HERBERTIA

1942

HERBERTIA

VOLUME 9

ALSTROEMERIÐ EDITION

EDITED BY
HAMILTON P. TRAUB
SALINAS, CALIFORNIA

ORLANDO, FLORIDA
THE AMERICAN AMARYLLIS SOCIETY
1942

Printed in the United States of America

Published May, 1943

This volume contains a total of thirty-five illustrations, seventeen plates and eighteen [text] figures.

PREFACE

Since the publication of 1941 HERBERTIA, many of the Society members have either entered the armed forces of the United States or are otherwise contributing to the war effort. However, in common with our British allies, Americans get a lift from their gardens and this makes it worth while to continue HERBERTIA as a valuable means of relaxation during these trying times.

When Harry L. Stinson took the Alstroemerids under his wing in 1933 at the time the American Amaryllis Society was organized, this plant group was little known and appreciated. For a decade he has now devoted himself to these plants and he is the outstanding authority on them. The results of his work are briefly summarized in this issue of HERBERTIA, the Alstroemerid Edition, that is dedicated to him. We congratulate him on his achievements and wish him much success in his future work.

At the ancient and renowned University of Coimbra, in Portugal, Prof. Dr. Abilio Fernandes has carried on cytotaxonomic researches on the Amaryllids, particularly *Narcissus,* for over a decade, and these outstanding contributions have been published in scientific journals. In recognition of his valuable researches, the Society has awarded him the William Herbert Medal for 1942, an honor that he richly deserves. The portrait of this talented Portuguese scientist; his charming autobiography and valuable summary of his cytotaxonomic researches on *Narcissus* appear in this issue.

In addition to the articles on the Alstroemerids already mentioned, many other valuable contributions on the amaryllids are included in this number of HERBERTIA. Space does not permit mention of all but attention is directed to some of the most outstanding.

We will all thank Major Pam for the valuable check-list of Amaryllid colored plates. It should prove very useful indeed to students of this group since it can be used in ordering bibliofilm prints of the plates and accompanying descriptions. Major Pam is a genuine Amaryllid enthusiast since he did all the research and also typed and corrected the manuscript himself at his home, Wormley Bury. He has published a history of this estate, covering a period of over a hundred years, and we plan to include a review of this article in the next issue.

We are indebted to Dr. Uphof for the review of the species of *Crinum.* He makes available to us the descriptions of *Crinum* species proposed since the appearance of Baker's Amaryllideae in 1888. Dr. Uphof has finished a similar review of *Agapanthus,* and will prepare other reviews for HERBERTIA. The members will be interested to hear that Dr. Uphof was recently called to Washington to assist in the war effort.

Dr. Fernandes, Dr. Anderson, Messrs. Jan de Graaff, and Hornback and Mary P. Finlayson contribute excellent articles on *Narcissus;* Mr. Splinter, J. G. DuPuis, M. D., and Messrs. Bennetts, Hannibal, Hayward and Lytel give us a fine symposium on hybrid *Amaryllis,* which we hope

is the first of a long series; *Hemerocallis* receive well deserved attention—Dr. Shull writes on the diversity of form in daylilies, Dr. Stout on the breeding of red-flowered clones, and also proposes a new *Hemerocallis* species; Dr. MacDaniels, the Chairman of the Daylily Jury, gives an excellent preliminary report, indicating that the work of daylily evaluation is definitely under way; other valuable daylily papers are presented by Dr. Stoutemyer, Messrs. Claar and Chittenden, Prof. Watkins and Fleeta Brownell Woodroffe.

Mrs. Henry writes on *Cyrtanthus* breeding; Mr. Hamor reports on *Zephyranthes bifolia,* Dr. Addicott on *Milla* pollen and Mr. Hannibal writes on several interesting subjects.

Dr. Killip of the National Herbarium is preparing a comprehensive check-list of *Alstroemeria* and *Bomarea* species that we had hoped to include in the present issue, but it was not received in time. It will be published in the 1943 edition.

On account of a typographical error the words "the late" appeared before the name of Arthur Herrington in the dedication of 1941 HERBERTIA. This error has been corrected under "Errata" in the present issue. Also in this issue, T. A. Weston, Associate Editor of *Florists' Exchange,* presents a brief biographical note on Arthur Herrington that gives us more details about the first daylily breeder in the United States.

We owe a debt of gratitude to your Secretary, Wyndham Hayward, whose untiring efforts in behalf of the Society, in spite of his local duties in connection with war work, made this issue of HERBERTIA complete.

The 1943 edition will be the 10th. Anniversary Number and will include reviews of progress in the advancement of the amaryllids since the Society was founded in 1933.

October 15, 1942
115 Carmel Avenue,
Salinas, California

—Hamilton P. Traub

TABLE OF CONTENTS

Alstroemerid Edition Cover Design, featuring Alstroemeria Ligtu, J. Marion Shull.

4. Cytology, Genetics and Breeding

5. Physiology of Reproduction

6. Culture

7. Harvesting, Storage and Forcing

8. Society's Progress

The Buyers' Guide

LIST OF ILLUSTRATIONS

PLATES

TEXT FIGURES

ERRATA

HERBERTIA, VOL. 8, 1941

Page 4; 6th. line from top, delete the words "the late" before the name of "Arthur Herrington."

Page 42; in legend for Plate 204, for "showin" read "showing."

Page 48; foot-note, 2nd. line from bottom, for "April" read "May."

Page 156; for "*Nothoscordum fragrans,*" where it appears, read "*Nothoscordum inodorum.*"

Page 178; 8th. line from bottom, delete the phrase "elsewhere in this issue" and substitute "in Vol. 7, HERBERTIA, 1940."

NOTE FOR HERBERTIA CONTRIBUTORS

Correspondence regarding articles and illustrations for HERBERTIA, the Year Book of the American Amaryllis Society, is cordially invited.

STYLE. Manuscripts must be *typewritten* and *double-spaced.* Check with special care all calculations, figures, tables, names, quotations and literature citations.

MANUSCRIPTS AND PHOTOGRAPHS. To insure against loss in the mails, authors should *retain copies* of manuscripts, and the *original negative or extra prints* of photographs, sent for publication in HERBERTIA. Photographs should have the *name and address* of the owner to whom credit should be given, and the *name and size of the subject,* written on the back.

