and one by Hamilton P. Traub, from which were obtained all the information I had when starting my work, and which should be read by anyone interested in propagating *Amaryllis.* These articles have recently been summarized in Dr. Traub's "The Amaryllis Manual" (1958). I follow in the footsteps of these authors with humility, attempting to justify this article by making an effort to supply helpful practical details.

I have never found any information to indicate that there is any way to perpetuate a true strain of hybrid *Amaryllis* by seeds, the only known ways being by splits, offsets, and bulb cuttage. The last named amounts to no more than a method of artificially accelerating the production of offsets. I have tried both the Luyten and Traub methods, and

have used soil, peat, and sand as media, and have obtained the most satisfactory results by using the Traub method of cutting, and sand as the medium. If the process described herein seems to entail a prohibitive amount of labor, be assured that you will find it is not so. The moment you decide to try bulb cuttage, the fun begins, and when, in checking the hot-bed, you find the first tiny bulb, all is forgiven. That is a "thrill that comes once in a lifetime". You at that moment become an addict, your creative instinct has an outlet, and from that moment on nothing that will further the process is too much work.

GLASSHOUSE.—It is questionable whether even in the warmer climates it would be desirable to have a propagating bed *elsewhere than in a glasshouse or similar enclosure,* but certainly not where freezing weather might occur, so only glasshouse culture is considered here. The house affords protection, for both the propagations and the propagator, from cold, wind and rain, and conserves hot-bed heat in cold weather. It should be of a size to accommodate the desired number of hot-beds, plus sufficient space for benches to hold the transplanted cuttings until they are ready to be put outdoors or into another glasshouse or lath-house. Large houses are better than small ones, but a hot-bed three feet by twelve feet will hold between two and three thousand cuttings. In a small house the hot-bed could be on one side and the pot bench on the other, while in a larger one the best place for the hot-beds is in the center. with the pot benches around the outside walls.

HOT-BEDS.—After trying, unsuccessfully, to propagate in a natural hot-bed, I investigated various kinds of artificial heat and decided that electricity would be the cheapest and by far the best. There are electric soil heating units of various lengths and capacities, as described later, but for a small operation the four hundred watt size, large enough for a bed of thirty six square feet, is about right. Because of space limitations ours are smaller. This, then, would determine the size of the beds to be built. The top of the beds should be about three feet above the floor, but to suit the proper working height for the person who is to use them. It is advantageous to have the beds no wider, from front to back, than three feet, because of the discomfort of working on material in the back of a wider one. The ideal size, then would be twelve feet by three feet. Two of these small units can be used to better advantage than one large one. As the amount of material in the beds is reduced by the continued transplanting of bulblets, and space becomes available, the remaining cuttings can gradually be moved to one bed, until everything has been removed from the second one, at which time it can be disconnected, with a consequent saving of electricity.

In our part of the country, California redwood lumber is used for long life in places exposed to the elements or in contact with the ground, and, among others, in glasshouses, although I believe cypress, cedar and others are used for similar purposes elsewhere. The bottom of our hot-bed is constructed of 1 by 6 six inch surfaced lumber with plain edges, set with enough space between boards to allow for expansion when wet. These boards should be supported by 2 by 4 inch joists not more than

three feet apart, which are supported at the ends by 2 by 4 inch legs. One half inch drainage holes are bored about 1½ or 2 feet apart in these bottom boards, to be covered later by pot shards, to retain the sand but release excess water. The sides are made of one width of 1 by 6 boards on edge, making the inside depth of the bed a little less than five inches. Galvanized nails are used throughout, not smaller than eight penny, and if there is any tendency for the lumber to split, lead holes are drilled for the nails. A shelf is provided near the electrical outlet to hold the thermostatic control unit. Protect this unit from water spray or drip by some sort of roof or shield.

HEATING ELEMENT.—Electrical soil heating units are not readily available at the usual retail stores, but should difficulty be encountered in obtaining them, write to the General Electric Company, Construction Materials Division, Bridgeport 2, Connecticut for information. We obtained ours from the General Electric Supply Corp. in Long Beach, California, and use 400 watt #HS11040 heating units and #HSC2 thermostat assembly. Heaters can be obtained for 110, 220 or 440 volt current, but since our house is wired for one hundred ten volts, that is the size we use. It would be economical to use the higher voltages for larger operations.

The HSC2 thermostats are plugged into a double utility outlet near the beds, and the heaters are plugged into the thermostat assembly boxes, which are on the shelf provided for them.

Attached to the thermostatic switch by a capillary tube is the sensitive bulb which is affected by temperature changes in such a way as to cause the switch to open or close. The temperatures of opening and closing can be adjusted, within the limits of the switch, by a control knob on the unit. Ours is set so that it will turn on at about 69°—70°F., and off at 82°—83°F. The sensitive tube, or bulb, is installed near the partition dividing the two beds, so that it will be in an area of average temperature, and will not interfere with the setting of the flats. It is set on a block of wood, laid on the bottom of the bed, which is of the proper thickness to hold the bulb at the same level as the inside bottom of the flats. The adjustment of the units is checked by a laboratory, or other reasonably accurate, thermometer, the bulb of which is inserted down into the sand adjacent to the bulb of the thermostatic switch, and changing the unit control knob to suit. This is a lengthy operation, since it takes a long time to change from maximum to minimum and back, and you have to be there when the switch clicks on or off, but it is necessary that it be done accurately before setting cuttings in the bed.

We have four beds, with only two in use at this writing, and the second two will be controlled, by the second thermostat. This will allow temperature variations for experimental purposes, or for two beds to be used for forcing while the other two are being used for propagating.

The heating unit is laid out on the bottom of the hot-bed, in the shape of a rectangular coil, with the outer wires about three inches from the sides of the bed and the ensuing ones from four to six inches apart, depending upon the size of the bed. Helpful information and illustrations are furnished with the units. The unit should be handled with

care so that neither the insulation nor the lead sheath are damaged, and the bends should be made with a minimum radius of two inches, never sharp. After the coil is laid out in a preliminary position, the spacing for uniformity is adjusted, the wire is straightened out to make a neat, workman-like job. Enough wire has to be left at the plug end to easily reach the outlet-box of the thermostat. Redwood lath, which is a little thicker than the heating coil, is cut into lengths to fit between the wires of the coil to keep them spaced. These are liable to split, so nail holes are drilled through them, and they are fastened in place with galvanized shingle nails. More laths are cut into lengths to extend full width of the bed and these are nailed down on top of the spacers so that the nails do not touch the coil. These strips are to protect the coil, and to support the propagating flats at a uniform level, far enough above the coil to allow a reasonably even distribution of heat to the cuttings.

FLATS.—The cuttings are set in flats, rather than in the open bed, to prevent loss or mixing, to keep all at the same depths where the heat will be uniform, to keep them, or their roots, from direct contact with the coil, and to allow for the removal of any group of cuttings without disturbing others. A flat just large enough to hold the cuttings from one bulb is the ideal size. You may eventually have several bulbs of the same kind to propagate, but at first you will probably have only one of a kind, and you will be cutting single bulbs at various times throughout the year, so these small flats will serve better than large ones.

Flats 10 by 15 inches inside, or 11½ by 16½ inches outside, will nest well in a twelve 12 by 3 ft bed, and will hold one hundred cuttings comfortably, more by crowding. A bulb seldom cuts into more than a hundred pieces. For the sides and ends of the flats use 1 by 4 inch finished redwood, making the inside depth 3½ inches. The bottoms are made of one-half inch redwood lath or battens, which will split unless nail holes are drilled. The wood swells when wet, so the lath should be soaked before use. The edges should be notched slightly so that water will drain easily but sand will be retained. Drainage is important. Standing water will soon become stagnant, especially at hot-bed temperatures.

PROPAGATING MEDIUM.—I have experiences with soil, peat, and sand, and the results were so much better with the sand that I use it exclusively now. It is common concrete sand, sifted through a one eighth inch mesh screen, and the fine dust is removed by washing. This is done by half filling a tub with sand, and then, with a fast running hose, filling the tub with water and agitating the sand with the hose jet so that the fine particles are carried away by the overflowing water.

The bulb of the thermostat is installed in the bed as previously noted, sand is placed in the bed level with the protecting laths, and the flats are placed in position. They are filled, and around and between them, with sand level with the tops of the flats. Then wet down the entire bed. This is the time to adjust the thermostatic control, before any cuttings are placed.

PREPARATION OF BULBS AND CUTTINGS.—Judging by my own experience, it seems advisable for the beginner to start experiment-

ing with something less than his most desirable bulbs, so that failure would not be a catastrophe. As soon as he begins to have confidence he should propagate only the best stock, and waste no further time on inferior material, since three years of time and effort is too much to spend on low grade bulbs. We propagate only named, or to be named, bulbs, and make it a rule never to cut a bulb unless we have another like it, or at least one off-set, so that we take no chance of losing something good. Include a wide variety, to determine which do best. Propagating any bulb less than three years old does not give maximum results, and the bulbs used should be strong and healthy.

After bulbs are dug, cut the tops down to within about a half inch of the swell of the bulb, trim the roots close to the base, wash bulbs thoroughly, cut off any dry or bad material, and dip them in a Bordeaux mixture for a few hours. After drying they are ready to cut. Keep a marker with each bulb, or each kind if more than one of a kind are cut.

For cutting use a knife having a thin blade at least four inches long, with a good point, and keep it sharp. Use a light, clean board, or piece of plywood, about two feet by three, and place it where you can sit down to do the cutting. Hold the bulb upright with its bottom on the board, and cut it in half by cutting down from top to bottom, as in halving an apple. Then in the same way cut the halves in two, the quarters in two, and the eighths in two, making sixteen segments. Lay a segment flat on the board and cut it into four, five, or six pieces, depending upon the size of the bulb, by slipping the knife between every other scale layer and cutting through the stem fraction so that each cutting has two layers of scale with some of the stem fraction attached. We have never known the very tender center sections to produce a bulb, so discard them. (Editorial note.—These may be used for experimenting; using hormones or antibiotics.) The cuttings from each bulb are kept in a separate container of cold water, with their marker, until ready for setting. We use Vitamin B1 in this water, and in the water with which the sand in the flats is soaked after the new cuttings are first set. The Vitamin seems to have a tonic effect, and we use it generously on cuttings, transplants, etc. It is well to cut a number of bulbs at one sitting, for economy of effort, and then do the setting in flats all at one time. Watch the markers. Clean up thoroughly after each operation.

SETTING CUTTINGS.—Spread about one half inch of moist sand over the bottom of the flat. Bank about three quarters of an inch against the far end, smoothing it with the small trowel and leave the face sloping slightly away from you. The cuttings will stay in place better against this slope than they would against a vertical face. Place the first cutting close to the left side, if you are right-handed, upright against the end sand, with the root zone end at the level of the sand in the bottom of the flat, and the hollow face of the cutting to the right. Press it lightly into the sand so it will stay in position, then nest the next one close to it, but not touching, and so on until the row is completed, which will be ten to twelve pieces. Then, with the trowel, place another three quarters of an inch of sand as at the end wall, place an-

other row of cuttings, and continue thus until the flat is full or the cuttings are all set. Water carefully but thoroughly, with Vitamin solution, settling the sand, and adding more sand, if necessary, to fill the flat to the top. Place the marker.

After the cuttings are set, keep the sand moist at all times, but be sure that the flats drain. Check the temperature regularly, and at the end of a month open the sand at one corner of the flat to see what has happened. There will normally be no bulblets started at this time, so if the cuttings seem healthy, replace them, water them, and hold your breath for another month. That should be the great moment. In opening the flat at that time you are quite sure to find some bulblets, and, if so, it would be well to go through the entire flat, remove bad material and decayed cuttings, and re-set the good ones as at first. When the bulblets have developed *a good strong leaf and some good roots* they can be transplanted, but do not transplant too soon, and lose them. They can be transplanted into four-inch pots or into flats, depending upon the number of cuttings involved and the ultimate destination. A little bottom heat helps at this stage if they are slow starting, but they should be hardened off after good growth is assured, if they are to be transplanted outdoors. For bottom heat the pots or flats are set part way into the sand of the hot-bed, and to harden off are set on top of the sand for a few weeks, then on the pot-benches for a few weeks. If they are to go outside at this early age they should be set outside in the pots or flats for several weeks before being transplanted. It is not entirely safe to transplant a bulb smaller than one inch in diameter to the ground outdoors. If to be grown on in pots or cans they can be transplanted the second year. Gallon cans or seven or eight inch pots are satisfactory, but my preference is the eight inch pot, which is large enough for offsets to grow to good transplanting size.

CONCLUSION.—Don't hurry things. Give the young bulblets time to develop before transplanting. Spray regularly with insecticide and fungicide, and keep everything as sanitary as possible. Ventilate well when the weather will permit. Use no fertilizers until bulbs are transplanted and growing well in their new locations.

Start now, take it step by step, be thorough, keep complete records, and the first thing you know you will have developed your own successful technique, and will be writing it up for the next HERBERTIA.

LYCORIS — OLD AND NEW

WILLIE MAY KELL, *Texas*

The Genus *Lycoris* is a desirable addition to the beautiful flowering bulbs in the gardens of the South, as most of the species make choice cut flowers, some of which will last a week when cut. For many years, *Lycoris radiata* was almost the only one generally found in these gardens, but was called "Guernsey-Lily" (=*Nerine sariensis)* until 1936 when the correct name of the species was reported as *Lycoris radiata* by Mr.

James of California and Mr. Hayward of Florida in the yearbook of the AMERICAN AMARYLLIS SOCIETY. This species is wide-spread in the gardens of the South, as they have been found to be hardy as well as easy to grow by the average amateur gardener, flowering brilliantly year after year. On the average they begin the first week in September here, when there are few flowers after the extreme heat and drouth of August and July throughout a large area of Texas.

In Florida, *Lycoris aurea* was to be found in very old gardens under the usual designation of "Hurricane-Lily", but was slow to be used elsewhere until later when its cultivation slowly spread along the Gulf Coast westward. *Lycoris squamigera* was listed for many years in the fall catalogues of bulb growers as *"Amaryllis hallii,"* and is often so listed as yet.

The season here opens with *Lycoris squamigera.* The flowers are beautiful in form and color, and make a choice cut flower which will last a week. In fact, the flowers open and mature so beautifully when cut and brought inside out of the extreme heat of the season of bloom. The size, form and color vary widely from flower to flower on different scapes and where grown in different locations. Those in full shade and a moist location being superior in size, color, and lasting quality as a cut flower to those in full sun with no ground cover. In some flowers, the edges were straight with only the tips of the tepalsegs curled back; others had the edges of the tepalsegs quite ruffled, and curved back sharply from the center of the flower, making a very wide-open flower. Some had much narrower tepalsegs, also very ruffled and curved back sharply. There was as much variation in the color shades on different scapes as well. The color was exceptionally good for most bulbs this season (1957) as there were abundant spring rains. The flowers numbered 4, 5, 6, 7, 8, and even a few with ten blooms to a scape. The diameter of the flower was 3¾″, tepalsegs 4⅛″ x ¾″. The color was #621/3 carmine rose (Horticultural Colour Chart which is used throughout unless otherwise stated) with tips of tepalsegs #640/1 wisteria blue and touches along the edges of the tepalsegs same or both having #628/2 to #628/3 Persian rose. Stamens were 1½″ long, color #031/2 Lilac Purple; pistil 2½″ long, color #031/1 lilac purple. The colors varied as the flowers matured. These have a slight fragrance. The first flower opened this season, July 27th and the last August 15th. Those in full shade and moist location were almost through before those in full sun and no ground cover started to flower and the flowers burnt very quickly. By August 7th, 58 scapes had flowered. This species does not make winter leaf growth, but when it does leaf out in the late February makes a quick and vigorous growth.

Lycoris incarnata started flowering August 1st. The first scape was 22″ long, with 8 flowers; tepalsegs 4″ x ⅝″; color of inside stripe #433 pastel mauve; outside stripe #027 magenta rose; background of tepalseg pastel mauve #433/3. On August 15th, there were scapes of 26″ to 27½″ long; tepalsegs 3¼″ and 3½″ long; diameter of flower 2½″; inside stripe pastel mauve #433; outside stripe phlox purple #632/2;

center edge of tepalsegs persian rose #028/2; stamens 1¾″ long, color lilac purple #031/1; pistil 2¾″ long, color 031; anthers orange. August 28th and September 3rd,—*Lycoris incarnata* growing in full sun and no ground cover burned badly. The flowers would not compare with those flowering earlier in full shade. One thing conducive to this was due to the fact that there was no measurable moisture for the entire month of August. We had spring floods when the water stood in the flower beds. The hard clay soil here has the property of becoming so impervious to water after the rains have stood and not drained off, it will hold water like a jug. But this is the condition of the soil which makes it possible for the ranchers and farmers to have their "Texas Tanks" for small earthern dams are thrown up and the overflow from big rains fill up these shallow or even deep tanks and hold water for long periods, thus giving stock water over the entire area. This delay in flowering was more noticeable in *Lycoris incarnata* than even in most of the other lycoris but was true of all lycoris grown in full sun. There was no winter leaf growth by December 1st.

Lycoris Houdyshelli had the first flower August 14th. One bulb was obtained from Mr. Hayward in May of 1949, and was planted at once in a location which was undoubtedly most favorable to its best growth. This bulb was marked "LYCORIS ALBA", but was such an outstanding flower of grace and beauty, that, from its first flowering, was recognized as a real treasure. It was never transplanted so did not have the set back of others often transplanted more than once. Here it has been found that transplanting lycoris, even when dormant, delays their flowering. Some purchased, which have been too long delayed through importations to dealers, and then in transit to customer, have been three years before flowering. They seem to resent being disturbed. The beauty of grace and form and color in *Lycoris houdyshelii* are far superior to any other lycoris. They have to be seen and compared with other lycoris to be fully appreciated. This season there were 8 scapes varying from a small late one of 11¼″ to 25½″ and 26¼″ with 7, 8, and 9 flowers to a scape. The buds are a warm white with the stamens and pistil extruding from the tight bud, with the anthers showing a color of terra cotta (French) and becoming a zinc orange (Ridgway) on the open flowers. The flower becomes less cream as it matures and makes an absolutely perfect white flower. The tepalsegs curve back sharply from the center of the flower with a wide gap between the two lowest, through which the stamens and pistil curve out and up so gracefully. The tepalsegs are delicate in texture, are ruffled, and have light touches of soft red at the edges and sometimes a pencil-line of the red on the inside of the tepalsegs, but these touches of color are so soft and faint as only to be seen by very close observation. They make a most beautiful and desirable cut flower of good lasting quality. The tepalsegs measure 2¼″ long; stamens 2¾″ and pistil 3¾″ long. On August 23rd, the first flower on the last scape opened. The flowers produce seeds when hand-pollinated. The leaf growth started October 5th. These leaves are very distinct from any other Lycoris, and remain all winter, and up to

the present time have been winter hardy here. The leaf has a thick rounded tip, is much broader than any others except *Lycoris traubii* (however very different from *Lycoris traubii* which is a bright shining green, very glossy). The leaf averages 11¾″ x ¾″. The center stripe is channeled but not conspicuously like *Lycoris radiata.* The color is quite a different green, but the R. H. S. Colour Chart does not show a green near enough to distinguish it. The nearest, but still not accurate, is yew green (Merz & Paul). The bulb has increased to four large ones as near as can be ascertained without disturbing it. Mr. Caldwell, in the 1957 issue of HERBERTIA, has adequately described it, and shows a picture of same.

Lycoris Sanguinea is most disappointing. It may be of interest to collectors, but is not ornamental, and makes a poor cut flower on account of its small flower of poor form and color. It does not answer to the description given in Grey's HARDY BULBS. Stock from four different sources are all the same poor flowers of the same harsh color. The flowers opened August 7th on two clumps and August 10th on the third and fourth group. The first scape was 8″ with two flowers. The tepalsegs were 2¼″ x ⅜″; stamens 1¼″ long; pistil 2¼″, anthers light straw color. The flower is jasper red 018/1; two other flowers were jasper red #018. They seem to be winter hardy, and do not make winter leaf growth. Two seed pods formed and fell down besides the bulb without hand-pollination by August 24th.