When taking photographs of amaryllids, an effort should be made to include the whole plant—*stem,* if any, *leaves, scape* and *flowers.* Separate views of the *bulb* and *roots* are also valuable in some cases. These remarks do not apply to cut-flowers.

This Volume of Herbertia
is dedicated
to Harry L. Stinson,
patriot, friend, teacher, gardener,
scientist.
His faithful devotion to the
Alstroemerids,
for a decade,
has rescued them from obscurity
—today we count them
among our choicest garden treasures.

Herbert Medalist — Prof. Dr. Abilio Fernandes

Plate 225

DR. ABILIO FERNANDES

Professor of the Faculty of Sciences of
the University of Coimbra, Portugal

An Autobiography *

I was born in Macainhas, a village in the suburbs of Guarda, on October 19, 1906. My childhood was spent in the country, and during this period I received my primary education.

Following the counsel of my teachers, in this case my parents, although they had very limited resources, they decided that it was necessary for me to have advanced instruction. Thus, after 10 years, I was entered in the Lycee de Guarda, where I completed my secondary education in 1923.

This same year, I entered the Faculty of Sciences of the University of Coimbra with the purpose of obtaining my degree in natural sciences. After preparatory studies in Mathematics, Physics and Chemistry, I became vitally interested in Zoology, Anthropology, Geology and Minerology. However, I reserved the last year of my course for the study of Botany. At this time my parents were undergoing a grave financial crisis, and for this reason, I was anxious to finish my degree with purpose of obtaining as soon as possible a position as a teacher in secondary instruction. In this dilemma I gave no thought to my devotion to the study of botany. These things, however, passed in a wholly unexpected manner. There were, in the degree of Natural Sciences, two courses in Botany—special Botany and Botanical Geography, and Morphology and Physiology of plants. These courses were taught respectively by the eminent Professors, Dr. Luiz Carrisso and Dr. A. Quintanilha. The lectures of these two great scholars, didactically impeccable and of remarkable clarity charmed me from the first, since they presented their material in such attractive and stimulating fashion, as to make one thirsty for further knowledge. To these Professors, the students were not only friends to be encouraged by sympathy and understanding, but also companions in the work to which they tried to transmit the devotion to the science to which they had dedicated themselves, and this was the goal of their teaching. Then, life in common, in the laboratory, in the herbarium, in the garden, on trips, attracted me still more toward these Professors, and gave me the desire to become somewhat like they were. And thus, in the warmth of enthusiasm for my Professors, I commenced to interest myself in Botany, a science which each day, gripped me more and more.

Under the direction of the late Professor Carrisso, I studied the taxonomy of vascular plants, ecology and botanical geography; and at the same time my attention was attracted to the complex questions of evolution and natural classification.

* The original was written in the French language. The Society is indebted to the eminent scientist, Dr. Thomas W. Whitaker, La Jolla, California, for the very excellent English translation. The original manuscript in the French Language has been deposited in the United States Department of Agriculture Library, Washington, D. C., where students may consult it. —Ed.

With Professor Quintanilha, I first studied cytology and then organography, the physiology and systematics of cellular plants.

All of these studies were pursued during the year 1926-1927, and it was therefore a year of intense effort. Fortunately, the work was crowned with true success, as I had the good fortune to pass my examinations with high rank, and was invited to occupy the position of Assistant in the Botanical Institute of Coimbra.

I was in charge of the practical work of the course in Botany (Medical Botany, General Botany, Morphology and Physiology and Biology). At the same time under the direction of Professor Quintanilha, I specialized in the domain of Cytology.

Once this specialization was acquired, from that time on I have been preoccupied with research. About this time (1929) the work of several cytologists (Navachine, Heilborn, Delaunay, Tischler, Babcock, etc.), suggested that a great many problems in systematics could be solved by a comparative cytological study of forms belonging to the same taxonomic group. In addition, this work has demonstrated that the study of variability of the chromosomes among individuals of the same species and a comparative study of the idiograms of neighboring species can contribute much to solving the problems of evolution and in turn to the establishment of a system of natural classification. Having had an interest from the beginning of my studies in the questions which this work initiated, the results of this research influenced me profoundly and has led me toward cytology.

After some experiments with plants belonging to the Liliaceae and Amarylidaceae, I chose the genera *Aloe* and *Narcissus,* which seemed to be very favorable material from the point of view of the studies I had in mind. The first results of my research were the subject of some notes presented to the Society of Biologie (Section de Coimbra), and a frequently quoted article "Estudos nos cromosomas das Lilacées e Amarylidacées", published in the "Boletim da Sociedade Broteriana." This work constituted my doctor's thesis, for which I was examined in the month of December 1931.

After having obtained the rank of Doctor of Science in Biology, I pursued my research in the genus *Narcissus.* This permitted me to elaborate another thesis, "Novos estudos cariológicos do género *Narcissus* L.", which I presented in competition for the post of Adjunct Professor of Botany. Having been elected unanimously, I was assigned to this post in January, 1934.

In addition to the practical teaching, I have also been charged with theoretical instruction, particularly in Medical Botany and the course in General Botany.

In 1935, my chief, Professor Quintanilha, was obliged to leave the Botanical Institute. This withdrawal was a very grave loss in the life of the Institute, since the teaching and research work have suffered a great deal through the absence of this incomparable Professor. As a consequence of the diminution in the number of the professors, the Council of the Faculty of Sciences decided to place me in charge of

instruction in the course which belonged to Professor Quintanilha, and for this reason, the time which I have been able to give to research work has been almost negligible.

In 1936, after having fulfilled the functions of Adjunct Professor during three years, I was named definitely to this position.

In 1937, M. le Professor Carrisso, Director of the Botanical Institute, was on his third trip of exploration in Angola. Unfortunately, during this trip, he died suddenly in the Desert de Mossamedes in the month of June. This was a very great loss, since, with the passing of Dr. Carrisso, the Institute of Botany lost a Professor who was much loved by his students, a man of exceptional activity, and organizer of unlimited capacity and a remarkable Director who restored the Institute to its ancient grandeur.

After the death of M. le Professor Carrisso, the Department of Botany was without any professor in the chair of Botany. For this reason, the Council of the Faculty of Sciences, in the month of September 1937, engaged me to fulfill the functions of this position, a place that I have occupied, by contract, until the 28th of February, 1942. In the month of May of this last year, after serving as Chairman of the Department of Botany, I was definitely named Professor of Botany on June 25, 1942.

In spite of the limited amount of time, which since 1934, the scholastic work has left me, I have continued my research in the cytology of the genus *Narcissus,* research which the "American Amaryllis Society" has recognized as distinguished, in granting to me the honor of the William Herbert Medal.

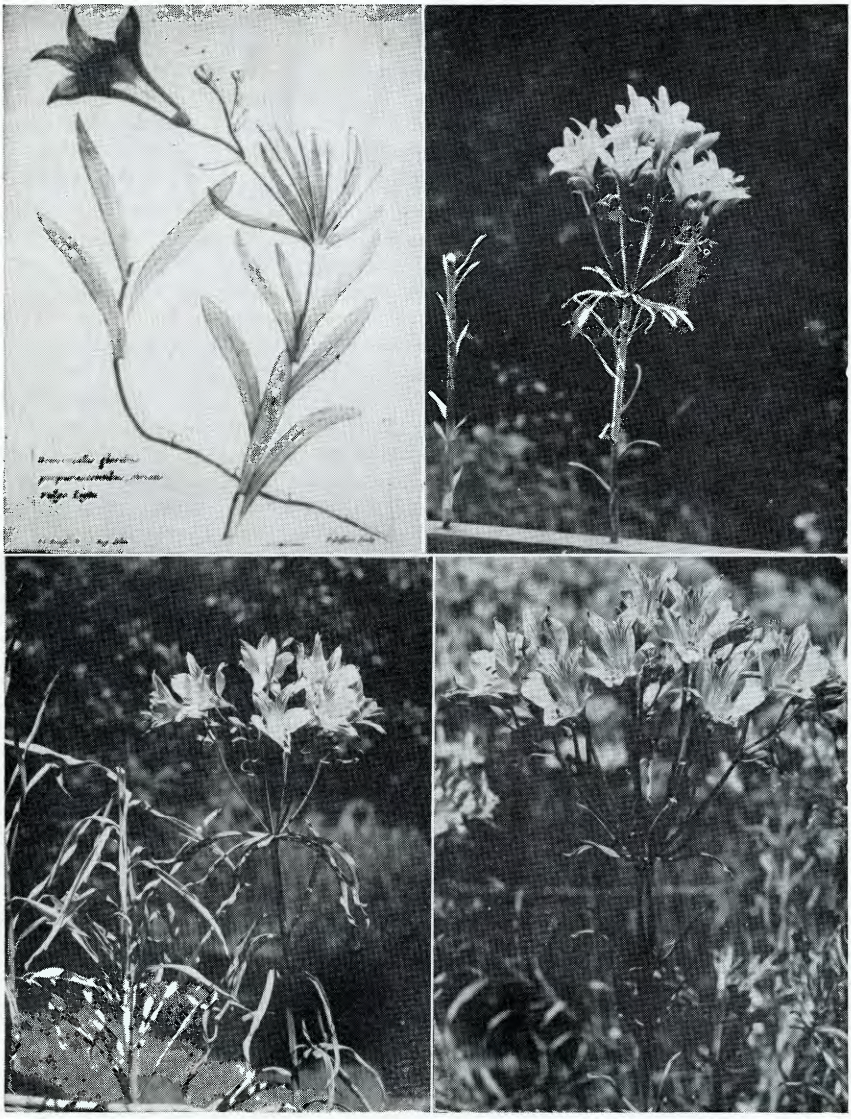
[*A "Summary of Work on Cytology of the Genus Narcissus L." by Prof. Dr. Fernandes is included in Section 4, Cytology, Genetics and Breeding.—Ed.*]

ARTHUR HERRINGTON

T. A. Weston, *New York*

Arthur Herrington, as I have pointed out in the *Florists Exchange,* page 63, April 11, 1942, issue, has been manager of the New York Flower Show for 27 years. He has been president of the New York Florists' Club; last year he was honored with the Massachusetts Horticultural Society's Gold Medal; he wrote a book on Chrysanthemums in 1905; he has lectured on landscape gardening for many years and was prime mover of the Chas. H. Totty memorial fund.

He crossed *Hemerocallis aurantiaca major* with *H. flava* soon after he came from England to lay out the McK. Twousbly estate at Convent, N. J., and he named the resulting hybrid *Florham,* which is the name of the aforesaid estate. He gave stock of it to Dreers who distributed it. Obviously it was the first hybrid daylily raised in the United States, and excepting Yeld, Arthur Herrington was ahead of the field though he



Harry L. Stinson, Seattle, Washington

Feuillet's Alstroemeria Ligtu, upper left; forms of A. Ligtu in Stinson collection—a form near to Feuillet's type, upper right; form in the trade as A. Ligtu, but may be A. haemantha, note leaves, lower left; the beautiful pink form of A. Ligtu, lower right.

Plate 226

made no attempt to go further. His only reason for making the cross was that *Hemerocallis aurantiaca major* wasn't hardy and he figured a cross on *H. flava* would give the needed hardiness which it did since *Florham* to this day is still catalogued.