"Lycoris albiflora carnea" is a very dainty and delicate flower, and makes a beautiful arrangement with the old rose 'Madame Jules Bouche'. It started flowering August 23rd. There is a larger number of these than most of the others, due to the fact that all bought as "Lycoris albiflora" and "Lycoris radiata alba" have proven to be "Lycoris albiflora carnea" with the one exception. This group bought December, 1950 as "Lycoris radiata alba" had 2 scapes, this summer, of white flowers among the rest of the clump which were "albiflora carnea". These were exactly like the "albiflora carnea" except for color. The first scape was 17″ long with an umbel of 5½″ across; diameter of flower, 2½″; tepalsegs 2¼″ x ⅜″; stamens 2½″ long; pistil 3″ long; both stamens and pistil cream with the tip of the pistil deep pink. The color of the flower was Venetian pink #420. These do extra well and multiply more rapidly than most lycoris. A planting of one dozen bulbs set out in September, 1954, had 19 scapes this season. One scape flowering August 27th, was 23″ long, flower umbel 5½″ across; color Venetian pink #420/2. On September 5th, there were scapes 16″, 21″ 22″ long, and the tallest was 28″, all with 7 or 8 flowers to the scape. Those flowering September 9th, in full sun, had mediocre flowers which burned quickly. The leaf growth was vigorous by December 1st. The leaf is 21″ x ¾″ but narrows at the tip to ¼″ wide; color spinel green #0960/1. In one purchase of "Lycoris albiflora carnea", planted September, 1954 there are 3 scapes with creamy flowers. The flowers were a little larger than "albiflora carnea". tepalsegs 2¾″ x ⅜″, curled back sharply from the center; diameter of flower 3¼″; stamens 2¾″ long; pistil 3¾″ long, both stamens and pistil are cream and flare out and

curve up; anthers chamois (French). The color of these flowers is mimosa yellow #602/3, with a center line inside the tepalsegs of flesh pink.

Lycoris Caldwellii, planted May, 1955, had its first flowers August 21st. There were 3 scapes, the first was 25¾″ tall with 6 flowers, tepalsegs 3½″ x ½″; stamens 2″; pistil 3″ long, both stamens and pistil were light orange with the tip of the pistil pinkish. The second and third scapes were 22½″ and 21½″ tall. The bud is peachy. No record was made of the color but it was a very soft light yellow. The bulb was obtained from Mr. Hayward, the same source as those obtained by Mr. Caldwell, and described in the 1957 issue of HERBERTIA.

"Lycoris purpurea" was obtained from Mr. Hayward in 1949, but it did not have the proper location nor care and has also suffered from too much transplanting. It flowered September 5th, but like all the other lycoris in full sun and no ground cover, was not a choice flower. The scape was 10⅞″ tall with 5 flowers; the tepalsegs were 2½″ x ⅜″; stamens 2″; pistal 2½″ long; both stamens and pistil are the same color as the petal which is mallow purple #630/1. The edges and tip of the petal are wisteria blue #640. Mr. Caldwell who obtained the same stock from Mr. Hayward advises me he thinks it is *Lycoris sprengeri,* but if this is true to name then it is the first of that species to flower here. Stock of *Lycoris sprengeri* has been purchased four times but none have ever flowered. This lycoris is quite different from any others grown here.

Lycoris radiata was late this season as it did not bloom until September 11th when, ordinarily it commences with the first days of the month. These are iron-clad here, only requiring slow, deep watering the last week of August, shade, left without being disturbed. They make a good cut flower, and a brilliant display in the garden. They are commonly grown over a wide area of Texas and the whole South. The leaf growth begins before the flowers are fully matured, and this leaf growth remains until early Spring. The leaf measures 28½″ x ½″, narrowing to the tip to ¼″ and broadening at the base to ⅜″.

Lycoris traubii was purchased as "Yellow Spider-Lily". One purchase from a dealer, who imported the bulbs direct from Japan, has been of great interest as there is such a wide variation of form, size, and shades of color together with flowers of grace and beauty. These new yellows are so superior to *Lycoris aurea* in not only the choice flowers but also in their greater hardiness to the climate here. September 19th, there were 9 scapes, the tallest being 22½″ with 6 flowers, tepalsegs 3″ x ½″; stamens 2½″; pistil 3½″ long, both stamens and pistil curve out and up gracefully; color maize yellow #607; anthers #607; stamens and pistil #607/2. September 21st the tallest scape was 22½″ with 7 flowers; tepalsegs 3¼″ x ¾″. The texture of the tepalsegs was much thicker and heavier than in the earlier flowers, and there was a center line inside the petal of a darker shade than the flower which was maize yellow #607. September 22nd there was a scape 19½″ tall with 8 flowers, the color was orange buff #507. September 23rd there were 2 scapes with flowers, 7 each, of saffron yellow #7. September 28th, there

were 2 scapes with 7 flowers each of maize yellow #607; and one scape 14½″ with 4 flowers Chinese yellow #606/1; petals 3″ x ½″, curled, rolled, and a center line inside the petal maize yellow #607. The last flower—October 10th. This collection of the new yellow lycoris besides being different in color, were as varied in the forms of the tepalsegs, some being smooth and straight, some ruffled, some only curled back at the tips of the tepalsegs, some curved back sharply from the center of the flower, making a very wide-open flower. The leaf growth starts very shortly after the flower finishes blooming, and is very vigorous and distinct. The leaf is broader than any others with the exceptions mentioned previously, and is a bright glossy, shining green, measuring 12½″ x 1⅛″ to ¼″ at the tip and ½″ at the base; color parsley green #00962. Another group has a leaf measuring 14¾″ x 1⅛″ to ½″ at tip and ½″ at base, very shiny and glossy; color spinel green #0960.

Lycoris aurea is most inferior in flower to *Lycoris traubii.* The winter leaf growth is sometimes damaged by hard freeze; besides it does not grow vigorously enough to multiply well. The flower is much inferior to the new yellows in form, size, and color besides lacking the grace and beauty of form. The first flower opened October 1st, with a scape 19¾″ tall and 5 flowers; tepalsegs 3½″ x ⅜″; stamens 4″; pistil 5¼″ long, color Egyptian buff #407/1. The tepalsegs, stamens and pistil all grow straight up together with only a slight curl at the tips of the tepalsegs.

Another *Lycoris* has been grown here but was lost, due to the lack of knowledge of its cultural requirements, as well as the lack of proper care and attention. This bulb was obtained from Orpet Nursery in Santa Barbara, California, March, 1945, under the listing "Lycoris incarnata Hybrid". It flowered in 1947, and answered to the description now given for *Lycoris straminea.* It was a very soft, delicate yellow with the tips and edges of the petals having touches of a deep rose or soft red. There should be some of this stock still to be found in California.

The article written by Mr. Sam Caldwell, together with his pictures in the 1957 issue of HERBERTIA has been the means of locating the correct names of the *Lycoris* which have been established and flowered here, though their beauty and worth have been enjoyed these years as "roses by other names".

CONTROL OF MITES AND THRIPS ON HEMEROCALLIS

Although mites and thrips on *Hemerocallis* grown at La Jolla, Calif., do not materially retard diploids and tetraploids, it is still desirable to control these pests if possible. It was found that such tetraploids as 'Copernicus' and 'Elizabeth Traub' with upright foliage do not harbor the pests when regularly given overhead waterings during the growing season. Clones with arching foliage do harbor the pests to some extent.—*Hamilton P. Traub*

HAEMANTHUS MULTIFLORUS CULTURE

WYNDHAM HAYWARD, *Florida*

Haemanthus multiflorus, the tropical AFRICAN BLOOD LILY, is a flowering bulb of colorful history and great present possibilities. Pictured by many famous plant artists in the past, including the great P. J. Redoute in his "Liliacees" of 150 years ago, it is still a beautiful and showy conversation piece of the sub-tropical garden and northern greenhouse or conservatory.

The accompanying illustration (Plate 6), generously provided by the well known wholesale bulb firm of Walter J. Guille, Inc., Syosset, L. I., reveals better than ten thousand words why this remarkable plant, known for 300 years, has been an eye-catcher and traffic-stopper wherever and whenever shown, but fails to show why it has not become more widely grown and more popular with lovers of fine plants.

Perhaps it is just neglect. Also the scarcity of material, as the bulb is a shy seeder, and makes offsets slowly, although a good increase can be obtained from year to year with good culture. Although Henry Nehrling wrote of bulbs of *Haemanthus kalbreyeri* (a form of H. multiflorus from Guinea) in his gardens at Gotha, Florida in 1908, fifty years later it is still a rare bulb in Florida, cherished and pampered by those horticulturists fortunate enough to possess good flowering size specimens.

The writer has a photostat of what is obviously *Haemanthus multiflorus,* as illustrated in the rare early French garden book, "Le Jardin du Roi," by Pierre Vallet, published according to Pritzel in 1608 in its first edition at Paris. Vallet names the bulb "Satyrium" from Guinea. *Satyrium* of course is the name for a present-day genus of orchids, but the plant in Vallet's plate is plainly our old friend the AFRICAN BLOOD LILY. It is curious that J. B. Ferrarius, who obtained other rare bulbs from France, should not have pictured this species in his De Florum Cultura of 1633 at Rome, when he published excellent plates of *Haemanthus coccineus,* a South African species.

According to Baker, in 1888, *H. multiflorus* is found "throughout tropical Africa from Sierra Leone (west Africa) to Abyssinia (northeast) and to Delagoa Bay (South Africa)," and doubtless the amazingly wide distribution accounts for the numerous synonyms now found under this species in the botanical literature. Baker's own *H. kalbreyeri,* under which this species is now found even today in the Eastern nurseries, (whence come most of the commercial stock of bulbs in the trade) seems to be a smaller form according to his own description of 1877, "umbel 5 to 6 inches", being a comparatively small one for the species.

Under optimum culture in Florida, usually in large pots or tubs, *H. multiflorus* bulbs have been known to produce "fire-ball" blooms of flowers a foot in diameter and on three to four foot stems, from bulbs up to five or six inches in diameter. Bulbs of this size have been carefully grown for many seasons. The average blooming size bulb ranges from two to three inches in diameter, similar to *Amaryllis* hybrids.

The writer in the company of Dr. H. P. Traub some 20 years ago came on a planting of several hundred of the bulbs all in bloom in a

Plate 6. *Haemanthus multiflorus* Martyn, a popular cultivated bulbous amaryllid; widely distributed in the wild in tropical Africa from Sierra Leone to Kordofan, Abyssinia and Delagoa Bay. Color plate by the courtesy of Walter J. Guille, Inc., Syosset, L. I., New York.

yard in Eustis, Florida, some of the bulbs in washtubs, pots and cans, others in long lines along the path to the well-worn home of the owner. When this discovery was made public the entire stock of the bulbs was bought up by local garden club members in a few months at a dollar a bulb, a bargain, because good blooming size bulbs of this species have always sold for $3.00 to $5.00 or more each in the retail trade in this country. Inquiry of the family as to the origin of their bulbs elicited the information that "Grandma got a bulb off a sailor in St. Augustine many years ago . . ."

Bulbs of *H. multiflorus* are best planted in early spring, and allowed to root a few weeks before they make their natural bloom in May or June. They like a fertile, leaf-mold type sandy loam compost, well drained and not too heavy. Manure, especially well rotted, suits them well, and they will take occasional applications of any good garden commercial fertilizer, stirred into the soil around them. They appreciate half shade conditions. Offsets can be separated at planting time just as with hybrid *Amaryllis*.

Simultaneously with the bloom spike, the leaves begin to grow and make a handsome fountain of foliage by the end of summer, produced on a short sheathing stem, with oblong blades, up to a foot long and having short sheathing petioles. The stems are usually rusty-spotted. The bulbs can be potted in six, seven or eight inch pots according to size. Small bulbs can be potted up individually or several in a large pot or flat and allowed to grow on.

The *H. multiflorus* is amenable to vegetative propagation and the stock could be increased enormously in a few years by careful cuttage procedure like *Amaryllis*. There is a report on this in early issues of HERBERTIA. The basal stem is larger than in the hybrid *Amaryllis,* and the root system heavier and larger by the end of the season. The foliage goes to rest from November to January unless cut down by frost in the lower South and similarly under glass. There are few pests, save possibly thrips, red spider, grasshoppers, or caterpillars.

The bloom spike or scape rises separately from the leafy stem and the umbel opens with 100 or 150 or perhaps even more small flowers in top specimens. Baker says merely "umbel dense, 3 to 6 inches in diameter", which is a conservative measurement. This species' only rival in the genus in common cultivation is *H. katherinae*, a somewhat similar plant from South Africa, with orange red flowers blooming in summer, later than the other. *H. katherinae* is almost evergreen, more sensitive and not as "fool-proof" in the writer's experience, at least in Florida, although the *H. katherinae* is grown more widely in California.

TETRAPLOID DAYLILY—'LUCRETIUS'

The plant of this clone is up to 39″ tall; up to 13 flowers per scape; evergreen; recurrent blooming. Flowers are wide open, up to 7″ wide, thick substance, bright cadmium orange (HCC 8/1), 38 vivid orange DCN, faint rounded reddish eye-zone, segs acute, margins ruffled, petsegs creped; fragrant.—*Hamilton P. Traub*

CULTURE OF BRUNSVIGIA, CRINUM, NERINE AND ALLIES

L. S. HANNIBAL, *California*

In California there is undoubtedly no easier group of garden amaryllids to grow than the common member of the tribe BRUNSVIGIEAE which contains *Brunsvigia,* including the CAPE BELLADONNA; the hardier species of *Crinum,* X *Crinodonna* (syn.—*Amarcrinum), Nerine;* X *Brunserine; Ammocharis; Boophone* and *Cybistetes.* All of these plants do best in a heavy clay-loam or adobe soil, but crinums and X *Crinodonna* normally require considerably more moisture than the others which go into a dry summer rest period. As a consequence, crinums are best adapted to the southeastern United States, particularly Florida and the Gulf Coast while the others are better adapted to the dryer summers of central and southern California, and southern Arizona.

In essence, if the plants are given the right environment they will take care of themselves as they do in the wild and need no care whatsoever, but try growing *Brunsvigia rosea* in Florida's humid summer climate, or *Crinum americanum,* an aquatic Florida species, unattended under Californias dry conditions, and both bulbs will soon pass out of the picture. All the loving care possible will never adapt these bulbs to conditions which are adverse to their native environment. However, by generous applications of water one can grow moisture loving bulbs under dry climate conditions and be fairly successful, but to give summer resting bulbs a dry rest out doors in a humid climate is not feasible. Thus it is no problem for the writer to grow most of the Crinum species and hybrids, but the nearest safe approach to the Cape Belladonna, *Brunsvigia rosea* for our Florida friends is X *Crinodonna (B. rosea* x *C. moorei* hybrid) which can take the moisture due to the *Crinum* parent.

The propagation of any *Crinum, Nerine,* or *Brunsvigia* or related plant starts with pollination. Many members of this South African group respond poorly to their own pollen. Particularly if the plant is a species which has a long history of natural inbreeding where a lack of minor variations has produced a homozygous individual without diversity. Such plants respond poorly to their own pollen and whatever seed which may be produced may quite possibly be parthenogenetic in lieu of sexual in origin. But cross this same plant with a different clone of the same species or a related subspecies and nominally a heavy crop of seed results. The writer has in mind *C. bulbispermum* var. *sanguineum* which rarely if ever sets seed by its own pollen, but pollen from the Cape form of *C. bulbispermum,* or Burbanks hybrid, or *C. moorei,* or even *C. yemenense* produce all kinds of hybrid sexual seeds which germinate rapidly and grow extremely vigorously due to the factor of hybrid vigor (Fig. 20).

Not all *Crinum* species set seed as easily. *C. kirkii* is persistently sterile despite the use of pollen from several divergent clones, and *C. macowani* is very chary with its seed. Many of the hybrids are sterile

or near sterile, and often the seedlings are questionably parthenogenetic. The seedling plants from *C.* 'Cecil Houdyshel' are a typical example.

Species of *Nerine* also produce all kinds of breeding problems. *N. fothergillii* is practically sterile, and crosses with other clones with extreme difficulty. *N. bowdenii* and *N. humilis* consistently produce parthenogenetic seed, that of *humilis* is initiated by other pollens whereas *bowdenii* requires no pollen whatsoever and will set seed despite emasculation or high water. Most of the other *Nerine* species as well as the hybrids nominally require pollen to initiate seed development, but a fair portion of the hybrids may be parthenogenetic. At least the results are so confusing that this field needs further investigation.

Brunsvigia appendiculata apparently sets both parthenogenetic and sexual seed, and surprisingly enough this plant crosses extremely easy with *N. humilis* to give robust hybrids. This is not the first hybrid of this kind since *N. x fletcheri,* a cross of *N. bowdenii x Brunsvigia rosea,* has been known for years, but the ease of the writer's cross suggests no significant division between some of the species of *Nerine* and *Eubrunsvigia. Brunsvigia slateriana* shows minor clonal variations and sets only sexual seed. The writer has never succeeded in crossing *B. slateriana* with either *B. rosea* or the Multiflora hybrids which contain *B. grandiflora* genes.

B. rosea, the Cape Belladonna as a species is notorious for producing nonsexual seeds when one is working with a homozygous clone, but the presence of a different clone during flowering season will give excessive yields of sexual seed. The *B. x multiflora* garden forms, which are crosses of *B. rosea* and *B. grandiflora* set excessive quantities of sexual seed, probably because these clones are such a complete heterozygous mixture.

X *Crinodonna corsii,* the bigeneric hybrid, which is a cross of *Crinum moorei* on *Brunsvigia rosea* as a seed parent, is readily obtained if one has the proper clones on both sides. Surprisingly enough many of the Multiflora hybrids will yield a few X *Crinodonna* seed, but these do not differ greatly from the typical cross. The hybrid seed are quite distinct from those of *B. rosea,* being a pale opal green, whereas those of *B. rosea* are red. The X *Crinodonna* hybrid itself is sterile.

Pollinations in *Crinum* and *Brunsvigia* are usually most successful if conducted in the late afternoon. The flowers open at this time and fresh pollen is available. Fertilization is usually better because the pollen does not dry out during the night on the stigma, whereas in daytime it soon loses vigor.

Seeds are usually collected from *Nerine* and *B. rosea* after the pods start drying but before they split and spill the seeds. Selected seed pods are placed in plastic food dishes or pans to ripen. Usually before the seed starts to sprout it is examined for small buckshot or other malformed types. In the case of *B. x multiflora* the white seeds are often segregated to permit shipment or sale of alba-flowered seedling segregates.

A planting mix of heavy loam, vermiculite and sand is commonly employed by the writer for the sprouting of seeds of the above genera.