[The reader should also consult "The genesis of modern daylilies" by A. Herrington, bull. gard. club Amer. 7(24) :44-45.1942. —*Ed.*]

ALSTROEMERID MUSINGS

Harry L. Stinson, *Washington*

Reference to botanical publications of Herbert's time and shortly thereafter discloses the fact that Herbert, Lindley, and other prominent botanists entered into many lively discussions as to the exact identity of *Alstroemeria Ligtu* which Father Feuillet had found, described, and illustrated in his Journal (See plate 226.) Linnaeus was so noticeably reticent in any general discussion of it, that I have often wondered just, why?—when he was so verbose in his description and praise of *A. pelegrina.* The answer was discovered when I translated Jacquin's description of *A. caryophyllaea.* He writes at the end of his description that, "Linnaeus, senior, took for granted the three species of Alstroemerias in his Systema and Species Plantarum from Feuillet, but he abstained from any description on a plant which he had not seen. While I, on the other hand, do remember having seen this plant flourishing in flower under the title of *A. Ligtu* thirty years ago in the gardens of Caesar Schoenbrunnes, which plant afterwards perished. I neither described nor illustrated it, but in so far as I recall, it is similar to Feuillet's figure. Certainly it is not the plant which I have just described, *A. caryophyllaea,* on account of its carnation-like odor, which now is considered as *A. Ligtu* in all botanical works." This, evidently, explains why Linnaeus did not give more attention to it, and evidently Alstroemer did not find it growing in or near Cadiz, Spain, where he found *A. pelegrina.* Although Linnaeus, Jr. does say in his supplement that, "he had received this *(A. pulchella)* as well as the drawings of the other species from his friend Alstroemer," who was still in Spain.

Herbert comments that, "By a strange mistake, when *Bomarea edulis* and *A. caryophyllaea,* both tender tropical plants, were brought from the East Coast and West Indies, they were confounded with *B. salsilla* and *A. Ligtu,* and have usurped their names in our stoves and in modern botanical works."

Professor John Lindley in 1839 gives in *Botanical Register* a description and illustration of what he considers to be *A. Ligtu.* Comparing his illustration with that of Feuillet's, I find myself at a loss to detect any point of similarity between the two. If it is *A. Ligtu*—I am reluctant to question Prof. Lindley's decision, arrived at, no doubt, after much study in the excellent herbaria at his disposal—could it then be, that Feuillet might possibly have described and illustrated the wrong plant? From his notes I am somewhat inclined to harbor a hunch that

he mistook a form of *A. haemantha* for *A. Ligtu.* Or does it exist, notwithstanding Prof. Lindley's reference, which might easily refer to a form of *A. pulchra?* Especially so, now that it is generally conceded that the *A. Ligta* of Ruiz and Pavon and the *A. Ligtu* of Linnaeus, Jr. is in reality *A. caryophyllaea.* This past season I did find a flower with a white center on the two upper petals instead of the usual golden yellow, and such a form might have been the basis of the white of which Feuillet says, "Two of which are streaked by some white bands which form acute angles with the rib of the same color which traverses their length." In so far as the ciliation on the leaves is concerned, it is highly probable that he completely overlooked this since it is rather inconspicuous on some forms and especially so when the blooming stems are defoliating at the base, and he might have also overlooked the spiral twisting of the leaves mistaking this feature for the natural dying away of the leaves. I am still more inclined to this conclusion for the reason that both the Index Kewensis and Baker, with access to the unlimited facilities of the Royal Botanic Gardens and other well known herbaria of Chilean plants in and about London, constantly refer to other species as being closely allied to *A. Ligtu.* Such plants have little or nothing in common with that of Feuillet. Are they confounding the *A. Ligtu* of modern botanical books which is really *A. caryophyllaea* with Feuillet's? I believe they are.

Could it be that Feuillet's plant has become extinct or that it has become so hybridized with *A. haemantha* and others that it is no longer recognizable, for it is in Ruiz and Pavon's Flowers of Chile and Peru, 1802, that we find the next reference to *A. Ligta,* and many things could have happened between 1712 and 1802.

In an observation appended to the latter's description of their *A. Ligta* they comment that, "Figures and dried specimens of this and the following species indigenous to the Royalty of Chile, we have lost in a well remembered shipwreck; therefore we do not give sketches of them here." This loss has been most unfortunate. In my reading I came across a biographical sketch of these gentlemen in a Spanish edition of Geografia Botanica de Chile by the German Botanist, Dr. Karl Reiche, in which he writes that they personally were in this shipwreck and it is well that they might write, "*naufragio memorato.*" These last two words puzzled me for I had come across no references to any such shipwrecks.

Edward Poeppig, who also travelled in and described several alstroemerias from this region had a similar experience but his misfortune happened in one of the torrential rivers. He lost all of his instruments as well as his specimens and had to return to Europe to replace the former before continuing his work.

Linneaus did a little philosophizing in his "Planta Alstroemeria" which might be of some interest in so far as it bears upon our subject. The botanists of that time were mostly medical men and based their medical science chiefly upon the "virtues" of the plants listed in their Herbals. Our learned doctor is not thoroughly convinced that, "all plants are destined for economic and medical use, although moderate

use is made of so many in the wonderful economy of Nature." He goes on to add that, "the most fragrant plants do not always produce the most beautiful flowers, while many plants are unfit for use because of their tenacity and strong odor." While he did not support the extremist's idea of plant economy, he nevertheless was a little hesitant to break completely away from the traditions of the herbalists and possibly earn their ill-will; for he hastens to add, "I seem to detect a something in the root, which in a measure comes close to Asparagus, Smilax, or Sarsaparilla; possessing diuretic virtues, which authors are want to call aperient, diluting and drying. . . . Furthermore Feuillet contends by the testimony of the Chileans that a cold infusion of this Salsilla, administered in the place of the usual beverage brings almost instant relief in distress of the stomach."

The quest for new species from South America has brought some very interesting contacts. One in Southern Chile was forced to give up his business due to war conditions, and the last word from him was to the effect that he contemplated going to Patagonia and engage in a silver fox farming venture and wished literature on our most approved methods which I was able to find and forward on to him. I wish him well. Another correspondent replied that he had four species of *Alstroemeria* for which I sent the necessary money, but nothing ever came of it, except to learn through another source that he was not to be trusted and was no longer in the country. However this is not generally the case, for almost without exception all correspondents have been most generous in their efforts to obtain the desired seeds.

Since this is supposed to be a species of musings, it may not be amiss to muse or dream that the wheel of fortune may go round and round and when it stops, it will send me to that far away region where the alstroemerias and bomareas grow so that I may retrace the steps of Father Feuillet and find that elusive *Ligtu*.

AMARYLLID NOTES

T. A. Weston, *New York*

Apropos W. M. James' remarks on *Nothoscordum inodorum* (syn. *N. fragrans),* I have had this for some years in my New Jersey garden, 25 miles north of New York City with winter temperatures well below zero. In rock work with a covering of salt hay, the old bulbs survive and even retain their foliage while seedlings come up, even in the path, and flower the same season. The flowers certainly are not showy but they are produced over a long season.