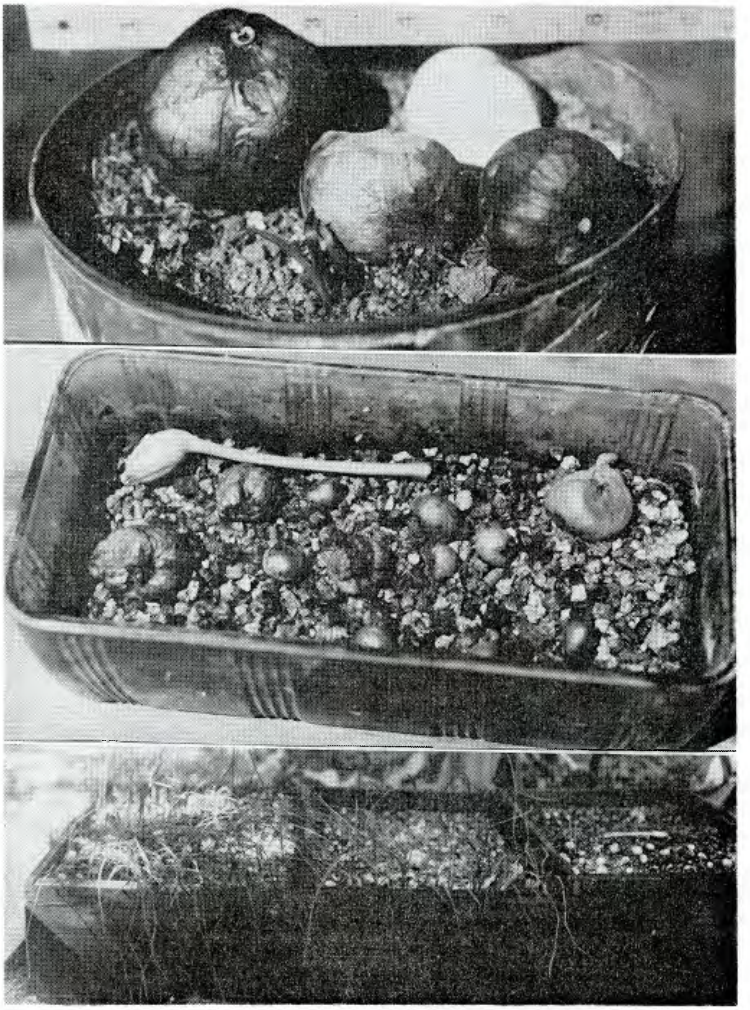

Fig. 20. Top, *Crinum yemenense* seeds up to 2 inches in diam.; seed in foreground has produced two sprouts. Center, germination of difficult *Crinum* seeds on moist vermiculite in covered dish. Bottom, deep redwood seed flats used for bulk planting of large seeds like *Crinum*.

Acid peat or sawdust should never be used. Occasionally ground limestone is added to keep the soil from turning acid if much organic matter is present. This planting soil is placed in redwood planting boxes, size 12 x 24 inches by 6 inches deep. These boxes are carefully painted inside and out with a copper naphthalate fungicidal paint (available from Fullers Paint Co.) some days before the planting soil is added.

This treatment insures no loss of the planting box due to decay for at least 8 or 10 years. Five inches of planting soil is added, well soaked, then the seeds are scattered across the top about an inch apart, and a glass plate is set over the entire box. This glass plate holds the moisture and keeps the slugs or snails from paying a visit.

In some instances stubborn *Crinum* seed or tempermental *Nerine* seeds are "pre-germinated" on moist vermiculite (Fig. 20) in a sealed glass or plastic food dish. These seed are usually planted after the radicles are well established, but *Nerine bowdenii* has remained in such containers for a year before transplanting the well established bulblets.

The seed flats in turn are usually left covered with the glass until all of the seeds have become fully established and foliage is three inches or more long. Stamped metal labels are nailed to all but the *Crinum* flats since the *Nerine* or *Brunsvigia* hybrids may remain in these flats for five or six years until transplanted. *Crinum* and x *Crinodonna* usually become too crowded if left in a flat for more than six months, so these plants are nominally planted out in beds the following spring, but *Brunsvigia rosea* or *B. x multiflora* bulbs take five or six years to size up to a hens egg diameter before they become crowded. Sometimes *Nerine* seedlings are not transplanted until the bulbs begin to flower.

Brunsvigia and *Nerine* bulbs are usually transplanted from the flats in September. A minimum of roots are disturbed in this operation in order to not retard bulb growth. The simplest way to effect this is to soak the entire flat in water and wash the soil free from the plants, then gently shake the bulb mass to segregate the entangled roots. The bulblets are planted in rows with a six-inch spacing between bulblets. The bulb base is set about 2½" below the normal surface. This shallow planting encourages better multiplication and earlier than normal first flowering, which may occur from the sixth to tenth year. Poorly colored or shaped flowering plants are promptly rogued out as soon as the initial blossom is fully expanded. Top grade material is marked for further observations, or even transplanted into a special bed. By soaking the bulb heavily and lifting all of the root mass no harm occurs with a quick transplant during the flowering period. No setback will occur if the roots do not became dry. However, if bulbs of *B. rosea* or *B.* x *multiflora* are permitted to become dry, the flowering cycle is upset for two years at least.

Normal transplanting of flowering bulbs should occur during late June or very early July. This will permit the bulbs to recover from the shock of root exposure and to initiate the flowering bud for the following year. However, some bulbs are prone to skip a year on the slightest provocation, and others do so naturally, so even the best gardeners miss a few blossoms until large bulb clumps are formed.

This tendency to skip flowering, plus the slow development of some seedling bulbs makes it impossible to evaluate a seedling bed completely until the tenth or eleventh year has passed. By that time it is assumed that the best forms have been placed in special beds, and the worst have migrated to the trash heap, so the remaining bulbs are passed around to non critical home gardeners or church raffles. At their worst

these are far superior to the old Cape Belladonna, *B. rosea* var. *major* of California gardens, and at best they are still surpassed by a great many top class and recently named clones, but they are still good garden material.

Summer resting bulbs can tolerate light watering during the midsummer previously to flowering, but heavy soakings are to be avoided. The writer has set up the hypothesis for further testing that the immature flower bud may be crushed by the sudden swelling of the immature foliage when bulbs are heavily watered. The writer usually withholds water until August 20th, then turns a light spray on for an hour or so. This practice brings all of the flowering buds up at once with the exception of some very late flowering Multiflora hybrids. The same treatment is used on *Nerine*, only with a month or six weeks delay. *Nerine* seldom produce scapes earlier than Sept. 15th, and they should not be rushed—the later the heavier watering the more flower scapes are obtained.

Some *Nerine* and *Crinum* are apparently subject to a form of chlorosis, but in the writers experience this is due to the loss of roots due to peat, acid soil, or late fall transplanting. This chlorosis may be a nitrogen deficiency within the bulb and might be eliminated by a spray of "New Green" or other soluble urea fertilizers. Those who are troubled with this disease should try this treatment, and report in HERBERTIA.

More bulbs can be lost by adverse culture or climatic conditions than due to disease or insects. Bulb rot will occur with some of the Cape Amaryllids if they either are chilled for too long a period in winter, or are left in a hot greenhouse during the summer. The *Narcissus* bulb fly which bothers a number of the central American amaryllids will rarely touch Cape bulbs. *Crinum* have been found infected on several occasions, but in each instance root disturbances have been noted and the rotting tissue had attracted both the bulb mite and *Narcissus* bulb fly.

The berry stem nematode which is related to the *Narcissus* stem nematode will attack both *B. rosea* and daffodils, but where this nematode will eliminate the daffodils, the *B. rosea* will clear themselves from the trouble in two or three years, particularly if the dry foliage is cleared away with the lesions which contain dormant nematodes.

ADDITIONAL TETRAPLOID HEMEROCALLIS CLONES

The following additional colchicine-induced *Hemerocallis* clones are hereby listed for the record—'Tetra George Gilmer' (Traub, 1959), saffron yellow; 'Tetra Neyron Rose' (Traub, 1959), pastel pink; 'Tetra Flirtation Pink' (Traub, 1959), pastel pink; 'Tetra Capri' (Traub, 1959), yellow blend; 'Tetra Junipero Serra' (Traub, 1959), yellow blend; 'Tetra Blue Danube' (Traub, 1959), pastel purplish; 'Tetra Dorothy McDade' (Traub, 1959), late light yellow; 'Tetra Charmaine' (Traub, 1959), pastel pink; 'Tetra Butterfly' (Traub, 1959), light yellow; 'Tetra Citation' (Traub, 1959), medium red; 'Tetra Salmon Sheen' (Traub, 1959), pastel salmon; 'Tetra Maid Marion' (Traub, 1959); pastel pink; 'Tetra Evelyn Claar' (Traub, 1959), pastel pink; 'Tetra Pink Prelude' (Traub, 1959), pastel pink.—*Hamilton P. Traub*

AMARYLLIS PRODUCTION IN HOLLAND

CLAUDE W. DAVIS, *Louisiana*

Commercial production of the Dutch hybrid *Amaryllis* is in the northwestern part of Holland within the triangular area formed by the cities of Den Haag (The Hague), Haarlem and Amsterdam. All propagation and growth of the bulbs is in steam heated greenhouses for the entire year. Approximately a quarter of a million bulbs are produced annually for the export trade. Most of the commercial production is by four large firms. These are Ludwig & Company, Hillegom; G. C. van Meeuwen & Zonen, Heemstede; W. S. Warmenhoven "Zonnewende", Hillegom and W. Warmenhoven & Zonen, Hillegom.

The firm of Ludwig & Company was originally founded by two brothers, Ernest and Casper Ludwig, in 1892. The first stock of bulbs consisted of the then relatively new Amaryllis Leopoldii hybrids, purchased from Robert P. Ker & Son, Liverpool, England. The firm, along with the name was sold to Van Til-Hartman, Ltd., Hillegom, Holland on Jan. 15, 1940. With the end of World War II, Ludwig & Company was changed into a limited liability company. The shares were divided as follows: two thirds to Mrs. C. J. van Til, one sixth to Mr. C. J. van Til and one sixth to Mr. A. Jansen. Mr. Van Til and Mr. Jansen are the managing directors of Ludwig & Company, Ltd. In addition, Mr. C. J. van Til is one of the managing directors of the parent firm, Van Til-Hartman, Ltd. Mr. Jansen (Fig. 21) is in charge of breeding and production for the Ludwig firm. In charge of sales and public relations is Mr. H. J. N. van Woesik, who is an employee of Van Til-Hartman, Ltd., but who sells *Amaryllis* for Ludwig & Company on a commission basis. The first illustrated, retail catalog was published in 1950. The sales office and plant breeding establishment is located at Hillegom, but the commercial production is some distance away at Aalsmeer, Holland, the seat of what is probably the world's largest market for the florist trade. Ludwig & Company now have an annual production of approximately 50,000 bulbs for the commercial trade, but they are expanding their facilities for an anticipated production of 100,000 bulbs for sale annually. Exports to America are made three times a year in pool shipments to New York for distribution from that point. The first pool shipment is made in November, the second in early January and the last in late February.

In 1958 Ludwig & Company offered 53 varieties of the large hybrids and three varieties of the miniature "Gracilis" for sale. A few of the best known of the Ludwig varieties are 'Doris Lilian', 'Pink Favorite', 'Pink Perfection', 'Miss Margaret Truman', 'Nivalis', 'White Giant', 'Ludwig's Dazzler', 'Snow Queen', 'Wyndham Hayward', 'Bouquet', 'Salmon Joy', 'Ludwig's Scarlet', 'Halley' and 'Apple Blossom'. An unusual and distinctive introduction in 1958 is 'Picotee', which is pure white with a clearly defined red edge.

The Royal Nurseries, G. C. van Meeuwen & Zonen N. V., located at Heemstede, is an affiliate of H. De Graff & Zonen N. V., Lisse, Holland.

Typical Van Meeuwen hybrid *Amaryllis*. Note excellent form; also the tepaloids at the base of the tepalsegs.
Plate 6a

with both firms having as director-owners Mr. B. J. C. Vandernat and Mr. G. Mastenbroek. The hybrids developed by this firm are known as "Van Meeuwen's Superiora" (Plate 6a) and are being sold under the

Fig. 21. Typical Ludwig & Co., hybrid *Amaryllis;* note excellent form. Top, Mr. Jansen among his choice hybrids. Bottom, typical greenhouse culture.

registered trade name of "PARADISE" *Amaryllis.* The sales agency in America is H. De Graff & Sons, Inc., 11 East 44th Street, New York 17, N. Y. The founder of the Van Meeuwen firm was G. C. van Meeuwen in the year 1856. It was purchased, including the name, by De Graff &

Zonen in 1921. The annual production of the *Amaryllis* grown in a large range of greenhouses covering 200,000 square feet of glass is exported largely to the Eastern Seaboard, the Middle West and the South in the United States.

Van Meeuwen offers two forms of *Amaryllis* in both standard varieties and by color. These are the early flowering, prepared bulbs and the regular, or late flowering bulbs. Prepared bulbs, known as "Herald" *Amaryllis* are sold in October for flowering at Christmas time. The regular, or unprepared bulbs are exported in November for flowering in February and later. In the 1959 catalog this firm offers 22 named varieties available in large quantities for the wholesale trade. In addition, they grow a large number of outstanding new varieties not yet introduced. A few of the best known of the Van Meeuwen varieties are 'Alcyone', 'Queen Superiora', 'Superba', 'Faust', 'Julia', 'Albino', 'Tristan' and 'Giant Goliath.'

The entire foundation stock of the "Original Gracilis" is owned by Van Meeuwen, having been purchased from the originator, Mr. H. Boegschoten, head gardener to Mr. J. C. Bunge, a leading industrialist in Holland. This small flowered, or Graceful strain was developed after twenty-five years of cross-breeding and selection, using as parents the medium flowered species, *Amaryllis striata* and the large flowered hybrid strains. These intermediate flowers are almost an exact duplicate of the larger hybrids, but with long, *slender* stems which makes them excellent for use in flower arrangements.

The firm of W. Warmenhoven & Zonen was founded by the former Willem Warmenhoven in the year 1860. He was succeeded by a son, Cornelis Warmenhoven, who died in 1936, leaving three sons. The eldest son, Willem S. Warmenhoven started a business of his own in 1923 and was the first commercial grower to use vegetative propagation of Amaryllis, beginning in 1925. He does business under the name, W. S. Warmenhoven "Zonnewende", Hillegom. The two other sons of the late Cornelis Warmenhoven are Simon Warmenhoven and Cornelis Warmenhoven, who jointly carry on the firm of W. Warmenhoven & Zonen, organized by their grandfather Willem. These two Warmenhoven firms produce annually more than 100,000 bulbs for export.

The firm of W. S. Warmenhoven "Zonnewende" Hillegom sells bulbs under the name, "ROYAL DUTCH AMARYLLIS", both in named varieties and by color. These are available in the prepared bulbs for early flowering and the regular bulbs for later flowering. All sales are wholesale, with a minimum order of 50 bulbs and on an ex-warehouse basis in Holland. The sales are handled exclusively by P. J. Komen, Anna Paulowna, Holland.

W. Warmenhoven & Zonen sells its entire product to exporters in Holland. Two of these are J. J. Grullemans & Sons, N. V., Lisse, Holland, and A. Frylink & Sons N. V., Sassenheim, Holland.

Some of the popular Warmenhoven ROYAL DUTCH AMARYLLIS are 'Leading Lady', 'Joan of Arc', 'Queen of the Whites', 'Red Master', 'Sweet Seventeen', 'Bordeaux', 'Anna Paulowna', 'Queen's Page', 'King

of Stripes', 'Violetta', (Fig. 22) 'Scarlet Triumph', 'Lucifer', 'Morena', 'Mount Tacoma', 'Beacon', 'Royal Ruby', 'Red Majesty', 'Cherokee', and 'Christmas Joy'. The latter is a intermediate, early flowering orange red which blooms in three to four weeks and can easily be in full flower by Christmas time.

Fig. 22. Typical W. S. Warmenhoven hybrid *Amaryllis*—clone 'Violetta', violet-hued to lavender-rose. Note excellent form. Photo by Wyndham Hayward.

Vegetative propagation of the named clones is by one or the other of the two methods now available. The first was introduced by Miss Ida Luyten (now Mrs. Oliver) in the 1920's at the Laboratory for Plant Physiological Research, Wageningen, Holland. According to this method, the *bulb scales* are utilized. The other method was introduced by Dr. Hamilton P. Traub and Mr. I. W. Heaton in Florida in the 1930's. In this method fractional scale-stem cuttings are made. These two methods

are described in detail in Dr. Traub's new book, "The Amaryllis Manual".

Usually, the bulbs are cut in December and January and bedded in pure sand. During the winter months the temperature of the bed is kept at 60 to 68 degrees F. at bulb level and during the summer at 70 to 77 degrees F. The following fall the small rooted bulbs, which formed on the cut segments of the mother bulb, are transplanted to beds where they are grown for three years to produce commercial bulbs. The No. 1 bulbs are 26 to 28 centimeters in circumference and top size bulbs are 28 cm. and up in circumference.

Of especial interest to American *Amaryllis* fanciers is the fact that the commercial bulbs are grown in pure compost, containing about 10% sharp sand by weight. This compost is made from leaves, manure and straw bedding from the stalls, all of which has been allowed to decompose for a year or more, or until it is almost completely reduced. The ratio of leaves to manure and straw bedding is dependent on the availability of the latter, but it usually is about three parts of leaves to one part manure and bedding. During the summer months the bulbs are watered daily by having the water sprayed on the beds. Commercial fertilizer containing nitrogen, phosphoric acid and potash is used in one or more applications by some growers. The soil reaction is kept at neutral (pH 7) or nearly so, and an effort is made to prevent it from dropping below pH 6. Intensity of sunlight is broken by spraying the inside of the greenhouses with a lime wash several times a year, or as often as may be needed. At the end of three years growth the bulbs are dried off and harvested in October. Some of the growers then completely remove all of the compost and replace it with fresh material. Others add an additional amount to the old beds to replace losses through oxidation, after which the beds are sterilized with live steam before planting again with small bulblets for another three years of growth.

The writer visited the *Amaryllis* greenhouses in late July, 1958 and was amazed to find that the beds with 2½-year old bulbs were completely filled with a mass of matted roots and the top growth of the leaves was from three to four feet high.

In the collection of material for this article, the writer gratefully acknowledges assistance from the following individuals in Holland: Mr. H. J. N. van Woesik of Ludwig & Company; Mr. M. Vandernat of G. C. van Meuween & Zonen N. V.; Mr. Cornelis Warmenhoven of W. Warmenhoven & Zonen; Mr. Willem S. Warmenhoven of W. S. Warmenhoven "Zonnewende" Hillegom; Mr. P. J. Komen, Bulb Grower, Anna Paulowna, Holland; and Mrs. Ida Luyten Oliver of the Laboratorium Voor Plantenphysiologisch Onderzoek.

Miss Luyten* has published the following instructions for potting: In our country *Amaryllis* "culture is always a hothouse-culture. The bulbs are planted in the bed either free or in pots. We always raise

* Mededeeling No. 70
Laboratium Voor Plantenphysiologisch Onderzoek, Wageningen, Nederland.

them in pots. After the resting period they are repotted; at the bottom a potsherd is placed for good drainage. The roots are spared. As potting soil 1/3 part peat dust, 1/3 part old decomposed cowdung and 1/3 part garden soil is taken while for each m^3 soil 10 kg Thomas papslack** is added. 2/3 of the bulb is above the soil of the pot, each bulb is surrounded with old cowdung. After this they are dug into the bedding in nutritive soil to enable the bulbs, planted in pots, to enlarge their root-system. In this embedding care is taken that the neck too is below the level of the soil, which prevents the settling of the mealy bug between the upper part of the scales. During each period of growth 5 times a gift of fertilizer is added viz. 2 kg superphosphate, 1½ kg magnesiumpotassium sulphate and 1 kg ammonium sulphate for each 10 m^2. Much air, light and moisture is needed. A few times each day water has to be squirted between the leaves as soon as the leaves have reached a certain length. ———— In our experiments the air in the hothouse varied from 17 to 24 degrees C. (62 - 77 F.) in winter; from 20 to 27 degrees C. (68 - 80 F.) in April until August."

GROWING AMARYLLIS FROM SEEDS

Mrs. J. V. Hoyt, *Texas*

I have always had a special love for the large and beautiful hybrid *Amaryllis,* but not until I started growing them from seeds did they become a special hobby with me.

I had learned from earlier trials that better germination of seeds is obtained when they are planted soon after they mature in this humid climate. I have also learned that *Amaryllis* seedlings respond better to a rich soil mixture. I now plant the seeds in a sterilized mixture almost as rich as the potting soil that I use for mature bulbs. Peat moss is also added, and a little lime to offset the acidity of the peat moss. Each flat is filled almost full of the mixture, and they are then set in shallow water to soak thoroughly. Then they are drained. I make indentations with the finger about an inch apart over the surface, and place a fat seed in each place and cover lightly with the same soil mixture, pressing down gently. I have found that it is not necessary to cover the flats with glass, especially when the flats are placed in the greenhouse. I water with a fine spray. The germination is excellent under these conditions, and when they are up I water heavily. Seedlings in flats are shown in Fig. 23.

I planted some of my 1956 seedlings in the garden in the spring and summer of 1957 and found that the ones in the flats with some peat moss had more roots. Hybrids grown outdoors are shown in Fig. 23.

The spring of 1958 was unusually frosty. I had bought a bale of hay and had mulched two beds of several hundred two-year old seedling hybrids. These were not damaged at all. However, it did damage the

** 10 kilograms (about 22 pounds) of basic slag for each cubic meter of soil.

buds showing in my three-year old hybrid seedlings out in the open that were not mulched. Thus the outdoor show in the spring of 1958 was not up to expectations, but after the cold moderated, I had some fine blooms. A few were pink, and rose-colored, but the rest were mostly reds. One seedling produced self-colored soft pink flowers and this is a favorite. It came out of a cross of a large Dutch orange on a Dutch white. Thus the best ones are really worth waiting for.

I was surprised to have five two-year old Dutch seedling hybrids bloom in the beds that were mulched. Three were seedlings of 'Bouquet' and two of 'Salmon Joy'. They were fine blooms for the small two-year old bulbs.

With reference to breeding stock, I have found that it is better to use only the Dutch named stock if the large open-faced type flowers are wanted. I verified the statement I read somewhere that it is better to use bulbs with good root systems as seed parents. Plants which have not had time to make good root systems are used only as pollen parents.

My original breeding stock has been obtained mainly from Ludwig & Co. I had never seen a truly pink *Amaryllis* until the clone 'Daintiness' flowered for me. I am especially fond of the pinks and the pure whites. The bulbs when received are potted in a sterilized mixture containing soil, sand, compost, and manure with bone meal added. The potted plants are placed in the greenhouse and watered as needed. Soon buds appear, the bloom scapes shoot upwards. They usually flower in about eight weeks. The drama is fascinating to watch. As the buds are lowered, and grow larger, I am a constant spectator. Then the buds begin to unfold so swiftly before my almost unbelieving eyes. I am completely captivated.

I found that some clones set seeds better than others. It was also noted that the flowers fade quickly *after* pollen has been placed on the stigma. In order to enjoy the flowers to the last, I wait until the stigma is receptive (is pointed upwards) before pollinating.

My greenhouse and garden have their limitations. I am often reminded of my own limitations by sore muscles and fatigue. But when the urge stirs, I am up and at it. When the blooming season comes, I am well repaid for my hard work.

My problem now is to find room to plant all of this year's (1957) seedlings to make room in the greenhouse for the 1958 seed. Enthusiasm for a hobby is a wonderful thing. The rewards are rich in pleasure and enjoyment. However, I see that it can get out of hand. I wish I could plant every seedling and see the resulting flowers, but I do not have the space. I plan to make fewer and more select crosses next year. That is if I can restrain myself when the time comes and the urge says, "just one more."

After the above was written, Dr. Traub suggested that I write about my plastic greenhouse in which many others would be interested. There seems to be a movement among amateurs to favor themselves with small hobby greenhouses.

Like other gardeners, I had wanted a greenhouse for years, but budget considerations always interfered. In the summer of 1954, my

husband mentioned that he wanted to provide for starting vegetable plants early in the season. Now, I thought, was a good time to get that greenhouse. A brooder house, 10 by 20 feet, no longer used, was torn down to the cement slab floor by my husband, and he made plans to build the framework with openings for removable windows on all sides

Fig. 23. Upper left, side view, Hoyt greenhouse, after enlargement.
Upper right, *Amaryllis* seedlings in flats; (to left) from 1957 seeds, transplanted and spaced fall 1958; (to right) from 1958 sown seeds.
Lower left, Mrs. Hoyt at work in greenhouse.
Lower right, *Amaryllis* seedlings in garden.

and two venetian windows high up on each end.

When this was completed, he built benches at a convenient height all around the inside, as wide as he could reach, to hold flats for vegetable seeds. Plastic film was purchased to cover the framework and windows. The woodwork was then painted.

The cement under the benches was covered to about six inches with sand for rooting cuttings.

The electric current was already there and he put in the electric lights. Then natural gas was piped in for heat, and water was obtained from the nearby well.

It worked like a charm. I began to neglect my housework for the more enjoyable greenhouse experiments. We liked it so much that we each kept adding new plant items until the house was no longer large enough. In 1956, he made an addition equal to the original unit, and changed the roof to heavy corrugated white plastic (fiberglas). The fiberglas is more expensive than glass but we believe that it is worth it. It allows light to come through that produces good germination and plant growth with good green color, yet is more durable than glass.

We leave the windows off when the weather is mild, but when a Texas "norther" blows up, we rush out and hook the windows on, and fasten them at the bottom, shut the door and all is secure until it warms up again. If it gets very cold, a small bathroom heater gives sufficient heat.

I admit that there are more flowers than vegetable plants grown in the greenhouse. However, when January comes room is made for vegetable plants.

I don't know how we ever got along without the greenhouse during the previous years. Of course, it is a lot of work, but when one is doing something in which one is interested, one does not seem to mind the amount of work. The best result is that my husband is more interested in flowers and is now almost as ardent an *Amaryllis* enthusiast as I am.

SUMMER CARE OF AMARYLLIS

W. J. Perrin, *Recording Secretary,*
Men's Amaryllis Club of New Orleans

Mrs. Perrin and myself are members of two local garden clubs which hold *Amaryllis* shows and are actively engaged in the advancement of these fine plants in our City. Mrs. Perrin is now President of the Garden Circle.

When January 15th comes along each year, we start working on our bulbs, making every effort to force them into bloom at their best for the show dates, which are usually during the latter part of March. This requires intensive forcing procedures and as a consequence, the bulbs shrink. This shrinkage prompted me to experiment with the half-shade lath covering in the summer care of *Amaryllis.*

At present we have sixty imported named Dutch hybrid clones, and endless numbers of our own hybrid seedlings, and also Meade strain hybrids. All named Dutch clones are planted in pots; the others in well-drained beds in various locations in our yard.

Prior to 1957, we had very little success in bringing our bulbs back to size during the growing season. In the early spring of 1957, we made up a bed 16 feet long by 4 feet wide, using second hand concrete blocks

as a border. These blocks are about 8 inches high, and were set on the ground level. We then made up a light cypress frame with a gabled

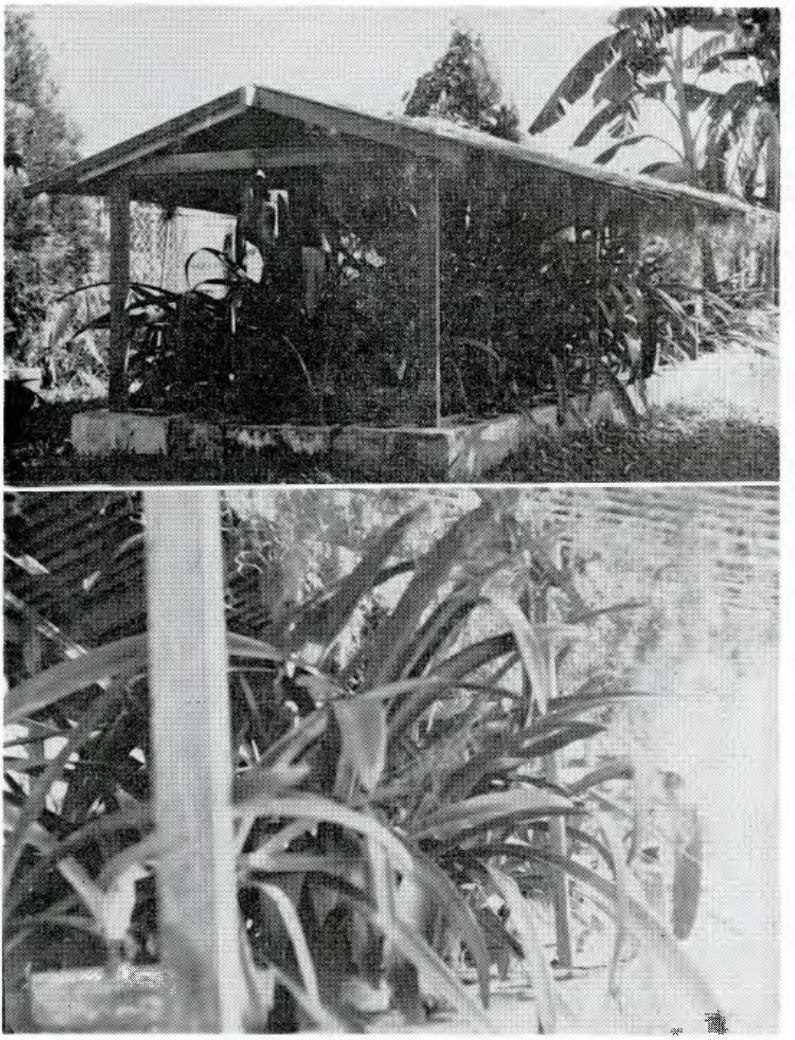

Fig. 24. Upper, showing lath half-shade for summer care of *Amaryllis*. Lower, close up, showing roof at right with Spanish moss used to cut down light still more; and roof at left, covered with laminated paper put on Oct. 1 to start withholding rain water. See text for further details. Photo by W. J. Perrin.

roof, 4½ feet high at the center. Old plaster laths were then nailed over the top of the frame with one lath-width space openings between

the strips, giving a half-shaded area underneath. The laths extend over the frame for 18 inches on the sides, giving the plants protection from direct sun for about 2/3 of the day. All pots are sunk in peat moss with the rims showing. See Fig. 24.

We use an extra light, well-aerated soil, made up of humus, rotted cow manure and vermiculite. Potted plants are protected from severe cold weather. Bone meal and "Cross Country Fertilizer" are used.

That this lath covering works very well is shown by the results—about 90% of last year's forced bulbs have come back to normal size or better.

NOTES ON AMARYLLIS AGLAIAE

JOSEPH C. SMITH, *M.D.*

Great excitement abounded in the greenhouse of the writer late in April 1958 when the first buds of *Amaryllis aglaiae* opened. At last the suspense was broken, and the first flowering of amaryllis aglaiae in the United States was at hand. Although the foliage had looked quite different, the five years from seeds to flowering had allowed the question to expand as to whether this would really be a new color or just another red amaryllis. Now, with a gleaming yellow flower with no trace of red as proof there could no longer be any doubt as to the identity, and that there really existed pure yellow in the genus *Amaryllis.*

Dr. Traub had obtained seeds of *Amaryllis aglaiae* from Dr. Castellanos in 1953. He distributed seedlings to various members including the writer.

Amaryllis aglaiae was first described in 1940 by Dr. Alberto Castellanos of Argentina. Its native habitat is the provinces of Tucuman, Salta, and Juyuy in the northwest corner of that country where it joins Bolivia. There it grows in quantity in the open fields and is an important part of the flora of this region where it is known as "The Great Amancay". This is a term that distinguishes it from other smaller yellow flowered liliaceous plants.

The word *agaliae* is derived from the name of the Greek goddess Aglaia, the goddess of grace, of the trio of beautiful goddesses of the graces, Aglaia, Thalia, Euphorsyne (grace, beauty, and joy). And, indeed, this is a graceful amaryllis both in flower form and in its natural miniature stature. The color of this species is a rich butter yellow which shades into green in the throat. There is nothing like it in hybrid *Amaryllis* colors, and this elegant shade of yellow should be carried over into the large hybrids as soon as possible. Some difficulty may be encountered here as the first flower of *A. aglaiae* did not cross with the hybrids or set seed to its own pollen. When it becomes possible to cross-pollinate between seedlings seeds should be obtainable as this species is reported to be fertile.

The culture of *A. aglaiae* has not been difficult. It responds well to heat and fertilizing and has been grown successfully both in the greenhouse and in the open ground here in southern California. Good drain-

age and a liberal amount of humus seem to be the main soil requirements. It was reported to be evergreen, but in the open ground here it has gone dormant in the late fall and remained below ground until the soil is warmed sufficiently to start growth in the spring, usually about

Fig. 25. Amaryllis aglaiae with 6-flowered umbel; grown by Dr. Joseph C. Smith of La Mesa, California. Reproduced from Kodachrome transparency; this accounts for lack of visibility of leaves just sprouted and the scape.

April 1st. In the greenhouse the bulbs will grow continuously if sufficient heat is applied. Then, they send up a new set of leaves about every third month, and a vigorously growing bulb may have as many as twelve to fifteen leaves at a time, the oldest set gradually dying off as the newest set is emerging. Offsets are made fairly rapidly when

bulbs are growing well. The cuttage method of propagation has not been tried as yet due to the limited stock since the writer started out in 1955 with only three seedlings.

A few variations from the official description as given in Traub and Moldenke's Amaryllidaceae: Tribe Amaryllae (1949) should be noted although these may be only seedling variations. Of particular interest is the fact that the first bulb to flower carried six florets to the umbel (Fig. 25). The pedicels varied from 20 to 45 mm in length at anthesis. The ovary was a deeper green than any other part of the plant. The tepaltube was 7 mm long. The tepalsegs were not paler on the margin and were even a deeper shade on the reverse side. The tips were more rounded than the standard. Setepelsegs were 7.2 cm by 3.1 cm. and the petepelsegs were 7.2 cm by 2.5 cm, the lower one only 2.0 cm in width. Anthers were pale yellow in color and 15 mm in length.

This is a wonderful little *Amaryllis* and will no doubt be very popular when the supply of stock is sufficient for commercial distribution to the public. It should be hybridized by crossing with the other amaryllis with yellow coloring such as *Amaryllis evansiae* which is also of small stature and *Amaryllis calyptrata* of the larger species. These crosses could give yellow hybrids without resorting to the red hybrids since red is the dominant color and would probably require as long to breed out as it did the green from the red series.

EXPERIENCES WITH HYMENOCALLIS

C. L. Burlingham, *Florida*

I settled in Punta Gorda, in 1940, one hundred miles south of Tampa, on the Gulf coast. When walking along the streets I often encountered clumps of what I later learned were *Hymenocallis.* One day, alongside a sidewalk, I picked up a few seeds, looking somewhat like small green olives. I put them in a saucer in my bedroom, as the most convenient place at the time, vaguely thinking that some day I would plant them somewhere. In two or three weeks I was astonished to see that the seeds were sprouting in the saucer.

There is a wild species, not yet identified, growing here in the fields. In the fields I have never seen but one scape and one flower at a time, but brought into cultivation the bulb is likely to have two or three flowers to the scape. The flowers are much smaller than the sort cultivated here. They blossom from May first into October. This year the last blossom I happened to see was on October tenth.

The cultivated species, so often found in clumps in houseyards here, has been identified as *Hymenocallis littoralis.* It has a much larger flower, and a fragrance somewhat reminiscent of the rose. I have counted as many as sixteen buds on one scape, but one seldom sees more than three or four open flowers on a scape at one time, and the buds may open over a period of weeks. The bulb grows amazingly well in our sandy soil without fertilizer or other attention, and is prolific in making seeds and offsets.

One bulb in the course of time becomes a clump, sometimes six feet in diameter, and one seldom sees them here except in clumps, and they are almost always grown here in the full sun. It begins blooming the first week in May and blossoms all Summer. It is of interest to find out how late they bloom. This year I visited some dozen clumps near the sidewalk in as many home gardens—every two or three days—beginning September 25th. By that date some clumps had already stopped flowering. The remaining seven clumps dropped out of the race from time to time until on October eighth the last flowers I could find were three flowers on two scapes in one clump. However, this year our daily maximum temperature did not drop below 90 until October ninth, a week later than usual.

In the fields my attention is called to a *Hymenocallis* only when I see it in blossom, and I never know whether or not I have seen that particular specimen before. *Hymenocallis littoralis* is seldom seen except in clumps, and one has no idea how many scapes are produced by a single bulb of either species in a season.

NOTES ON HYMENOCALLIS X FESTALIS

PHILIP G. CORLISS, *M.D.*,
Somerton, Arizona

In the difficult (hot, dry, alkaline) climate of southwestern Arizona, the clone sold as *Hymenocallis* x *festalis,* displays remarkable 'hybrid vigor'. I have tried to grow many of the ismenes and their close relatives, and this hybrid far out-performs any of them. Its only rival, and not a close one, at that, is the lovely *Pancratium maritimum.*

H. x *festalis* was introduced to Yuma gardens by one of the most capable women gardeners of Somerton, who paid $7.50 for her first bulb. She divided it with many friends, including the writer. I have further distributed it, donating several dozen large bulbs to a church auction, and giving and selling bulbs to many local gardeners. I wish I could sell all I am now supporting for $7.50 each! In a few years after division each bulb becomes an enormous clump whose leaves, if well fed and watered, exceed five feet in length and arch in a diameter of eight feet or more, eventually draping themselves untidily over everything within reach.

Depending on the amount of shade, water, and weather, these clumps bloom from late spring to early fall, the massive white chalice-shaped flowers rising to height or just above that of the foliage. They are surely the most striking flowers of the garden during the months of over one hundred degree heat; their foliage stays bright and glossy throughout the year, but is at its best in the hottest weather.

There is but one serious pest, up to this time, and it is the reason for this paper. It is the favorite food of the citrus mealy bug! (Fig. 26) Not until the plant is heavily infested with this pest does it leave for other fare. At present, I have perhaps a dozen clumps, or groups of clumps, of *H.* x *festalis.* Every clump will be infested before the mealy

bug appears on other crinums, *Amaryllis,* or other plants and I have yet to find it on my citrus trees!

The citrus mealy bug looks grossly like so much cotton which has blown onto the foliage. Unlike the red spiders, it does not hide on the underside of the leaf, but prefers the upper surface. The full-grown bugs are perhaps one-third of an inch long and one-quarter of an inch wide and thick, but they are accompanied by bugs from that size down to microscopic speck-size individuals. Only the large bugs would be recognized grossly as an insect, and only these large ones show much movement, and that only if disturbed.

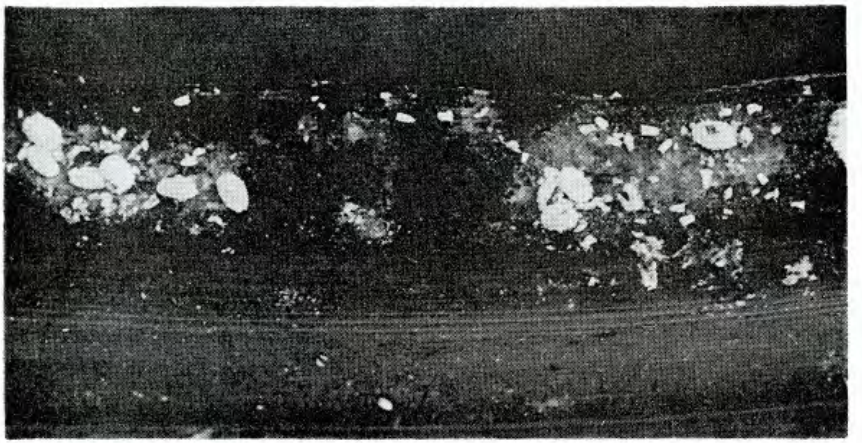

Fig. 26. Mealybugs on the foliage of *Hymenocallis* x *festalis (Elisena longipetala* x *Hymenocallis narcissiflora)* at Somerton, Arizona. Photo by Dr. Philip G. Corliss.

When I first identified the citrus mealy bug, it was easily controlled with D. D. T. or any of the standard garden insecticides. During the past year, however, it has apparently developed a resistance comparable to that of the red spider mites for these insecticides, and it has taken frequent thorough spraying with every available chemical to control the pest. Even so, it may be that only the advent of cold weather has aided me, and next season may result in a campaign which, if I lose, means that all of my *H.* x *festalis* must be discarded! This will be a great pity, for it is a never-ending source of wonderment that any plant could stand day after day in full sun for more than four months when the temperature in the shade never fell below 110 degrees and remain green, glossy, and floriferous!

DR. CORLISS EUROPEAN GARDEN TOURS

As we go to press word has been received that Dr. Corliss will start on an European Garden Tour on June 29, 1959; and again in the autumn (see page 148). Those interested should write to Arnold Tours, 79 Newbury St., Boston 16, Mass.