Amaryllis advena—E. G. Orpet of Santa Barbara, Calif., years ago sent me bulbs which as potted plants bloomed in the fall but the large bulbs failed to survive in the cellar. The soil from the pot was apparently thrown on the rose bed and must have harbored a tiny bulb for some two or three years later I was astonished to find a plant flowering in this bed close to the retaining stone wall. The bulb was practically on the surface. Without special protection it survived that winter, but later the cluster was moved to a more sheltered situation where flowers

were again produced that season, but eventually the stock disappeared although nearby *Callicore rosea* has hung on up to this time. This latter species has flowered but once and under salt hay went through the winter of 1936-37 when we had 24 degrees Fahrenheit below zero. Most years the clusters of bulbs have made masses of leaves in the late fall. Under salt hay these are largely retained but the past fall no leaves were made, nor flowers. However, in March of this year, new leaves have proved that the bulbs are still alive and I am wondering if they have changed their habit in line with that of *Lycoris squamigera,* which starts leaf in March, goes to rest, blooms in the fall and then rests over winter.

Lycoris radiata, by the way, refused to bloom in pots so it was planted against a west wall, very dry, where for the past three years the bulbs have held their leaves all winter unprotected and of course the bulbs have multiplied. But this is about all that this species ever does, for I know of no one who has bloomed it indoors or outdoors in this vicinity. In this respect, it is like the presumed hybrid *Vallota* which years ago came with *Nerine* bulbs from the Isle of Guernsey. The bulbs flowered once and then died except a few small bulbs that have since made little or no progress.

It may be worth recording that in the fall of 1941 I left my nerines, *Fothergilli, coruscans major, crispa rosea, Bowdeni* and one or two hybrids as well as a variety of hybrid lachenalias, in a frame too late and they were badly frozen. The hybrid and *Fothergilli* nerines as well as most of the *Bowdeni* were so damaged that the bulbs parted from the roots, the bases being killed. *Nerine crispa rosea* was not harmed beyond the foliage, and some bulbs flowered the past fall as usual. One or two *Bowdeni* bulbs apparently were not so badly frozen as they remained sound but have to date (April 1942) made little or no leaf growth after more than a year. Some of the bulbs that lost their roots, were crosscut and left on the bench for a time and these made bulblets that have grown. One bulb of *Fothergilli* similarly treated has also yielded a few bulblets but the hybrids and *coruscans major* were too softened by the frost to produce anything. Practically all the *crispa rosea* have gained in size. The lachenalias in a few instances were killed, but most of the large bulbs before decaying produced tiny bulbils, large numbers of these being found in the pots the following summer. These have increased in size the past winter but have not flowered.

To test their hardiness, I placed a pot of newly planted *Leucocoryne ixioides odorata* in a frame last November, but they couldn't take it, obviously needing heavier protection. Bulbs of this subject, one and two years old, that had flowered in the greenhouse at 50-55, last fall, were planted very deeply in 6-inch pots, practically at the bottom, and they flowered in February better than ever before, 2 to 4 stems on each bulb. One pot of seedlings sown in April 1941, startled me by flowering this season. The bulbs were quite small when potted.

The multiplicity of bulb production of *Nerine Bowdeni* as mentioned by Mr. James is found in some daffodils. We used to call them "horse teeth" and *Victoria* was given to the habit. It is my impression

that the habit is inherent in some varieties and the best thing to do with such stocks is to rogue them although it is claimed that deep planting will cure the habit.

I obtained a packet of hybrid *Hemerocallis* seeds from Dr. Leonian several years ago and raised some 30 plants, all but one being red and of better color than any of the named sorts I had seen up to that time, ranging from bright crimson to chocolate maroon. The petals of all are narrow but as a rule the plants are strong and free flowering. I saved seeds of one plant and the seedlings were reds and yellows.

Mr. James' studies of the nerines indicates that these develop their flowering buds in succession as in *Amaryllis*, but what I would like to know is—Why are nerines so shy blooming? The hybrid *Dainty Maid* which came from Guernsey with the others, never did flower although the bulbs were of good size. The other sorts, especially *coruscans major* and *Fothergilli* were intermittent; even *Bowdeni* refused to bloom for some years. *Crispa rosea* was the only certainty, and this like *Bowdeni* retains its foliage at all times. I tried leaving them alone and also shaking them out, but the flowers were never a certainty. If the buds are initiated years ahead, what happens to them?

Amaryllis pratensis is another problem child. What does it dislike when grown in a pot? In England this gorgeous red flower is reasonably certain to flower outdoors in sheltered places, but one plant raised from seeds three years ago refuses to make more than 2 or 3 grassy leaves that hang over 12 inches or more. The bulb is still less than a half inch in diameter.

And what is the matter with large plants of *Amaryllis procera?* I have one that this season has made long leaves, but the hoped for buds are still awaited. The plant is growing nicely in orchid peat and sphagnum. The leaves are up to 2 feet long. However, seedlings do not thrive in this compost for the roots die away within a week or two. Germination in sand last spring (1941) was nearly 100 per cent, but potting into sandy soil didn't help them and osmunda and sphagnum was worse. Now they look far worse in April 1942 than in September 1941, but they are gradually making new roots in nothing more than plain sand with a little soil below.

AMARYLLID MUSINGS

W. M. James, *California*

One year ago I was busy grading and preparing bulbs for shipment. At the present time I am just planting the last of a large shipment of cymbidiums from England. As Rancho Rinconada specializes in these, orchids and camellias, it has been a transition period for me and the time has passed more quickly than I ever imagined it could. The experimental bulbs moved from Las Positas Nursery are doing well, in spite of the fact that so far their care has not been all it might be. Another season should see things quite well organized.