NERINES ARE BEAUTIFUL

EMMA D. MENNINGER, *California*

Modern hybrid nerines blossom in an array of brilliant colors ranging from white and the palest pink through the gamut of salmon, orange, scarlet and crimson to deep reds, even to purple and blue shades. Comprising about forty-one species, the entire genus is native to South Africa, growing in areas of little to heavy rainfall. Most are summer dormant, the lush dark green leaves flourishing in the cool rainy winters. With few exceptions, they are fall flowering, bringing a wealth of color to rival the autumn leaves. But instead of their bright colors proclaiming the end, they herald a season of burgeoning growth.

Their few to many flowered umbels, adorn scapes a foot or less, to as much as three feet tall and are as dainty as one could wish, being both sturdy and long-lasting. One intriguing quality of the blossoms is that many gleam with what is described as "gold or silver dusting". When seen in bright sunlight or an artificial light, the flowers appear to be closely set with minute transparent gold or silver beads, that have a glitter and sheen that must be seen to be appreciated. No need to fear dulled colors when exhibited at night under artificial light. The six perigone segments usually recurve gracefully at the ends, some having a waved or crisped edge. Nerine 'Pompadour' is an example of ruffled edges that is very pleasing. The color of this attractive nerine is vermilion 18/1 on the Horticultural Colour Chart (HCC). I like to check the colors with the above mentioned chart, although it is time consuming. The colors as we imagine them, may seem somewhat different than the names applied to them in the chart. However, a more accurate description can be had than mere words can give. One caution in using the chart with nerines is that I find that flowers held too close to the chart, using the black mask, may be graded too dark, because the chart color reflecting through darkness the flower color. Holding the specimen somewhat above the chart sample, I feel, will give a better reading.

Returning to the flowers, the tepalsegs may be from an inch or less to two or more inches in length and up to a half an inch in width. The decorative median line down the tepalsegs is usually either a lighter or darker shade of the flower, or it may be a contrasting color. A pretty seedling that we flowered this season, was white with a deep cerise line down the middle of the tepalsegs. It immediately won the appellation "Candystick."

The crosses bred from the *N. sarniensis* and *N. curvifolia* group, as a rule, have long protruding stamen filaments which give an airy elegance to the cluster. Those bred from the *N. flexuosa* group may have less symmetrical perigones with declinate styles and filaments. The former group comprises species with deep colors, while the latter are mostly in tones of pink or white. The latter species more often have the flowers come with the leaves or are comparatively evergreen, such as *N. bowdeni.*

Modern hybrids are a blending of characteristics inherited from the species, with apparently many colors and tones unknown in nature. Some

of the pinks show decided lavender edges or stripes. Naturally, wide tepalsegs and large, not too crowded umbels are most desirable, while another point in favor, is when the flowers of an umbel open about the same time, instead of some of the first flowers having faded before the last buds have expanded.

The Royal Horticultural Society has granted many awards to nerines over the years. The first award to a hybrid, an F. C. C. (First Class Certificate) in 1887 to *Nerine* x *'mansellii'*, strangely enough, is still a favorite found in collections, being valued for its beauty as well as for its late flowering habit. From the Royal Horticultural Society List of Awards from 1859 to 1955 and the later Journals of the Society, I find the first award to a nerine that of an F. C. C. to the species *N. sarniensis* var. *corusca major* in 1864. In all there have been seven F. C. C.'s and eighty A. M.'s (Award of Merit) which include a sprinkling of species. A list of the F. C. C.'s may be of interest:

1864 *sarniensis* var. *corusca major,* an orange colored species.
1887 x *mansellii (flexuosa* x *fothergillii)* a tall rose-pink
1888 x *excellens (flexuosa* x *pumila).*
1893 x *elegans alba (flexuosa* x *sarniensis)*
1920 'Aurora' *(bowdeni* x *fothergillii)* a rose colored triploid.
1920 'Hera' a bright rosy-pink triploid.
1945 'Alice', a beautiful white triploid, the mother of the first tetraploid, 'Inchmery Kate'.
1955 'Nelson', a combination of fuchsia purple and turkey red.

Of the awards since 1945, the palm has gone to Mr. Edmund de Rothschild for his Exbury hybrids, for of the two F. C. C.'s and twenty-two A. M.'s granted, he has been honored with two F. C. C.'s and sixteen A. M.'s.

In the last few years, we have acquired a duplicate set of the Exbury collection, and this year we have about a hundred of these in flower, together with some thirty of our own Greenoaks seedlings with which we are much pleased. Some are average, some very good and several of award caliber.

Among the Exbury hybrids that we have flowered is the tetraploid, 'Inchmery Kate'. This nerine won an A. M., R. H. S. in 1949. It is a lovely soft pink with deeper centers, the flowers being very large with wide petals. The somatic chromosome number is 44 instead of the diploid 22. It was reported by E. K. Janaki Ammal in the Journal of the Royal Horticultural Society for October 1951. Two articles in this Journal give an extensive review of the cytology of both species and hybrid nerines. The author of the articles who discovered the tetraploid 'Inchmery Kate', believes it is the result of the selfing of 'Alice' instead of the reported cross of 'Alice' x 'Lady Foster'.

Another fine Exbury hybrid is 'Inchmery Elizabeth', A. M., R. H. S., 1942, it being a brilliant orange red. *N.* 'Dunkirk', also A. M., 1942, is one of Exbury's finest and largest. It has a large cluster of bright cherry red (HCC 722/-) flowers. My favorite among the Exbury hybrids is 'Susan', A. M., R. H. S., 1954. It produces large trusses of ex-

Hybrid *Nerine* clones: upper left, 'King of the Belgians; upper right, 'Solent Swan'; lower left, 'Flamboyant'; and lower right 'Fairy Wand' as flowered by Mrs. Menninger at Arcadia, California, fall of 1958. Photos by Emma D. Menninger.

Plate 7

quisite flowers of carmine rose (HCC 621/1) with camellia rose (622/-) stripes and centers. It is a cross of 'Aerolite' and the large pale pink 'King of the Belgians'. At this writing it is just opening and the large size of the flowers on tall stems outshine the others in flower.

One of the older hybrids, that to my mind, has hardly been surpassed is 'Rotherside'. It checks signal red (HCC 719/-), a little misleading as to name. I describe it as deep salmon pink. Mr. Hanger's description in the Journal of the R. H. S. for September 1946, is pure salmon, while the R. H. S. Dictionary Supplement lists it as pale rosy orange. All these appear applicable, but here is an example of the value of the Horticultural Colour Chart rating in which the number 719/- can be consulted for a fairly true sample of the color. One must not forget, however, that colors may vary under different cultural conditions and with the age of the flower.

Among the white nerines, 'Solent Swan' is outstanding, being a large glistening white, displayed in a large umbel. 'Snowflake' is a pretty white, but for us is not as outstanding as 'Solent Swan'. 'White' is also good, although it has the faintest tinge of pink. An Exbury hybrid labelled 'Blue Seedling'' is blend of deep blue and touches of magenta. There are a number of clones in blue shades, such as 'Nautilus', with splashes and edges of cerise, magenta or lavender. I do not find these as pleasing as the clear colors. A recent award to Exbury in the newer combination of colors, *N.* 'Nelson', F. C. C., R. H. S., 1955, is described as ''fuchsia purple with broad perianth segments having a central streak of turkey red. It is the result of a cross between N. 'Aerolite' and N. ''Lionel'.'' (Journal of the R. H. S. January 1956) Two beautiful pinks are quite similar—'Pamela' and 'Wisley Bridesmaid'. The former is porcelain rose (HCC 620/1) and the latter porcelain rose (HCC 620/2). They both have darker median lines on large glistening perigones of the softest pink.

Some of the Greenoaks seedlings flowering for the first time this year, have been of comparable beauty to those described above. One a carmine rose (HCC 0621/2) has noteworthy silver dusting. It earned the name 'Sequin'. Another christened 'Fairy Wand' was deep pink geranium lake (HCC 20/1) with lighter centers (HCC20/2). The umbel and flowers are large, with wide segments. 'Sharon' is two shades of pink with centers of salmon pink, the edges of the tepalsegs being several tones lighter. It too, has a handsome umbel of large flowers. 'Avalon' is another deep pink, with darker centers and radiating lines. But not all the seedlings were pink. Indeed, in the thirty seedlings to flower, there were various tones of pinks, orange, red, old rose, blue, with only pure white lacking. 'Flamboyant' is a vivid flame color and 'Bengal Rose', a lovely rosy crimson called rose bengal (HCC25/1) and (HCC-25/1). 'Arcadia' is bright turkey red (HCC721/3). The quality of the flowers on first blooming was a pleasant surprise.

Flora and Sylva (1903-1905), edited by the noted English horti culturist, W. Robinson, in Volume 3, has one of the best articles on the early hybridizers of nerines. James O'Brien was said to have raised

Hybrid *Nerine* clones: upper left, 'Pamela'; upper right, 'Avalon'; lower left, 'Susan'; and lower right, 'Sharon', as flowered by Mrs. Menninger at Arcadia, California, fall of 1958. Photos by Emma D. Menninger.

Plate 8

thousands of seedlings, among which was *N.* x *cinnabarina (curvifolia* x *flexuosa);* x *mansellii,* previously mentioned; *x elegans (flexuosa* x *rosea)* and x *o'Brienii (pudica* x *plantii)* this being described as carmine to slate blue. Another well known hybridizer was H. J. Elwes whose hybrids are still found in collections. Mr. Elwes aimed at producing leaves and flowers together, a field in which much might be attempted today. The species that might contribute most to this end is *N. bowdenii,* which with us is practically evergreen and it has the advantage of having large pink flowers and being among the most hardy of the species. *N. filifolia,* a dwarf species, is also almost evergreen, although it probably flowers more freely if given a short rest in late summer.

An interesting field for hybridization would be the production of more miniatures. There are a number of dwarf species such as *N. filifolia* and *N. masoniorum* that could be tried with the modern hybrids. No doubt many of such crosses, unknown to me, have been made.

Another promising area of hybridization is that of bigeneric hybrids. A number of these have been reported, but it appears that much more could be done. Janaki Ammal, in the above mentioned Journal, reports *N.* x *fletcheri* as a cross of *Nerine* with the Cape Belladonna, *Brunsvigia rosea.* This, she says is an easy cross which has been repeated in the R. H. S. Gardens at Wisley. It flowered in 1942 when the pollen sterility was found to be as high as 96%. She also reports an alleged cross of a *Nerine* with an *Agapanthus,* which received an A. M. in 1896 as *N.* 'Novelty'. However she shows some doubt as to the authenticity of the cross. Another bigeneric cross, *N. marginata* with the Cape Belladonna, *Brunsvigia rosea* was reported in HERBERTIA for 1958.

As aforementioned, the cytology of nerines has been interestingly dealt with in the Journal of the Royal Horticultural Society for October 1951 by Janaki Ammal entitled,—"The Chromosome History of Cultivated Nerines" and in the same issue,—"Chromosome Numbers in Hybrid Nerines" by the above author and Margery Bridgwater. The highlight is the report of the first tetraploid nerine, 'Inchmery Kate' from the Exbury Gardens of Mr. Edmund de Rothschild. Some time ago when our bulbs of 'Inchmery Kate' flowered, I attempted to self it, but was unsuccessful. Perhaps it is self-sterile, or perhaps my failure was due to my being unaware, at that time, of the dichogamous nature of nerines and failure to apply the pollen when the stigma was receptive. The above articles give an exhaustive list of about one hundred chromosome counts which include diploids, triploids, the one tetraploid and a number of aneuploids. The triploids and aneuploids appear to be very fertile. *N.* 'Alice', the seed parent of 'Inchmery Kate', is a triploid plus with 2n=36 chromosomes, while 'Inchmery Kate' has 2n=44, or four times the basic number of 2n=11. Janaki Ammal remarks: "Many of the best hybrids of today have come from these and similar triploids." In contrast, in *Cymbidium* orchids, the triploids are almost completely sterile.

Other chromosome counts of nerines have appeared in HERBERTIA. One by W. M. James and F. T. Addicott in 1941 lists six species and five

hybrids, while J. B. Gouws of the University of Pretoria reported a number of species counts in HERBERTIA for 1949.

The habitat of nerine species covers various conditions of temperature and rainfall. L. B. Creasey in HERBERTIA for 1937 says: "Nerines grow under a wide range of natural conditions . . . and any which show a tendency to retain their foliage, should not be completely dried off." Nerines can be grown out of doors in much of California and other areas with similar climatic conditions. Since California has winter rains—the growing season, and dry summers—the dormant season, it would seem as though it would be ideally suited to nerines. I must say here that I do not pretend to be an expert at growing nerines, in fact, I feel that I am just beginning to learn a little about them. I have learned by experience that the recommended culture for England and coastal areas, must be changed for regions of warmer summers, such as our San Gabriel Valley, where the temperatures in September and October of this year hovered near the hundred degree mark. Frequently this occurs during much of the summer and the recommendation to give the dormant bulbs "a good baking in the sun" as is frequently advised, is too drastic. Many of the bulbs simply shriveled so badly they died or were set back considerably. Therefore, I believe that an occasional watering in the summer in hot dry climates will be beneficial in keeping the bulbs plump and a spraying of the pots when temperatures are high, will serve to cool the bulbs by causing evaporation. Morning sun seems to be to their liking, but hot overhead sun is too severe. *Nerine sarniensis,* in the background of many of the modern hybrids, comes from Table Mountain, where in summer the crest is seldom seen owing to the cloud cover or "tablecloth". When we were in Capetown and environs in October of 1957 (spring), it was very clear but cold with occasional rain that left the mountain tops near Stellenbosch white with fleeting snow. A friend who grows cymbidiums near the Cape, wrote that they seldom have temperatures over 90%, and 95% is most unusual. Our nerines are grown in pots and a concession to higher temperatures is to plant the bulb with the top an inch or so below the soil, instead of being exposed as is usually recommended. There seems to be no danger of the bulbs rotting since the pots dry out quickly. Of course in winter during active growth, much water is needed. As soon as the flower buds or leaves appear, the pots are given a good watering. The frequency of watering is gradually increased and when the plants are in full growth, the pots are not allowed to dry out.

A good sandy loam with much humus seems ideal. In our potting mix of oak leaf soil, we include the compost in which our cymbidium seedlings have been grown for a few months, by about one third. It includes fir bark, peat moss, redwood bark fiber to which was added some fertilizer such as bone meal, hoof and horn, and manure. This is still very coarse when added to the oak leaf soil.

While fairly hardy—the *N. bowdenii* varieties are grown out of doors in southern England—nerines will not, I believe, stand freezing. Although frost is rare here, at least in the last few winters, we keep our pots of nerines in unheated greenhouses. Since the usual recom-

mendation is to "secure the greatest possible development of the bulb", an occasional feeding with liquid fertilizer or top dressing with blood meal or other fertilizer may be given when the plants are in active growth.

A factor in flower production, is that nerines require a good light intensity to bloom. In one of our greenhouses, we have the usual bench with another narrow shelf above. This is definitely not desirable, because the lower shelf receives less light. While it seemed that not much light was cut off, it was a surprise to find that while the upper shelf received 500 foot candles of light, the pots directly beneath, at the same time, received only 125 foot candles. Most of the plants in the more shaded places did not flower. While the reading was taken in the late afternoon, when the greenhouse was shaded, there is usually morning sun. Obviously this situation is being remedied.

It is not necessary or probably desirable to repot nerines oftener than every three or four years. Each August, I remove the top soil and any bulblets that have formed and top dress with rich soil. If necessary to repot, the bulbs can be shaken out and repotted. There is a question in my mind if this is at all harmful, for it appears that the bulbs form new roots each season. In hot regions, larger pots can be used, for the additional soil helps to insulate the bulbs against the heat. I believe our nerines have not flowered as well as if they had less severe summers and I hope to counteract the adverse effects as much as possible in the future. On the other hand, it has been reported that in very humid climates, nerines suffer from mildew, although I have not heard of this condition in England which has a fairly damp climate. It has been suggested that by hybridizing with species from regions of high rainfall or summer rain, this objection might be overcome. Such hybrids would be better adapted to places with summer rains, such as Florida.

The offsets or bulblets previously mentioned, which are freely produced, may be planted in community pots, one for each variety, if they are too small for individual pots. They sometimes flower in a year or two depending on the size.

Perhaps my method of identifying each clone, whether division or seedling, may be of interest. Each clone is given a number composed first of a letter indicating the source, then the year acquired and finally a serial number. Thus E54-8 would be the eighth bulb from Exbury in 1954 and G54-8 would be one of our Greenoaks seedlings sown in 1954 with the serial number of 8. Every clone can be accurately labeled and a card index can be kept to record divisions, flowering dates, descriptions with the Horticultural Colour Chart number and in case of loss or disposal, this too, can be entered.

The fruit of the nerine is a three-celled capsule, each of the cells may contain one or more fleshy green seeds. These are a little smaller and less globular, especially in the hybrids, than a pea. From one umbel of *N.* 'Fairy Wand' with nine flowers, 116 seeds were produced, one of the flowers having no seeds. They look good for the most part, but only time will tell if they are viable. The seeds ripen shortly

after the flower fades and when the capsule begins to burst they must be removed and planted or rather laid on the surface of a good compost. They will sprout very soon if kept slightly damp. There they may remain in the same pot for two years and at this stage are evergreen and may be watered in the summer. Some of our seedlings flowered in three years, others several years later. Some seedlings started in 1952 have not yet flowered. Although I have not had much time for controlled crosses, we are very happy with the seedlings that have flowered. The quality of the flowers and the range of color have been unexpectedly good.

Nerines, whether one has few or many, are always thrilling when in flower and are much admired by visitors. A young boy who helps us on Saturdays, on seeing the many nerines in flower, commented: "Those are the prettiest flowers I have ever seen."

Greenoaks, Arcadia, California.

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LYCORIS IN NEBRASKA

VIVIAN BARNICA GRAPES, *Nebraska*

I have had the pleasure of growing *Lycoris squamigera* in my garden since 1932 and its rose-lilac blossoms are always a pleasant surprise during August. It is perfectly hardy here, even in more open situations. There is a slight variation in growth of bulbs from three different sources, the blossoms are a bit darker colored, taller growing and the foliage longer on the two later additions.

In 1946 I purchased bulbs labeled "L. purpurea"; they have been growing in the same parts of my garden as *L. squamigera* and seem to be equally as hardy. The blossoms are darker, a month later than *L. squamigera* and the foliage more narrow. A bloom stalk was identified, by Dr. Traub, this fall as *L. haywardii.*

Lycoris incarnata, L. sprengeri and *L. sanguinea* were added in 1954. *L. incarnata* has made a good increase and *L. sprengeri* bloomed for the first time this fall. *L. sanguinea* has bloomed around August 22 the last three years and sets seeds. The funnel-shaped blooms, 1½ inches across are brick-red, the bloom stalk 12 inches high. Here none of these put up any foliage until early spring.

Some foliage measurements made the latter part of May are given below:

L. squamigera [obtained 1932] 7/8 to 1 in. [2.—2.5 cm.] wide, 18 in. [45.7 cm.] long.

L. squamigera [obtained 1939 & 1946] 1 to 1¼ in. [2.5—3.2 cm.] wide, 25 in. [63.5 cm.] long.

L. haywardii 7/16 in. [1.1 cm.] wide, 18 in. [45.7 cm.] long.

The above are all ten year old clumps.

L. incarnata ¾ in. [1.9 cm.] wide, 18 in. [45.7 cm.] long.

L. sprengeri ¾ in. [1.9 cm.] wide, 18 in. [45.7 cm.] long.

L. sanguinea ½ in. [1.3 cm.] wide, 13 in. [33.0 cm.] long.

This fall I have planted for trial in the most sheltered part of my garden, bulbs of all the other species of *Lycoris* that I have been able to obtain.

LYCORIS RADIATA BY THE THOUSANDS

Wyndham Hayward

One of the few Far Eastern bulbous plants which have adopted Florida and the Lower South as its own is the popular red *Lycoris radiata.* This is the darling of many an humble dooryard in the Gulf Coast area, from North and West Florida around to lower Texas.