The plant, shown in Fig. 70, appeared as a stray several years ago among some *Alstroemeria* seedlings in Mr. Orpet's garden. All records of its source or the time it was received were lost. Identification of a plant acquired in this way is not easy because often many of the parts are larger and more vigorous than they are when growing under natural conditions. After observing the plant pictured for several seasons and

Fig. 70. Alstroemeria Hookeriana.
Photo by W. M. James

getting others to do so also, there appears the possibility that it may be referred to as *Alstroemeria Hookeriana*. The description found in Kunth's Enumeratio (footnote—translated from the Latin by Mr. Harry L. Stinson) was used and is quoted for reference. Compare also Plate 171, HERBERTIA 7 : 27, 1940. The plant figured there apparently does not fit the description that follows.

A. hookeriana, Schults Systema, 7.738; Herbert Amaryll. 95.t.1. f.1.2.4.5.17.; Roemer Am. 249.

Stem 5-12 inches high; leaves glaucous, sessile, twisted slightly, not resupinated, 3 inches long or under, 5/32nds wide; peduncles erect, bracteated, forked at the base, 2-4 flowered; secondary peduncles erect, close together; perianth almost 1½ inches, pale rose with a green tip; sepals obovate, apiculated, petals similar, acuminated; lower portion on the upper petals whitish and line-speckled, above with a pale yellow spot; capsule globose, purplish ribs. (Herbert.)

A. rosea Hooker Exot. Flor. t. 181; *A. Hookeri,* Lodd, Bot. Cab. t. 1272.

Chile. Stem simple, erect, slender, glaucous, as well as the entire plant smooth; leaves linear, glaucous, slightly twisted, scattered, few; inflorescence two branched; with mostly six flowers, erect; peduncles long, slender, with a foliaceous bract at the base; segments of the perianth rolled into a tube at their base, open at the apex, almost equal; sepals wider, tapered toward the base, upper part slightly serrated, faintly lined within, striated on the outside with deep purple; petals linear-spatulate, the lower exterior one crazily marked and striated, two lateral ones with golden yellow lines above the middle, dotted with red; all with long slender points and green tips; filaments purple; three anthers discharging pollen at the same time, purple, when exhausted becoming a swarthy green; ovary turbinated, deeply grooved; styline column purple, shorter than the stamens, eventually becoming longer; stigmas three, recurved. It comes close to *A. pelegrina.* (From Hooker. Re-worded.)

Note—Kunth also describes a specimen which he says he saw growing in the Berlin Garden.

A short time ago I saw flowers of *Alstroemeria violacea* at Mr. Orpet's. It is beautiful and I look forward to having a few plants some day.

Since my introduction to bomareas a few years ago, I have wondered many times just how they could be used. Most of the species I have seen have a weak, vine-like stem which twines around some stiffer object for support. Apparently they flower best when the roots are in the shade and the blossoms have a chance to open in more or less full sun. Small plants of *Bomarea caldasiana* planted under *Feijoa Sellowiana* a few years ago bloomed this season and the reddish flowers showed up nicely on the gray-green foliage of the shrub. This gives promise that the bomareas will be effective when planted under shrubs where the flowering stems can climb up through branches and bloom in brighter light on the outside of the shrub. Even if the *Bomarea* stems and foliage die in the winter, which they generally do unless grown quite warm, they will be on the inside of the supporting shrub and not detract from its appearance.

Climatic and soil conditions in Ojai are much different than are those in Santa Barbara and I look forward to watching the bulbs "perform" in their new home. *Callicore rosea* (syn. *Amaryllis belladonna,* Herbert, not Linn.) is already in bloom—earlier than in Santa Barbara.

Ojai, Calif. July 25, 1942.

LAWRENCE'S "A SOUTHERN GARDEN"*

HAMILTON P. TRAUB, *California*

Cultural America has reached the age of maturity in most fields and with the advent of such finished masterpieces as Lawrence's "A Southern Garden" we can definitely say that gardening as a fine art is also included. In this connection it is interesting to note that Van Wyck Brooks, in "New England Indian Summer"—that soul-searching analysis of the sins of our fathers which undoubtedly contributed in no small measure to the inevitability of World Wars I and II—makes no apologies for including the work of Olmstead, the late great landscape artist, along with the other fine arts. This is indeed a sign of real maturity.

In such a grown up America, it is natural to expect gardening books of the highest merit and one is not disappointed in the major event for the gardener in 1942—the appearance of Elizabeth Lawrence's book. It is subtitled "A Handbook for the Middle South" but it will prove to be much more than that for it will undoubtedly be used as a model for regional gardening books all over the American Continent.

The book is original and is entirely free of pedantry and is not complicated in make up. Therein lies its chief charm. One realizes at once that one is reading a classic in the sense that the book is ageless. Miss Lawrence apparently realizes that there are an abundance of good garden cyclopedias but that there is a great need for a basic plan for the selection, arrangement and appreciation of plants. This basic plan she gives us, it consists of four subdivisions corresponding to the seasons. The subject matter is charmingly presented from personal experience which includes world wide contacts. The entire work leaves the impression of a prose poem.

No doubt, much of the success achieved by Miss Lawrence is due to her original viewpoint, and probably no writer on gardening has ever stated his objectives so clearly. She is interested first of all in gathering plants from all parts of the world that will thrive in the part of the country in which she lives. We learn that "it is the garden value that interests me rather than the rarity—or even beauty." The reader is reminded that "dirty fingernails are not the only requirement for growing plants. One must be as willing to study as to dig for a knowledge of plants is acquired as much from books as from experience." She challenges the reader with the statement that "I am writing, then, not for those who want to grow rare and difficult plants, but for those who want to grow a variety of plants in an average garden, giving them a reasonable amount of care and spending a reasonable amount of intelligence upon them." Finally Miss Lawrence is an artist first and last—"One thing more, I do not mean to lay undue emphasis on plants. Plants are the materials from which the garden is created. I think of a garden not as a manifestation of spring (like an Easter hat) nor as beds of flowers to be cut and brought into the house, but as a place to be in and enjoy every month of the year." The garden thus becomes an

* A Southern Garden—A Handbook for the Middle South, by Elizabeth Lawrence. University of North Carolina Press. Chapen Hill. 1942. $3.00.

essential part of the gracious art of living, which is after all the most important mission and activity of man.

Nowhere has the reviewer read such an enchanting description of the winter garden as in Part I of this book. From inspiration thus received, he will plan his with greater care and enthusiasm hereafter.

Part II begins with spring daffodils, hyacinths and other early bulbs, shrubs, tulips, and continues with a long list of enchanting subjects, ending on the note of roses in the South.

The theme of daylilies as a vehicle for introducing southerners to the summer garden is presented in Part III. Other members of the Amaryllis Family are also fittingly considered—*Allium, Cooperia, Crinum, Hymenocallis, Lycoris, Pancratium, Sprekelia* and *Zephyranthes.*

Again, Part IV, the Climax of Fall, is introduced by a section on the Amaryllis Family—*Lycoris, Amaryllis, Sternbergia, Zephyranthes* and *Crinum.* Other sections are devoted to late annuals and perennials, chrysanthemums, etc., and finally fruiting shrubs.

An appendix gives a most valuable selected list of blooming dates based on records kept by Miss Lawrence.

This is a book that should be reviewed in *Time* and *Life* magazines, the institutions that have done so much to bring other forms of art into close harmony with everyday American life. It is also a book that the book clubs should adopt without delay. In fact it is a book that everyone with a plot of ground should read, and that landless persons should peruse again and again so that they will not be content to remain landless any longer.

ALSTROEMERID EDITION (1942) COVER DESIGN

The cover design of this Alstroemerid Edition represents a flower stalk of bostryx of *Alstroemeria Ligtu* drawn by the eminent artist and horticulturist, J. Marion Shull, from cut flower specimens sent by Harry L. Stinson from Seattle, Washington to Chevy Chase, Maryland, a distance of some 3,000 miles, by air express. Although the package was delayed a day or so due to war conditions, the flowers were in fairly good condition so that Mr. Shull could use them as the basis of his design.

Mr. Stinson also included cut flowers specimens of other Alstroemeria species, and these together with the Ligtu blossoms were enjoyed by the Society members in Washington, D. C. and vicinity.

1. REGIONAL ACTIVITY AND EXHIBITIONS

1942 NATIONAL AMARYLLIS SHOW, ORLANDO, FLORIDA

WYNDHAM HAYWARD, *Florida*

The American Amaryllis Society, after two years of holding its Florida shows in the Mead Botanical Garden, moved back into the Orlando Chamber of Commerce Building for its Ninth Annual National Amaryllis Show, April 14-16, 1942, and with a resulting attendance of many thousands, marked up a new high in success for this event.

The 1942 show was presented as a feature of the Orlando Centennial Pioneer Celebration, which attracted throngs of tourists from all parts of the Southeast and many winter visitors from the North. The exhibition was staged as in former years, in the main downstairs lobby of the Commerce Building, and benches lined the walls with hundreds of gay and gorgeous blooms. Admission was free to the general public on the three days.

Mr. Ralph W. Wheeler of Winter Park, treasurer of the Society since its organization, was again the manager of the National Show, and produced an outstanding and colorful display which attracted a steady procession of flower lovers morning, afternoon and night on the show dates. The Society had the generous and whole-hearted cooperation of the Orlando Men's Garden Club, Dr. L. C. Ingram, acting president, and of the Greater Orlando Chamber of Commerce, in the plans and details of the arrangements.

Mr. A. C. Splinter, eminent South Florida horticulturist and Amaryllis specialist, superintendent of the Arthur Curtiss James Estate at Coconut Grove, Fla., was the chief judge, and found the competition close in most of the classes. Top honors in hybrid Amaryllis displays were won by the Wheeler-Springer entries, (R. W. Wheeler and John R. Springer, jointly) which included numerous fine show specimens of Dutch and other fancy types.

Second place in show honors for Amaryllis went to M. C. Varnier of Fort Pierce. Crinum flowers were entered by a number of growers, including John R. Heist, Wyndham Hayward and Mrs. F. G. Yerkes.

Interesting exhibits of *Zephyranthes, Narcissus, Clivia* and *Amaryllis* species were set up by Heist, Hayward, Frank Vasku and Mulford B. Foster, noted plant collector and landscape architect of Orlando, Fla., including two rare and unidentified *Amaryllis* species from Brazil. One of these was a greenish, up-turned flower, something like *A. aulica,* and the other was a glorious crimson-flame bloom, apparently a "super" *Amaryllis belladonna,* Linn., and very showy and beautiful. These were found in their native habitat in Brazil by Mr. Foster and brought back to Florida on his plant exploring trips.

On the second night of the show, April 15, Elmer A. Claar, of Chicago, Ill., chairman of the daylily committee of the American Amaryllis Society, gave an illustrated lecture with his colored motion pictures of Iris, Peony, Amaryllis and Hemerocallis gardens north and south. The

films were shown in the third floor auditorium of the Commerce Building before an enthusiastic audience of more than 300 Central Florida flower lovers, who rose to give Mr. Claar an ovation at the end of his remarks.

The complete list of prize winners in the show follows:

Class 1, single entries of *Amaryllis* species, first, Frank Vasku for *Amaryllis Alberti* (double); first, (two ribbons) M. B. Foster, for rare *Amaryllis* species collected in Brazil; first, Wheeler-Springer, for U. S. D. A. collected type *Amaryllis Belladonna* Linn.; first, M. C. Varnier, for *A. rutila* var. *crocata;* first (Florida type *Amaryllis belladonna* Linn., var. *major,)* Wyndham Hayward; second Frank Vasku.

Class 3, best display of hybrids and species, first, Wheeler-Springer; second, M. C. Varnier; third, L. S. Thornton. *Class 4,* white without markings, first, Mead Botanical Gardens; second, Wheeler-Springer; third, E. A. Peterson. *Class 5,* White with slight red markings, first, M. C. Varnier; second, Wheeler-Springer; third, Wyndham Hayward. *Class 6,* White with heavy red markings, first, Wheeler-Springer; second, Mrs. J. H. Churchwell; third, Wyndham Hayward. *Class 7,* Red with White star, first, Wheeler-Springer; second, M. C. Varnier; third, Ralph B. Piper. *Class 8,* Light red (self), first, Wheeler-Springer; second M. C. Varnier; third, L. S. Thornton. *Class 9,* Orange red (self) first, Wheeler-Springer; second M. C. Varnier; third, L. S. Thornton. *Class 10,* Scarlet (self), first, Wheeler-Springer; second, Frank Vasku; third, M. C. Varnier. *Class 11,* Crimson (self), first, Wheeler-Springer; second, M. C. Varnier; third, William Cammack. *Class 12,* Dark Red (self), first, M. C. Varnier; second, Wheeler-Springer; third, Frank Vasku. *Class 13,* Pink, first, Wyndham Hayward; second, M. C. Varnier, third, Frank Vasku. *Class 14,* Any other Color, first, Wheeler-Springer; second, Mrs. J. H. Churchwell; third, M. C. Varnier. *Class 15,* Best Flower in the Show, first, Wheeler-Springer. *Class 16,* Double hybrid Amaryllis, first, J. J. McCann.