Lycoris radiata is not reliably hardy in the upper South but has been grown well with good flowering results in protected locations as far North as Washington, D. C. and Southern Ohio. In some parts of the South especially Alabama, Mississippi and Louisiana it is so common and thrifty, it is almost a weed, and one hears of gardeners digging up a bushel from their beds and giving them away!

Dozens of offers of the bulbs are found in the lower South Marketing Bulletins, state publications for farmers and other country people.

Traub and Moldenke in their "Amaryllidaceae: Tribe Amarylleae", 1949, place *Lycoris radiata* as species No. 7 of the genus, in the Sub-Genus II, *Lycoris.* They give the range as China and Japan. It has a confused botanical history, extending even to its introduction and identification in the South, where it was known as *Nerine sarniensis* for many years. The writer and W. M. James of California cleared up this mis-identity some 20 years ago. At the present time the proper name *L. radiata* has become general for the bulb.

Without doubt, a vigorous specimen of *Lycoris radiata* in full bloom is one of the most gorgeous, exotic and beautiful flowers of all the vegetable realm. The tepalsegs glisten as if with fine gold dust, and the bristling stamens and pistils make a positively radiant picture. The color is a flaming bright red. The individual flowers open one after the other until the full umbel is expanded before the flowers begin to fade.

According to Baker in 1888, (Handbook of the Amarylleae) the Dutch Medical botanist Engelbert Kaempfer noted *Lycoris radiata* in Japan. No careful survey of the native sites of this bulb in China

[**LYCORIS RADIATA—HAYWARD,** continued on page 80.]

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1958 EUROPEAN TRAVEL NOTES

PHILIP G. CORLISS, *M.D.*
Somerton, Arizona

During the past few years that I have been taking 'Garden Tour' parties to the British Isles, the Low Countries, and Paris, I have pondered the question of whether I prefer the gardens and flower shows of spring or fall. Summer trips are avoided because all travel facilities and accommodations are taxed by the school-vacation travellers; because the weather, rarely good by California or Arizona standards, is likely to be uncomfortable in summer; and most of the people you wish to see are also away "on holiday".

I think that Fall is my choice. There are more horticultural subjects in bloom in the spring, it is true, but they are spotty-beds of bulbs at peak bloom next to others that have finished or not yet flowered. The fall colors of the trees and heather are gorgeous, and the roses. chrysanthemums, and dahlias are ablaze with color, not ending, as do the spring flowers, but constantly opening new bloom until stilled by frost.

My first horticultural tour of England was made in the spring. It seemed as though all the trees were flowering ones—chestnuts, golden rain, and hawthorne, supported by masses of azaleas and rhododendrons. I wondered what charm the countryside could display in the fall. On my next trip, I learned. Not only do the trees take on the autumn foliage colors, but the red beeches and white birches are interplanted with the other trees so that every copse and dale is actually like a beautiful landscaped garden.

Fall-blooming flowers are used more widely over there than in America. Everywhere the spring bulbs are replaced by dahlias and chrysanthemums, and the hardy perennial asters are universally used.

There is also a wider variety of spring bulbs to be seen everywhere abroad than in the United States. Tulips, daffodils, Dutch iris, crocus, and scillas are seen everywhere, but there are also ixias, species and baby gladiolus, fritillaries, camassias, and many other spring bulbs which our gardeners simply will not try because they are not familiar with them.

It is always a joy to visit the fields and glass houses of the Van Tubergen firm at Haarlem. This spring even a rain drizzle couldn't dampen my spirits as I made the rounds with Mr. Hoog, Sr. Great blocks of flowering bulbs native to South Africa were especially intriguing. One bed of a species *Gladiolus* was supposed to be *G. blandus,* but Mr. Hoog was not certain, so we went to his library (what a library!—built by all the owners of this firm since its establishment) for a description of *G. blandus.* Here I was introduced by Mr. Hoog to the superb volume "South African Flowers for the Garden" by Sima Eliovson, published by H. Timmons at Capetown. (When I returned to London

Oct. 1959.

I tried to buy it—and Harrod's secured a copy for me—which they said was the only one available in London at the time.)

There are several spring bulbs at Van Tubergen's which surely deserve the attention of our gardeners. There are so many beautiful tritonias, a spring-flowering relative of the gladiolus which should be better known. Two brodiaeas were new to me—the red-and-green-flowered *Brodiaea coccinea* and the yellow *Brodiaea ixioides*. Unlike their hybrid hyacinth relatives, they should not be a one-season wonder in our gardens. A wonderful bulbous *Iris* species is I. *latifolia,* which has large flowers and tall strong stems, and should prove valuable in breeding. Why don't we adorn our spring borders with the *Nerine angustifolia,* which I admired here at Van Tubergen's? The fall-blooming nerines are temperamental beauties, only *Nerine bowdenii* accepting more than a few habitats.

The *Amaryllis* breeder of Ludwig and Co. at Hillegom, Mr. A. G. A. Jansen, had kindly arranged to retard several dozen bulbs of their new named *Amaryllis* clones so they would be in bloom at the time our party visited their nursery. We were especially impressed with the brilliant 'Candy Cane' and the red 'Invincible', while the lovely pink 'Apple Blossom' was liked by all of us. Ludwig is offering their picotee-flowered *Amaryllis,* about which I wrote in these pages last year, although it still may throw an occasional touch of red on the broad white petals which have such a tiny red pencil edging. They have also named three of their "Gracilis" *Amaryllis*—the small-flowered type bred from A. *striata* x large-flowered hybrids.

Is there a more spectacular flower than the large *Amaryllis* of the 'Royal Dutch' strain? I think the large ones are surely a man's flower. They have boldness, brilliance, and are surely traffic-stoppers. It is something of an anticlimax to add a note from the U. S. scene at the end of this paper, but I feel it only fair to say that Dr. Traub has bred some dazzling pure white amaryllis which are apparently more suitable for gardens of our temperate region than the presently available whites from Holland; and the blackest red *Amaryllis* I have yet seen was bred by one of our hemerocallis enthusiasts of Houston, Texas. I have not yet seen any *Amaryllis* hybrids which justify being called blue. But our hemerocallis breeders are close to blue, so doubtless the amaryllis workers will achieve lavender and purple—and perhaps, one day, a blue.

NEW CLONE OF MYOPORUM LAETUM

Hamilton P. Traub, *California*

In southern California *Myoporum laetum* from New Zealand makes a very valuable wind-break, particularly on the Pacific Ocean coast where it can withstand the salt-spray. It may be grown as a shrub with trimming, or as a small tree up to 25 feet. It is evergreen, drought resistant and fast growing. Unfortunately it is propagated by means of seeds at present in spite of the fact that the progenies are quite variable

and produce a superabundance of messy fruits. Some of the seedlings are not as useful as others. Thus it is desirable to select superior seedlings for vegetative propagation.

From a large number of seedlings grown at La Jolla, Calif., one outstanding clone has been selected that is definitely superior to all of the others seen.

Myoporum laetum cl. 'Traub's Compact'. Plant relatively compact, many-branched, leaves relatively smaller, almost elliptic. Fruits relatively few.

This plant is easily propagated by means of cuttings. In the present experiments, 4 to 5 inch cuttings gave 100% rooting in a soil medium of ½ loam and ½ granulated peat. The use of the University of California basic soil mixes B or C will most likely give equally good results (see Manual 23. The U. C. System for Producing Healthy Container-Grown Plants", by K. F. Baker et al. $1.00. Agric. Publ. 22 Giannini Hall, Univ. of Calif., Berkeley 4, Calif.)

BEST PLANTS FOR THE COOL GREENHOUSE

S. B. Whitehead, in Gardeners' Chronicle, Lond., 144: 156-157, 1958, discusses the best plants for a cool greenhouse, which latter is defined as "one where by periodic heating as required, the temperature is kept just above 40° F. in the coldest weather." The list of plants includes *Primula obconica, P. malacoides, P. sinensis, Erica hyemalis rosea, Cytisus racemosus, Euphorbia fulgens, Acacia drummondii, A. arnuta, Loropetalum chinense, Solanum capsicastrum, Begonia* cl. 'Gloire de Lorraine', 'Elatior', 'Mme de Rothschild', *Cyclamen persicum* (finest forms), including cl. 'Grandiflora', *Freesia* hybrids, in various colors, *Lachenalia aloides, L. nelsonii, L. quadricolor, Cinereria, Schizanthus, Calceolaria, Salpiglossis,* Winter stocks, *Celsia arcturus, Jasminum polyanthum, Lapageria rosea, Plumbago capensis, Streptodolen iamesonii,* and *Salvia patens.* He reproaches himself for omitting such fine subjects as chrysanthemums, carnations, pelargoniums, and so on.

EUGENIA PANICULATA CLONE

Hamilton P. Traub, *California*

The Australian Bush Cherry, *Eugenia paniculata* Banks, is widely grown in California as a hedge or wind break. It is propagated by means of seeds and thus the individual plants vary very widely. The fruits are usually large-seeded and quite astringent to the taste, and they are not used as a dessert fruit or in making jelly in California.

Recently the writer raised numerous seedlings of *Eugenia paniculata* and to his surprise found several plants with relatively small-seeded, large, mild, pleasantly-flavored fruits. These have been eaten with

relish as a dessert fruit either out of hand or with cream and sugar like strawberries.

One of the finest seedlings has been propagated vegetatively as a clone, and has been named, 'Traub's Choice' since it was chosen out of several superior seedlings for its high quality fruits.

Eugenia paniculata Banks, clone 'Traub's Choice' (Myrtaceae)

The fruits are usually broadly pear-shaped, rarely roundish, dahlia purple (HHC 931) in color outside, and the flesh is lilac purple (o31/1). The dimensions based on the measurement of 20 fruits taken at random are as follows:

Fruit, length, range, 2.10 to 2.40 cm.
width, range, 1.80 to 2.35 cm.
Seed, diameter, range, 0.55 to 0.70 cm.

The plant is a vigorous tree and is easily propagated by means of cuttings, either with or without the use of plant regulators (hormones) such as rootone.

The type specimen No. 633 (TRA), of the clone, has been deposited in the Traub Herbarium.

A REVIEW OF THE GENUS **GAGEA** SALISB.

J. C. TH. UPHOF, *Florida*

[Continued from page 132, **Plant Life,** Vol. 14. 1958.]

Subsection 2. **Pygmaea** Pascher, Lotos, n. ser. 14: 111. 1904. Most species having a vigorous, obovoid gynoecium; style relatively short, about as long as the ovary; stigma round, slightly 3-lobed; androecium half as long as the perigone.

7. G. LIOTARDII (Sternb.) Roem. et Schult. Syst. 545, 1704; *G. fistulosa* (Ram.) Ker-Gawl. Journ. Roy Inst. 1:180, 1816; *G. pygmaea* Salisb. in Kon. et Sims, Ann. Bot. 2:557, 1806; *G. algeriensis* Chab. in Bull. Soc. Bot. France 26:320, 1889; *Ornithogalum fragiferum* Vill. Hist. Plant. Dauph. 2:270; *O. fistulosum* Ram. ex DC. Flor. France, 3:215; *O. liotardi* Sternb. Denkschr. Bot. Ges. Regensb. 2:56, 1818; *O. bohemicum* Lois. Flor. Gal. ed. I, 1:243.

DESCRIPTION.—Plants 10 to 12 cm. high. Bulbs two. Basal leaves 1 or 2, round, hollow, grooved at the base, 2 to 4 mm. wide. Cauline leaves two, almost opposite, lanceolate, laying toward the inflorescence, lanceolate; the lower one with a broad base, narrow toward the apex, longer or shorter than the umbel. Bracts small. Inflorescence 1 to 5-flowered. Pedicels somewhat hairy, 4 to 5 times longer than the perigone. Segments of the perigone obtuse, elliptic-lanceolate. Stamens hardly half as long as the flowers. Var. *laevipes* Henri Jaccard (var. *glabra* Dalla Torre et Sarntheim) has glaborus pedicels; var. *fragifera* Vill. (var. *bulbifera* Henri Jaccard) produces many bulblets instead of flowers.

NOTES.—This is one of the few alpines among the Central European species where it flowers in June and July. The plants grow in fertile

meadows, humic soils in the Alps, usually to 1200 m. alt. occasionally reaching 2400 m. among which in Wallis at 2470 m. It is distributed in the Pyrenaea, Alps, Corsica, Apenines and Himalaya region.

8. G. DISTANS Pasch. Lotos N. F. 14: 118-119, 1904.

DESCRIPTION.—Plants slender, 4 to 15 cm. high. Bulbs of medium size. Tunic with few or without fibres. Stems frequently attentuate at the base, somewhat robuste, upright or slightly flexuose. Basal leaves narrow more or less filiform, seldom wider. Basal leaves often sideways remote from the internodes; the lower ones often much longer, oblong or ovate-oblong; the upper ones long and somewhat attenuate, frequently elongate recurved, 3 to 9 mm. wide, shorter than the inflorescence. Internodes of the flowercluster long. Cauline leaves at some distance. Bracts smaller than the caulines leaves. Pedicels longer than the flowers. Flowers 8 to 10, seldom 15 mm. long. Segments of the perigone oblong, somewhat yellow; inner segments oblong or obovate-oblong. Capsule more or less emarginate.

NOTES.—Native to Spain. Exsiccata: Porta Rigo. Iter. Hosp. II. 1890, nr. 40; Hater, Porta Rigo, Plant. Hisp. nr. 52, 1879.

9. G. DURIEUI Pasch. Lotos N. F. 14:112, 1904.

DESCRIPTION.—Plants slender. Stem more or less flexuose. Basal leaves more or less filiform. Lower cauline leaves oval, elongated toward the apex, somewhat filiform, narrow attenuate. Inflorescence few flowered. Pedicels about double the length of the flowers. Outer tepals of the perigone usually attenuate, obtuse toward the apex; inner tepals oblong or subovate-oblong, obtuse or slightly acute. Tepals are often spotted with red.

NOTES.—Native to Northern Africa, especially Algeria.

10. G. COSSONIANA Pasch. Lotos N. F. 14:119-120, 1904.

DESCRIPTION.—Plants often with an elongated stem, to 25 cm. high. Bulbs large. Tunic membranaceous, dark ash colored, unequally incissed, covered with fibres. Basal leaves about as long as the inflorescence or slightly longer, narrow linear, somewhat thickened, toward the base attenuate, near the apex attenuate acute, 1 to 1½ mm. wide and 20 to 25 cm. long. Cauline leaves conspicuous, 1 to 5 cm. long, the lower ones as long as the inflorescence, somewhat clasping, concave at the base, oblong-linear or ovate-linear, toward the apex slightly attenuate, acute or obtuse, 4 to 9 cm. long. Inflorescence 3 to 7-flowered; bracts linear, attenuate toward the apex, half the length of the pedicels. Pedicels double the length of the flowers, spreading. Flowers small, 8 to 11 mm. long. Outer tepals, small, linear-oblong, toward the apex and base somewhat attenuate; inner tepals oblong, often on both sides to a high degree attenuate, at the apex obtuse. Stamens half as long as the perigon; filaments toward the base somewhat dilatate. Ovary obovoid, at the base slightly attenuate, retuse and emarginate; stigma 3-lobed.

NOTES.—This species differs from the *G. pygmaea* by the strongly developed bulbs and the peculiar formation of its fibres. Pascher supposes that it may form a southern race of *G. pygmaea*. There has not been, however, sufficient material available to substantiate this. Yet

G. Cossoniana should be considered a distinct species. Native to Northern Africa.

11. G. FOLIOSA Schult. Syst. 7; 1704, Boiss. Flor. Orient. 5:205, 1881; *Ornithogalum spathaceum* Flor. Graec. Lab. 341 non Schult.; *G. polymorpha* Boiss. Voy. Esp. ex parte; *G. billardieri* variarum coll. or. non Kunth; *Ornithogalum luteum* Flor. Pelop. non Schult; *G. pygmaeu* var. b Roem. et Schult. 7;1705.

DESCRIPTION.—Bulbs in two's. Tunic usually leathery. Basal leaves linear-lanceolate or filiform, grooved. Stem loose or corymbose, 1 to few flowered. Cauline leaves alternate, seldom more or less opposite, glabrous or ciliate, lanceolate, accuminate. Pedicels slender. Perigone yellow with linear-oblong segments. Filaments one third the length of the perigone. Anthers ovate. Capsule obcordate.

NOTES.—Native to Greece, Crete, Thrace, Cyperus, Armenia, Transcaucasia, especially in the mountains to the subalpine zones. *G. nevadensis* Boiss. and *G. corsica* Mutel which are mentioned by Pascher as separate species, are referred in the Index Kewensis to *G. foliosa*. *G. nebrodensis* Nyn. Syll. 372. probably belongs to this group.

Subsection 3. **Arvensis** Pascher, Lotos, n. ser. 14: 122. 1904. Ovary strongly developed; style about 1.5 times as long as the ovary; stamens usually half the length of the flower; flowers in many cases larger than those of Subsection 1. Chrysanthae.

12. G. BOHEMICA Roem. et Schult. sensu ampl. Syst. 7:549, 1705.

DESCRIPTION.—Plants small and low. Basal leaves more or less filiform, moderately curved to attenuate. Inflorescence few flowered. Pedicels 9 to 16 mm. long. Segments of the perigon obovate, oblong, obtuse.

NOTES.—This species is very variable and is composed of forms that are often considered as species, among which is *G. saxatilis* Koch., *G. zauschneri* Pasch., *G. alleppoana* Terracc. and others. Morphologically they resemble each other and show close relationship by transition forms. Many of such have been found near Magdenburg, Germany. This species is considered as being originally Mediterraenean which passed into the Pontic region, to Austria and Central Germany, where the plants are sterile. This condition has been ascribed to a failure of pollination due to the absence of insects native to the Steppe region. This explains perhaps the abundant production of bulbs, which often dominate in areas where non-flowering plants predominate.

13. G. ZAUSCHNERI (Pohl) Pasch., Lotos, N. F. 14:1904: *G. szovitsii* Besser. ex. Schult. Syst. 7:550, *Ornithogalum bohemicum* Zauschn. Abhandl. Privatges. Prag. 2:120, 1770;—*O. zauschneri* Pohl. Flor. Bohem. 2:14.

DESCRIPTION.—Bulbs small. Plants 4 to 5 occasionally 8 to 10 cm. high, glabrous, sometimes more or less hairy. Stem robust. Basal leaves round, filiform. Cauline leaves somewhat expanded, with a sheathlike base, frequently pointed. Inflorescence with a few flowers. Flowers 15 to 18 mm. long, deep yellow, generally longer and wider than of *G. saxatilis*. Margin and back of the perigone more or less hairy. Outer seg-

ments of the perigone broad, obtuse, about 3 to 7 mm. wide; the inner ones obovate, 3 to 6 mm. wide, often irregular, narrowing at the base. Ovary obvate.

NOTES.—This species is distributed in Southern Europe, especially in the Balkan Peninsula, Southern Russia, Hungary, Syria, Palestina. It has been but seldom observed in Germany and Austria and is apparently absent in Switzerland.

14. G. SAXATILIS Schult. Syst. 7:549; *G. bohemica* Gren. et Gord. Flor. Fr. 3:195; *Ornithogalum fistulosum* Roth, Enum. 2:42; *O. bohemicum* Ten. Flor. Nap. 1:172.

DESCRIPTION.—Bulbs two. Plants reaching a height of 2.5 to 8 cm. Basal leaves longer than the flower stalk, filiform, bent or curved. Cauline leaves 4 to 5, usually lanceolate, 4 mm. wide. Flowers solitary or in umbels of 2 to 3 flowers, light yellow. Segments of the perigone long-oblanceolate, obtuse, about 1 to 1.3 cm. long. Ovary obovate. There are a number of individuals that produce a large number of bulblets known as var. *fragifera* Zimmern.

NOTES.—This species prefers sunny rocky places, composed of granite, porphyr and tertiary lime. Occurs occasionally also along roads, on level land and in the mountains to about 600 m. alt. It is a native of the Iberian Peninsular, Italy, Central and Western France, it is less frequent in Central Germany and Western Switzerland.

15. G. STELLARIS Salisb., in Kon. & Sims, Ann. Bot. 2:556 (err.356). 1806; *G. arvensis* Dum. Flora Belg. 140; Boiss. Flor. Orient. 5:205. 1881. *G. villosa* Duby Bot. Gall. ed. II 1: 467; *Stellaris minima* Moench Meht. 303, 1794; *Ornithogalum arvensis* Pers. in Usteri, Ann. Bot. 11; 8, 1794; *O. minimum* Willd. Spec. Plant. 2:114; *O. villosum* Bieb. Flor. Taur. Cauc. 1:274.

DESCRIPTION.—Bulbs two. Tunic membraceous. Plants reaching a height of 7 to 5 cm. Flowering stalk usually hairy. Basal leaves two, linear, 0.5 to 2 mm. wide often longer than the inflorescence. Cauline leaves inclined toward the flower cluster; the lowest lanceolate at the base 1 cm. wide; the upper linear, rough hairy along the margin, in the axils often forming bulblets. Inflorescense 5 to 10-flowered united into an umbel-like cluster. Segments of the perigone yellow, lanceolate, 10 to 15 mm. long, obtuse. Pedicels and segments of the perigone more or less rough hairy. Ovary obovate. Capsule long obovate, obtuse, slightly shorter than the segments of the perigone. Among the different varieties belong var. *typica* Beck (var. *pubescens* Peterm.) with hairy flower stalks and upper leaves; var. *semiglobra* Beck with glabrous stems and leaves.

NOTES.—Plants grow especially in sandy soils, in fields, grassy places, along hills, roads, in vineyards along mountains. They are usually found on level land and in hilly country, though occasionally they have been found at an alt. of 2200 m. Plants occur often on cultivated land and are therefore generally called in German Kulturbegleiter. In cultivated lands where the plants occur abundantly bulbs are often spread by farm implements. This species is distributed through Central and Southern Europe, as far as Denmark and Southern Sweden, further

through Asia Minor, Iran and Northern Africa. It is absent in the British Isles.

16. G. GRANATELLII Parl. Flor. Palermo 2:376; Terracc. Bull. Soc. Bot. France. Mem. 1905; *Ornithogalum Carovagli* Manby, Flor. Alg. 35.

DESCRIPTION.—Leaves lanceolate, flat. Segments of the perigone deep yellow, lanceolate-oblong, obtuse, on the back loosely pilose or glabrous. Peduncles villose seldom glabrous. Capsule oblong or obovate.

NOTES.—This species has the appearance of *G. arvensis*. It occurs in the mountains and fields of Tripolis, Cyrenaica and Algeria. There is a variety *maroccana* Terracc. Bull. Bot. France. Mem. 16, 1905 with larger bulbs. It is found near Tangiers and other parts of Morocco. Subsp. *Chaberi* Terracc. Bull. Soc. Bot. France. Mem. 16, 1905 with smaller bulbs is found in ravines and forests near Medeah.

17. G. BOISSIERI Pasch. Lotos N. F. 14:121, 1904; *G. foliosa* Boiss. Flor. Orient. 5: 205, 1881.

DESCRIPTION.—Bulbs small, often verrucose to arealate. Basal leaves linear, at the apex more or less attenuate. Cauline leaves somewhat opposite or distinctly alternate; the lowest oblong or oblong-linear, often nearly filiform, attenuate, the upper linear, short. Inflorescense compact, with few flowers, bracts narrow linear, 10 to 15 cm. long. Segments of the perigone obtuse, seldom subacute or oblong, nearly elliptic; inner segments narrow, obtuse. Capsule attenuate at the base.

NOTES.—This species is related to *G. arvensis*. It has been stated by Pascher that this species may be *G. dubia* Terracc. Bull. Ort. Bot. Pal. 39. Exsiccatae Callier, Iter. Lauric. II nr. 257.

18. G. FIBROSA Schult. Syst. 7; 552; Kunth, En. Plant. 4:243; *G. mauritanica* Cosson, Rev. Flor. Libycae in Bull. Soc. Bot. France 12:279; *G. rigida* Boiss. et Sprun., Diagn. Plant. Or. Ser. I. fasc. VII, 108; Munby, Cat. Plant. Alg. 1:32; *Ornithogalum fibrosum* Desfont., Flor. Atl. 1:294, Tab. 84; Poiret, Encycl. Method. Suppl. 4:193.

DESCRIPTION.—Leaves distinctly grooved. Segments of the perigone glabrous, seldom faintly pubescent. Pedicels sparcely pilose or somewhat pubescent. Capsule ovate-oblong, obtuse, one half the length of the perigone. Seeds triangular.

NOTES.—Native to the hills and calcarous fields of Tripolis and Egypt. Among the varieties are mentioned var. *latifolia* Terracc. and *angustifolia* Terracc.

19. G. MICRANTHA Pasch. Lotos N. F. 14.122-123, 1904, *G. foliosa* var. *micrantha* Boiss. Flo. Orient. 5:205.

DESCRIPTION.—Plants small more or less robust. Tunic ash colored, slender, stem robust. Basal leaves shorter than the inflorescence, linear at the apex hardly wider, toward the apex short attenuate, somewhat acute, 3 to 5 mm. wide, 15 cm. long. Cauline leaves alternate, seldom opposite; lower leaves oblong, at the apex attenuate to acute, 1.5 to 2 mm. wide, 1 to 2 cm. long. Inflorescence few to many flowered, flowers somewhat clustered. Bracts at the base of the pedicels, oblong-linear or somewhat filiform. Pedicels of unequal length, one half to 1.5 times length of the flower. Flowers 7 to 11 mm. long. Outer segments of the perigone

oblong, at the apex a little attenuate, subacute or sub-obtuse, seldom toward the base attenuate, narrow, yellow bordered, near the base ciliate 1.5 to 2 mm. wide; inner segments oblong, at the base slightly attenuate or subobvate to oblong. Stamens one third of the perigone in length. Filaments scarcely dilatate at the base. Ovary obovoid, 3-sided, above somewhat emarginate; style scarcely half as long as the ovary; stigma retuse, slightly 3-lobed. Capsule as long as the perigone segments or slightly shorter, obovoid, obtuse, 3-sided with a remaining style. Var. *libanotica* Pasch. in Fedde Repert. 1:191, 1905 differs slightly from the species.

NOTES.—Native to Lebanon, Syria and surrounding territory. Exsiccata. Kotschy, Iter. Syr. 245, 1885.

20. G. PEDUNCULARIS (Presl.) Pasch. Lotos N. F. 14:114, 1904, Bull. Soc. Imp. Nat. Moscou, 356, 1905; *Ornithogalum pedunculare* Presl. Del. Prag. 150; *G. foliosa* Boiss. Flor. Orient. 5:205, 1881.

DESCRIPTION.—Basal leaves narrow, about 2 mm. wide, linear or somewhat filiform. Inflorescence few flowered. Flowers 14 to 26 mm. long. Segments of the perigone obovate-oblong, obtuse or somewhat rounded. Capsule arcuate.

NOTES.—This is a very variable species. Native to littoral Asia minor, Syria, Cyprus, Crete, Greece to Dalmatia.

21. G. ASSYRIA Terracc. in Bull. Soc. Bot. France 5:1122-1123, 1905.

DESCRIPTION.—Bulbs small. Basal leaves more or less filiform, not reaching the length of the flowers. Cauline leaves broad, shorter than the inflorescence, convolute toward the apex, long tapering, attenuate. Scape slender, striate, glabrous. Inflorescence many flowered. Pedicles villose, unequal. Flowers small, yellowish green, segments of the perigone lanceolate, acute, greenish on the dorsal side; distinctly veined. Stamens half the length of the perigone; filaments subulate, toward the base dilatate. Anthers oblong, small. Ovary oblong, 3-sided; style slender and often appearing above the anthers. Capsule obovate-oblong, 3-sided.

NOTES.—In woods of Mountain Tur Tschell, Assyria.

22. G. JULIAE Pasch. Lotos N. F. 14:123, 1904; *G. foliosa* var. *orientalis* Sinten. in exs.; *G. peduncularis* var. *orientalis* Pedch. in sched.

DESCRIPTION.—Plants slender, bulbs small. Tunic dark brown, fibres absent or at some distance surrounding the bulb. Stem often elongated, slender, circular on cross section, subangulose, attenuate at the base. Basal leaves narrow linear, 1 to 1.5 mm. wide, as long or longer than the flower cluster, the upper ones somewhat grooved, at the base slightly attenuate. Cauline leaves alternate, 1 to 2.5 cm. distance from each other; lower leaves 3 to 7 mm. wide and 3 to 5 cm. long; upper leaves linear, attenuate toward the apex, seldom slightly clasping around the stem. Bracts somewhat cilate. Pedicels of unequal length, elongating during the fruiting stage. Flowers small 3 to 9 cm. long. Outer segments of the perigone 7 to 9 mm. long; the inner ones often pilose, oblong, attenuate at the tip; the interior ones nearly obovate-oblong, at the apex

attenuate. Stamens about one fourth the length of the perigone; filaments widened at the base. Ovary obovoid; style short. Capsule about one third of the length of the perigone, obovoid, arcuate, retuse, emarginate with a remaining style.

NOTES.—Native to Cyprus.

SECTICN 2. **Monophyllos** Pascher, Lotos, n. ser. 14: 112. 1904. First and second leaves free, not surrounding the stem; each one having usually an erect bulb in its axil; the second leaf although present is mostly rudimentary.

Subsection 1. **Minimae** Pascher, Lotos, n. ser. 14: 112. 1904. Leaves narrow, linear, occasionally filiform, often angular.

23. G. MINIMA (L.) Ker.-Gawl. Journ. Roy. Inst. 1:180, 1816; *G. callosa* Reichb. Flor. Germ. Excurs. 107; *G. baumgartneriana* Schur. Enum. Plant. Transc. 667; *Ornithogalum minimum* Pall. Reise 2:14; *O. Gracile* Hagen Chlor. Boruss. 122; *O. Callosum* Kit. in Schult. Oesterr. Flor. ed. II, 1:557.

DESCRIPTION.—Bulbs small. Plants 8 to 20 cm. high, very slender. Flowering stem forming at the base a large and a small bulb. Basal leaf one, seldom a second one which is very short, narrow, 1 to 2 mm. wide, linear, flat to somewhat hollowed. Lower cauline leaf 7 to 8 mm. wide; often sword-like curved, shorter to longer than the flower cluster; upper leaf linear, resembling the basal leaf. Inflorescence umbel-like, 1 to 7-flowered. Pedicles glabrous, usually 2 to 3 times longer than the flowers. Segments of the perigone linear-lanceolate, 10 to 12, sometimes 15 mm. long, acuminate, slightly recurved. Stamens shorter or half the length of the perigone, Anthers elongated. Capsule ovate, shorter than the perigone.

NOTES.—This species is found along margins of forests, along slopes, under fruit trees, bushes, in alpine meadows. Occasionally in the Alps to 1600 m. alt. It prefers calcareous soils. Native to Southern and Eastern Europe, as far as Denmark and Scandinavia, is absent in Spain, France, Belgium and the Netherlands. It also occurs in Caucasia, Ural Mountains, Asia Minor, Siberia and the Altai Mountains.

24. G. MESOPOTAMICA Bornm. in Notizbl. Bot. Gart. Berlin 7:172, 1917.

DESCRIPTION.—Bulbs in two's. Tunic leathery, brownish. Basal leaves 1 to 2, glabrous; the majority reaching the flowers, linear, 1.5 mm. wide and 10 to 15 cm. long. Cauline leaves two, more or less opposite, glabrous or somewhat ciliate, oblong-lanceolate. Inflorescence density 4 to 7-flowered. Pedicels glabrous, somewhat of the same length, 2.5 cm. long erect. Segments of the perigone linear, narrow, about 1 mm. wide and 12 to 15 mm. long; the inner ones yellowish; the outer greenish, 3-veined. Filaments one third or one fourth the length of the perigone; anthers yellow, ovate. Stigma retuse not lobed.

NOTES.—Native to the steppes of Djirdjib-rud, Mesopotamia, at 400 m. alt. This species is apparently related to *G. minima.*

25. G. MINUTA Grossh. in Komarov, Flora U. S. S. R. 4:734, 1935.

DESCRIPTION.—Bulbs small, solitary. Tunic dark, fuscate. Stems 2 to 5 cm. long, slender, thin. Basal leaves solitary, linear, at the base not

attenuate, 3 to 4 mm. wide, shorter or as long as the flower cluster. Cauline leaves short, linear. Inflorescence 1 to 4-flowered. Pedicels unequal, thin, 2 to 3 times as long as the flowers, somewhat crispulate villose, more or less glabrous. Segments of the perigone 7 to 9 mm. long, narrow-linear, acute, inside bright yellow, on the outside greenish. Anthers small, ovate-rotundate.

NOTES.—Native to the mountains of Buchara.

26. G. GRANULOSA Turcz. Bull. Soc. Imp. Nat. Moscou 26:2, 112.

DESCRIPTION.—Plants more robust than *G. minima,* about 14 cm. high. Leaves flat, veins clearly visible, attenuate, somewhat narrow sublanceolate. Flowers 14 mm. long. Pedicels 1 to three times longer than the flowers. Var. *elatior* Pasch. Fadde Repert. 1:33 is more slender, leaves are around 30 mm. long. Pedicels are more delicate.

NOTES.—Native to Altai Mountains and Turkestan. Under this species is sometimes included *G. rufescens* Regel, Index Semen Hort. Petrop. 128, 1863 which is a luxuriant horticultural form, having a height of about 20 cm.

27. G. MINIMOIDES Pasch. Lotos N. F. 14: 124, 1904.

DESCRIPTION.—Plants 15 to 20 cm. high. Bulbs two. Tunic membranaceous, brown. Stem slender, slightly angled. Basal leaves one, linear, attenuate at the base, somewhat grooved, innerside slightly reddish, 8 to 12 mm. wide, slightly longer than the flower cluster. Lower cauline leaf elliptic-oblong, attenuate, shorter than the inflorescence. Inflorescence with few flowers, loose. Bracts oblong-linear, at the apex attenuate-acute. Pedicels slender, 3 to 7 times longer than the flowers, often flexuous, slightly spreading. Flowers 9 to 13 mm. long, yellow; outer segments of the perigone oblong, attenuate at the top, somewhat acute, often narrow bordered; inner segments bordered, attenuate-acute, 1.5 to 2¼ mm. wide. Stamens one quarter the length of the perigone. Ovary obovoid, 3-sided, at the top somewhat emarginate; stigma slightly notched, scarcely 3-lobed. Capsule and seeds unknown.

NOTES.—Native to Iran.

28. G. HIENSIS Pasch. Lotos N. F. 14:125, 1904.

DESCRIPTION.—Plants small. Bulbs two. Tunic brown to dark brown. Stem 3 to 7 cm. long, attenuate at the base. Basal leaf longer than the inflorescence, slightly attenuate at the base, scarcely attenuate toward the apex, 1.5 to 5 mm. wide, somewhat grooved. Lower cauline leaf somewhat convave, grooved at the base, oblong-linear, gradually attenuate, shorter than the flower cluster. Inflorescence few flowered. Bracts more or less filiform. Pedicels 2 to 4 times longer than the flowers, slender. Flowers 8 to 11 mm. long, yellow, here and there reddish. Outer segments of the perigone oblong or obovate-oblong, obtuse, 4 to 5 times longer than wide; inner segments wider bordered, usually a little narrower, obtuse. Ovary obovoid, attenuate at the base; style about twice as long.

NOTES.—Native to Turkestan.

29. G. INTERCEDENS Pasch. in Fedde Repert. 1:192, 1906.

DESCRIPTION.—Plants robust, 7 to 10 cm. high. Bulbs firm. Tunic dark violet. Basal leaves linear, at the base attenuate. Cauline leaves

more or less opposite, surrounding the stem at the base, broad oblong, attenuate-acute. Inflorescense many flowered. Bracts linear to filiform. Pedicles double the length of the flower, occasionally shorter, glabrous. Flowers 12 mm. long. Outer segments of the perigone, oblong, obtuse, narrow limbate; inner segments obovate-oblong. Stamens one third as long as the perigone; filaments at the base somewhat dilatate. Ovary 3-sided, obovoid; stigma more or less capitate or 3-lobed.

NOTES.—Native to Sultanabad, Iran. This species seems to form a connecting link between *G. filiformis* and *G. luteoides*.

30. G. CONFUSA Terracc. Boll. Soc. Ort. Palermo 2:1904, Bull. Herb. Boiss. 5: 1066, 1905.

DESCRIPTION.—Bulbs large, numerous ones are formed at the base. Basal leaves solitary, broad lanceolate-linear, distinctly veined; reaching the flowers, attenuate at the base. Cauline leaves surrounding the base of the stems, distinctly veined. Inflorescence few and loose flowered. Pedicels glabrous erect. Flowers small, yellowish green. Segments of the perigone obovate-lanceolate or elliptic, acute, with translucent margins. Filaments filiform, dilatate at the base; anthers small, oblong. Ovary small, obconic, afterwards obovoid to 3-sided.

NOTES.—Native to northern Iran. The flowers appear soon after the melting of the snow. They grow to an alt. of 2400 m.

Subsection 2. **Luteoidae** Pascher, in Bull. Soc. Nat. Moscou 361. 1905. Basal leaves thick, somewhat terete, linear; capsule broad obcordate to oval-oblong, nearly as long as the perigone.

31. G. LUTEOIDES Stapf. in Denkschr. Akad. Wiss. Wien. 1:80, 1885.

DESCRIPTION.—Basal leaves single, broad lanceolate, more or less sickle-shaped, at the base attenuate, toward the apex acute, reaching the flowers. Cauline leaves opposite, of unequal length, lanceolate-falcate, surrounding the stem at the base. Inflorescence umbel-like, single or few flowered. Pedicels slender, glabrous. Segments of the perigone small, lanceolate, acute, glabrous, 3-veined. Filaments one fifth the length of the perigone; anthers round. Ovary oblong or obovate-conical; style slender. Capsule obovate-oblong.

NOTES.—Native to Iran and the mountains of Nemrud Dagh, Mesopotamia. It has been claimed that this species stands between *G. assyrica* and *G. micrantha*.

Subsection 3. **Fistulosae** Pascher, in Lotos, n. ser. 14: 125. 1904. Leaves round tube-like; capsule broad, obcordate to obovoid-oblong, about as long as the perigone or shorter.

32. G. FISTULOSA (Ram.) Ker.-Gawl. Journ. Roy. Inst. 1:80, 1816; *Ornithogalum fistulosum* Ram. ex DC. Flor. Fr. 3:215.

DESCRIPTION.—Bulbs large. Basal leaves ternate, fistulose, often elongate. Cauline leaves more or less opposite, lower leaf very much concave, ovate, above hood-like contracted. Inflorescence umbella like. Pedicels several times longer than the flowers. Flowers 16 to 21 mm. long. Segments of the perigone oblong or obovate-oblong, toward the apex slightly attenuate, obtuse or rotundate-obtuse. Here belong var. *eufistulosa* Pasch. and var. *De-Candolleana* Pasch.

NOTES.—Native to Caucasia, Asia Minor; in the mountainous areas of Syria, Turkestan and Altai.

33. G. SAMOJEDORUM Grossh. in Komarov, Flora U. S. S. R. 4: 84, 1935.

DESCRIPTION.—Bulbs ovate. Tunic gray with numerous fibers. Stem 8 to 18 cm. high, slender, fistulose. Basal leaves lanceolate, toward the apex becoming narrow, at the base dilatate, 7 to 8 mm. wide. Inflorescense one to two, sometimes three flowered. Pedicels almost equal, long, glabrous. Segments of the perigone 14 to 15 mm. long, oblong-elloptic, obtuse, toward the apex somewhat angustate, yellow. Anthers half as long as the perigone.

NOTES.—Native to the meadows and calcareous soils of Petshora, U. S. S. R. This species is related to *G. fistulosa* though it is more slender and the flower clusters are composed of less flowers.

34. G. MIRABILIS Grossh. in Komarov, Flora U. S. S. R. 4:736, 1935.

DESCRIPTION.—Bulbs ovate, often small. Tunic dark brownish, leathery. Stems 8 to 15 cm. high, fistulose, below the inflorescence to 4 mm. thick. Basal leaves solitary, fistulose, 2 to 4, seldom 5 mm. in diameter, reaching somewhat above the inflorescence, linear, at the apex attenuate. Cauline leaves smaller, lanceolate, at the base surrounding the stem, 10 to 12 mm. wide, angustate at the apex, as long or shorter than the flower cluster. Inflorescence more or less umbellate, 2 to 6-flowered. Pedicels almost equal, about 3 to 4 times longer than the flowers. Segments of the perigone 10 to 12 mm. long, lanceolate-oblong, at the apex attenuate or acute, light yellow, on the outside greenish. Stamens half as long as the perigone segments; anthers oblong. Capsule 1.5 to 2 times shorter as the perigone, obovate, toward the apex emarginate.

NOTES.—Native to Northern Kasakstan. Type specimen from prov. Aktjubinsk, Mugodshary, prope Ber-Tschogur. This species is related to *G. anisanthos* C. Koch from which it mainly differs by its dark brown tunic.

35. G. SINTENSIS Pasch. Lotos N. F. 14: 125, 1904.

DESCRIPTION.—Bulbs two. Tunic black or dark brown, suberect, stem at the base attenuate, somewhat angled. Basal leaf one, double the length of the inflorescence, rounded to flat, fistulose, attenuate at the base. Cauline leaves more or less opposite or alternate, lower leaves concave to grooved, at the base slightly clasping around the stem. Inflorescence few flowered. Bracts somewhat filiform. Pedicels longer than the flowers. Flowers 9 to 13 mm. long. Outside segments of the perigone slightly attenuate at the apex, subacute to acute; inner ones narrower, 1.5 to 2 mm. wide. Stamens one third to one quarter of the length of the perigone; filaments subulate. Ovary obovoid, above notched, slightly emarginate; style double the length of the ovary; stigma slightly expanded. Capsule obovoid, emarginate of various lengths.

NOTES.—Native to the region of the Euphrates. Exsiccatae, Sintensis, Exciss. Iter. Or. 1889 as *G. liotardii.*

36. G. SPATHACEA (Hayne) Salisb. in Kon. et Sims, Ann. Bot. 2:556, 1806; G. belgica Dum. Flor. Belg. 139; Ornithogalum spathaceum Hayne

in Asteri, Ann. Bot. 21:11, 1797; *O. Heynii* Roth in Roem. Arch. 3:42; *O. belgicum* Lej. Rev. Flor. Spa 67.

DESCRIPTION.—Bulbs two, roundish-egg-shaped, of unequal length. Plants occasionally to 20 cm. high. Basal leaves two occasionally three, linear to filiform, hardly 1 mm. wide, half round, above hollow or flat, veins faintly visible on the lower surface. Lower cauline leaf 6 to 9 mm. wide, as long or shorter than the flower cluster; upper cauline leaf linear-lanceolate. Inflorescence umbel like, 1 to 5-flowered. Pedicels glabrous, usually two to three times longer than the perigone. Segments of the perigone long-lanceolate, 10 to 12 mm. long, obtuse.

NOTES.—This species prefers shady situations, especially forests that are rich in humus and moist shrubby low lands. From north Atlantic and is common through Central Germany, Denmark, Sweden and southern Norway. It is rare in the Netherlands, more common in Belgium, is absent in Austria and Switzerland.

37. G. JOANNIS Grossh. In Komarov, Flora U. S. S. R. 4:734, 1935.

DESCRIPTION.—Bulbs small, secondary bulbs small, foveolate-regulose, dark. Tunic leathery. Stems 3 to 10 cm. high. Basal leaves single, about 1.5 times longer than the flower cluster, narrow-linear, fistulose, 1.5 to 2 mm. wide. Cauline leaves single, lanceolate, as long or somewhat longer than the inflorescence. Inflorescence few flowered. Pedicels thin, 2 to 3 times longer than the flower. Segments of the perigone yellow, greenish on the dorsal side, 9 to 10 mm. oblong-lanceolate, obtuse. Filaments half the length of the perigone; anthers ovate-roundish. Capsule obovate-oblong, slightly shorter than the perigone.

NOTES.—Native to Southern Transcaucasia, Armenia and the Rep. Nachiczhevan growing in alpine regions. It is related to *G. spathacea.*

38. G. DSCHUNGARICA Regel in Act. Hort. Petrop. 6; 513.

DESCRIPTION.—Plants small, robust, 6 to 9 cm. high. Basal leaves linear, 10 mm. wide, attenuate toward the base, somewhat hooded or cucullate toward the apex, slightly grooved, inner side more or less reddish. Cauline leaves much shorter than the flower cluster, surrounding the base, attenuate below. Inflorescence articulate. Flowers 4 to 8 mm. long. Segments of the perigone oblong-lanceolate, obtuse, 6 to 7 mm. long. Anthers roundish. Stigma small, faintly 3-lobed.

NOTES.—Native to Turkestan, Dsungaria and Iran at an alt of 1800 to 2100 m.

39. G. VAGINATA Pasch. in Fedde Repert. 2:58.

DESCRIPTION.—Tunic dark brown. Basal leaves narrow linear, somewhat grooved. Cauline leaves very much concave, surrounding the stem at the base, oblong, the apex contracted near the middle. Inflorescense 2 to 3-flowered, very short. Flowers 8 to 11 mm. long. Segments of the perigone oblong, ovate oblong, somewhat obtuse. Stamens one third the length of the perigone. Filaments at the base slightly dilatate. Ovary obovoide, 3-sided; style longer than the ovary. Capsule unknown.

NOTES.—This species is closely related to *G. dschungarica.* It is native to Japan.

[To be continued in PLANT LIFE Vol. 16, 1960.]

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THE EVOLUTION OF GENETIC SYSTEMS, by C. D. Darlington. Revised and enlarged edition. Basic Books Inc., New York: 1958. Pp. 265. Illus. $5.50.

After a lapse of about 20 years Professor C. D. Darlington has revised his little book, "The Evolution of Genetic Systems". The revision is larger than the original (265 compared to 149 pages), and chapters have been added on, "The Management of the Cell," "Types of Plasmagenes", "Heredity and Infection", and "Initiative in Evolution".

It is not clear to what audience the message in this book is directed. But it is abundantly clear that it is not intended for the socalled, "intelligent layman". Probably graduate students in biology, professional biologists, biochemists, and biophysicists, would derive the most benefit from contact with Prof. Darlington's ideas, but even here a good working knowledge of genetics and cytology will be necessary for understanding the essentials of his arguments.

It seems fair to assume that this book represents the latest views of Prof. Darlington on contemporary problems in genetics, cytology and evolution. If so, he has not taken the trouble to integrate his thoughts with many of the modern discoveries in these disciplines. For example, the important work of McClintock on genic expression as related to chromosomal organization goes unmentioned. The same is true of the ingenious and significant research of Sears with wheat. Likewise, the experimental work in radiation cytology by Swanson and others cannot be dismissed entirely when one is concerned with the evolution of genetic systems. It would appear to be almost impossible to write an up-to-date book on the subject Prof. Darlington has chosen, and at the same time ignore Anderson's work on introgressive hybridization or the many contributions of G. L. Stebbins, Jr., to current evolutionary thought. Darlington has managed to turn the trick, but the book is much the poorer as a result of these omissions. The examples cited are by no means a complete list of important work of the past decade that has been overlooked or neglected. But they will suggest that the reader can expect to be served a highly selective dose of Prof. Darlington's "free-wheeling imagination" and "colorful writing" (quotes from the dust jacket).

Of the 317 references, about 62 percent were published prior to 1950. Most of the figures have been carried over from the original version, but several new ones have been added. The text is singularly free of annoying typographical errors and there is a good index of about 11 pages.

The critical reader of this revision will be repaid for his efforts with a number of new ideas, along with a great deal of speculative discussion and valuable information. Prof. Darlington has the knack of devising plausible hypotheses that knit together what appear to be widely unrelated biological phenomena. Some of these hypotheses will undoubtedly be rejected as more information becomes available while others may withstand the test of time, but it is reasonable to anticipate that all of them will serve the useful purpose of stimulating more discussion and research into basic biological problems.—*Thomas W. Whitaker, U. S. Department of Agriculture, La Jolla, California.*

PRINCIPLES OF GENETICS, by E. W. Sinnott, L. C. Dunn and T. Dobzhansky. 5th ed. McGraw-Hill Book Company, Inc. New York. 1958. Pp. 459. Illus. $6.75. Users of previous editions of this standard textbook of genetics will hardly recognize the 5th edition. A change in format to the 2-column page has resulted in a slightly more bulky book, but the present edition is shorter by almost 50 pages. However, these are not the most important changes. The new edition has been completely rewritten and brought abreast of current research in genetics, while still retaining the proper emphasis upon fundamentals.

There are almost twice as many chapters in the new book compared to the 4th edition (18 vs 29). The new chapters are concerned with such topics as, "Varieties of sexual reproduction"; "Physiological genetics"; "The genetic control of development"; "The elements of the genetic system"; "Organization of the genetic material" etc. The last chapter "Statistical inference in genetics", by Prof. Howard

Levene, is a clear, well-written treatise of the statistical ideas and methods necessary for treating and exploiting the significance of genetic data. Concentration of the statistical matter in one chapter is a vast improvement in arrangement over scattering such material piece-meal throughout the book as happened in the 4th edition. The authors point out in the Preface that the study of Chapter 29 (Statistical inference in genetics) should commence immediately and run concurrently with the progress of the student through the book after the contents of the two introductory chapters have been mastered.

One of the best features of previous editions, the "Problems" or "Questions for Discussion" at the end of each chapter have been retained and improved. It has been said that genetics is essentially a problem-solving science. It therefore behooves the student of heredity to make an early start in becoming acquainted with the application of genetic principles to practical and theoretical questions.

An Appendix consisting of Mendel's classical paper "Experiments in plant hybridization", should be read, not only by embryo geneticists, but by all students of biology. This masterpiece of experimental work and deductive reasoning could appropriately be included in the table of contents of all textbooks of genetics.

From cover to cover this is an exceptionally attractive book. The figures are uniformly excellent, especially the reproductions of photographs. The printing is clear, neat and easy to read, while there is a marked absence of the usual glaring typographical errors. The book concludes with an annotated bibliography and an index. The bibliography consists almost entirely of reference works collected under the appropriate chapter headings; generally a dozen or more for each chapter. Citations to original papers can be found in many of these reference books should they need to be consulted.

This book will undoubtedly attract and hold the attention of the serious student who seeks to know and understand the facts of heredity and variation. At the same time it will be of immense aid, as well as a stimulus and inspiration to the conscientious teacher.—*Thomas W. Whitaker.*

FIFTY YEARS OF BOTANY, edited by W. C. Steere. McGraw-Hill Book Co., 330 W. 42nd St., New York 36, N. Y. 1958. Pp. 638. Illus. $10.00. This Golden Jubilee Volume of the Botanical Society of America is the cooperative effort of more than forty authorities. The forty articles beginning with the early history of the Botanical Society of America include special invitational papers of broad and general interest that appeared in Vols. 43 and 44 of the American Journal of Botany, and also six papers on the progress and outstanding achievements in various fields of plant science during the past fifty years. This is a book that all who are seriously interested in plant science must have. Highly recommended.

PLANT BREEDING AND CYTOGENETICS, by F. C. Elliott. McGraw-Hill Book Co., 330 W. 42nd St., New York 36, N. Y. 1958. Pp. 395. Illus. $8.50. This stimulating volume deals primarily with the fundamental principles and the evaluation of the newer methods in plant breeding by an outstanding authority in the field. Some background in genetics on the part of the reader is assumed, and the text will appeal more to advanced students and breeders than to beginners. Highly recommended.

COMMERCIAL FRUIT AND VEGETABLE PRODUCTION, by W. V. Cruess. 4th ed. McGraw-Hill Book Co., 330 W. 42nd St., New York 36, N. Y. 1958. Pp. 884. Illus. $15.00. This revision of the standard work in this field is based on forty years of lecturing by the author, and is designed for college lecture courses on fruit and vegetable products and will serve also as an outstanding reference work on principles and production methods for canners, freezers, juice producers, preservers, and other food processors. This 4th edition includes much new material. Highly recommended.

HANDBOOK OF BASIC MICROTECHNIQUE, by Peter Gray. 2nd ed. McGraw-Hill Book Co., 330 W. 42nd St., New York 36, N. Y. 1958. Pp. 252. Illus. $6.00. This revised and enlarged edition was written as an elementary text on the preparation of plant and animal tissues for microscopic examination with examples taken from bacteriology, pathology and also from general zoology and plant science. It includes a section on the microscope and elementary photomicrography which is new,

a second section on the preparation of microscope slides, and the third section on specific examples of slide making. Highly recommended.

COMMERCIAL FLOWER FORCING, by A. Laurie, D. C. Kiplinger and K. S. Nelson. 6th ed. McGraw-Hill Book Co., 330 W. 42nd St., New York 36, N. Y. 1958. Pp. 509. Illus. $9.50. This is the 6th revision of the outstanding text on all phases of flower growing under glass, including culture, marketing and cost accounting. It is designed for college courses in floriculture, and also for the commercial grower. On pages 311-312, the vegetative method (cuttage) of Amaryllis is omitted (see Traub, Amaryllis Manual, 1958), and only one species is mentioned, although there are more than forty species, and many outstanding hybrids. The mention of these omissions, which can be included in the next edition, should not be construed as a criticism of the text as a whole which is excellent and highly recommended.

THE ART OF DRYING PLANTS AND FLOWERS, by Mabel Squires. M. Barrows & Co., 425 4th Ave., New York 16, N. Y. 1958. Pp. 258. Illus. $4.50. This is an outstanding practical book on drying plants. The first part concerns the kinds of plants to dry and where they may be obtained; the second part gives directions for gathering and drying flowers, foliages, nuts, seed pods and cones; and the third part is devoted to the uses of dried plant materials. This book will be welcomed by those interested in flower arrangements, and home decoration.

THE SWIMMING POOL, by Robert Scharff. M. Barrows & Co., 425 4th Ave., New York 16, N. Y. 1958. Pp. 214. Illus. $3.50. This is a comprehensive book on the construction, care and maintenance of swimming pools, including also suggestions for landscaping the pool, and for the uses of pools. This book will be welcomed by the many who plan to build a pool.

THE FLOWER ARRANGEMENT CALENDAR, 1959, by Helen Van Pelt Wilson. M. Barrows & Co., 425 4th Ave., New York 16, N. Y. The publishers sponsor an annual flower arrangement calendar contest. In this little book some of the photographs of floral arrangements accepted by the publishers are reproduced in calendar form for 1959. This calendar will be useful to those interested in flower arranging.

PHYSIOLOGY OF FUNGI, by V. W. Cochrane. John Wiley & Sons, 440 4th Av., New York 16, N. Y. 1958. Pp. 524. Illus. $9.75. This important new book is concerned with the fungi from the standpoint of comparative biochemistry, including the filamentous fungi and actinomycetes and those researches on the yeasts that have direct bearing on the physiology of the true fungi. Highly recommended to students and research workers in all fields of microbiology.

CHEMICAL TRANSFORMATIONS BY MICROORGANISMS, by F. H. Stodola. John Wiley & Sons, 440 4th Av., New York 16, N. Y. 1958. Pp. 134. Illus. $4.25. This stimulating book summarizes information on three main types of research in microbiological chemistry,—the chemical composition of microorganisms, the organic type reactions they carry out, and their synthetic powers. Among the new and useful chemicals produced by microorganisms which are discussed, the section dealing with gibberellins is of particular interest to those interested in crop plant production. Highly recommended.

THE GENETIC BASIS OF SELECTION, by I. M. Lerner. John Wiley & Sons, 440 4th Av., New York 16, N. Y. 1958. Pp. 298. Illus. $8.00. This stimulating book is based primarily on detailed data from poultry genetics, but the subject is presented in such a manner that the principles discussed may be applied to other species. The emphasis is placed necessarily on artificial as against natural selection in diploid sexually reproducing populations on the intraspecific level. The book is designed for readers who have a thorough knowledge of modern genetics but who lack an extensive background in mathematics and statistics. Highly recommended.

THE ECOLOGY OF INVASIONS BY ANIMALS AND PLANTS, by C. S. Elton. John Wiley & Sons, 440 4th Av., New York 16, N. Y. 1958. Pp. 181. Illus. $5.25. This stimulating book brings together the author's ideas from the fields of faunal history, ecology and conservation with which he has been concerned for more than thirty years. He gives concrete examples of the advance of invading species of animals and plants that affect the balance between populations thus leading to the

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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

[Affiliated with the American Plant Life Society]

[AMERICAN AMARYLLIS SOCIETY, continued from page 2.]

(c) REGISTRATION OF PLANT NAMES

Registrar: Mr. W. D. Morton, Jr., Registrar of Amaryllis Names.

Correspondence about the registration of plant names should be sent directly to Mr. Morton, 3114 State St., New Orleans, La. and a self-addressed, stamped envelope should be enclosed if a reply is expected.

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III. PUBLICATIONS OF THE AMERICAN PLANT LIFE SOCIETY

BOOKS

1. AMARYLLIDACEAE: TRIBE AMARYLLEAE, by Traub & Moldenke (including the genera Amaryllis, Lycoris, Worsleya, Lepidopharynx, Placea, Griffinia, and Ungernia; Manila covers; 194 pages, incl. 18 illustrations. $5.00 postpaid.

This is required reading for every amaryllid enthusiast.

2. DESCRIPTIVE CATALOG OF HEMEROCALLIS CLONES, 1893—1948, by Norton, Stuntz, and Ballard. A total of 2695 Hemerocallis clones are included and also an interesting foreword, and explanatory section about naming daylilies. Manila covers; 100 pages (1—X; 1—90), includes a portrait of George Yeld. $2.50 postpaid.

PERIODICALS

(A) **HERBERTIA [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), $20.00, postpaid.
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11-15 (1944-1948), $20.00, postpaid.

1-15 (1934-1948), $58.00, postpaid.

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Single volumes of HERBERTIA (1934-1948), when available may be purchased at $5.00 per volume postpaid.

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(B) **PLANT LIFE,** including numbers on various plant subjects, 1945 to date; and the **Second Series** of **HERBERTIA,** 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.

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Vols. 11—15, 1955-1959, $22.50 postpaid

Vols. 1—15, 1945-1959, $56.00 postpaid

Sets of 5 volumes published after 1959, when completed, are $22.50 for each set, postpaid.

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Single volumes of PLANT LIFE for 1959, and those published later, are $5.00 for each volume, postpaid.

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A GUIDE TO THE HISTORY OF BACTERIOLOGY, by T. H. Grainger, Jr. Ronald Press Co., 15 East 26th St., New York 10, N. Y. 1958. Pp. 210. Illus. This guide, consisting of selected lists of reference sources, is designed for use in the course "History of Microbiology" offered at Lehigh University. Following the introduction, there are selected references to the literature: (a) bacteriology, (b) the history of bacteriology, (c) biological references, and (d) biographies of selected bacteriologists.

ZEN IN THE ART OF FLOWER ARRANGEMENT, by G. L. Herrigel. Chas. T. Branford Co., 69 Union St., Newton Centre 49, Mass. 1958. Pp. 124, Illus. $3.00. This is a translation by R. F. C. Hull of the German text with an introduction by D. T. Suzuki, and provides a concise and artistic description of the methods by which Zen can be taught. The subject matter is grouped under headings: the instruction, the master, the technique, the flowers way, the ceremony, and the substance of the teaching. Highly recommended to all interested in Japanese culture, and particularly in flower arrangements.

AN INTRODUCTION TO THE PLANT KINGDOM, by N. H. Russell. C. V. Mosby & Co., 3207 Washington Blvd., St. Louis 3, Mo. 1958. Pp. 353. Illus. $3.50. This clearly written and concisely presented text is designed for those who teach. and for students who pursue one-semester elementary botany courses. After an introductory section on the plant kingdom, there are sections on algae, fungi, mosses and liverworts, lower plants and flowering plants. Highly recommended.

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HAMILTON P. TRAUB
HAROLD N. MOLDENKE

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