Class 758, Brodiaea, first, Frank Vasku; *Class 623, Hemerocallis,* first, Frank Vasku; *Class 622, Hemerocallis,* first, Frank Vasku; *Class 602, Hemerocallis* collection, first, Wyndham Hayward; *Class 1357, Clivia,* first, M. B. Foster; second, Wheeler-Springer; *Class 754, Allium,* first Mrs. J. H. Churchwell; *Class 1403, Zephyranthes,* John R. Heist, first, for *Z. Treatiae;* Mrs. J. H. Churchwell, 1st for *Z. atamasco;* W. Hayward, 2nd for *Z. atamasco; Class 1611, Narcissus* (Jonquil) first, Wyndham Hayward.

Class 110, Crinum species and hybrids: *Crinum Louis Bosanquet,* first, John R. Heist; *Crinum Cecil Houdyshel,* first Wyndham Hayward; second, John R. Heist; *Crinum Peachblow,* first, Mrs. Fred G. Yerkes; *Crinum Powellii* var. *Krelagei,* first, Wyndham Hayward; *Crinum Wormley Bury,* first, Wyndham Hayward; *Crinum Major Pam,* first Wyndham Hayward; *Crinum Mrs. James Hendry,* first, Wyndham Hayward; *Crinum Powellii album,* first, Wyndham Hayward; *Crinum Rawlinsii,* first, Wyndham Hayward.

Certificates of Horticultural Merit, to L. S. Thornton, for large-flowered red *Amaryllis* with three scapes in full bloom; to Mulford B.

Foster for new *Amaryllis* species collected in Brazil; to Mulford B. Foster for *Clivia.*

First Class Certificates for individual choice blooms of hybrid *Amaryllis;* Wheeler-Springer, 3; M. C. Varnier, 2; Mead Botanical Gardens, 1; Mrs. J. H. Churchwell, 1.

Awards of Merit: Wheeler-Springer for *Amaryllis* exhibit; Mulford B. Foster for exhibit rare *amaryllids;* Wyndham Hayward for exhibit of *Amaryllis, Crinum* varieties, and other amaryllids.

AMARYLLIS MEETING OF CALIFORNIA HORT. SOCIETY

L. S. Hannibal, *California*

Some time back Sidney B. Mitchell, President of the Calif. Hort. Society, proposed a joint conference with the American Amaryllis Society—the meeting being set for the afternoon of Saturday, April 18th, 1942 and conforming to the usual third Saturday of the month on which the "Cal-Horts" have their regular meetings. These are held in the spacious club rooms of the Commonwealth Club of San Francisco. Some 250 Horticultural Society members were present, but in spite of the advance notices sent to all local California A. A. S. members, only a very few found it possible to attend. Realizing at the last moment that the long contemplated round table conference was hardly practical since few participants were present, Mr. Herman Brown of Gilroy and the writer decided to deliver a joint discussion on "Hardy Amaryllids for Central California." Fortunately Mr. Brown had had favorable weather conditions for his hardy hybrid *Amaryllis* and he brought a number of his choice forms; thus much of the discussion centered about the culture of these beautiful plants.

During the last twenty years Mr. Brown [Herbertia: *6,* p 203, (1939)] has not only developed one but several strains, some containing the best blood of the U. S. D. A., Dupont, and Dutch hybrids, but his own free flowering fragrant Leopoldi "A" strain which can endure the cold, wet winters of central California without bulb loss is, in the opinion of several, including the writer, one of the finest forms available. The apparent absence of *A. aulicum* and *A. belladonna* Linn. blood which normally introduce the corona, green in the throat, or a light orange cast, has made it possible to obtain many blooms with a snow texture which would be the envy of any daffodil breeder. One clear, pure pink which attracted much attention was so far superior to several named forms that it belongs to a class of its own and is well worthy of registration.

The S. F. bay area of California is in the marginal zone for outdoor plantings of hybrid *Amaryllis.* The broken terrain makes use of these plants possible only in warmer pockets. In pointing this out Mr. Brown suggested that in questionable areas winter protection or conservatory culture should be considered. Under his outdoor growing conditions it takes 4 years to get large bulbs, but flower spikes can be expected every 4th. leaf in the mature plant. Soil enrichment with well rotted manure is desirable, but winter resting is not strictly necessary. In the interior valleys light shade is advantageous since the low summer humidities and hot sun can burn the leaves black.

The writer in turn discussed *Callicore, Crinum, Nerine, Zephyranthes* and several other hardy types of bulbs which do well under the varied conditions which prevail on the west coast. A portion of this discussion appeared later in the C. H. S. Journal [Vol. 3, No. 2 (1942)].

Regarding the two forms of *Callicore, major* and *minor,* which are so common in California, the writer pointed out that the source of these bulbs was quite obscure and no mention of similar clones could be found in European literature. The "major" is apparently intermediate between the type and *Spectabilis bicolor* Sprenger, whereas "minor" is a small form of *C. rosea* of which there are several clones in circulation. The recent introduction of the *Brunsvigia X Callicore,* or *multiflora* hybrids from Australia has opened up a new field of breeding and we should have new material available in the near future. For those who dislike bare scapes the use of the evergreen *Amarcrinum Howardii* was suggested.

Crinums, being essentially semi tropical are not well adapted to our local garden conditions, but of the hardier *C. Moorei, C. bulbisperum (longifolia* or *capense* in trade), and the *Powelli* hybrids including *C. Cecil Houdyshel* make the best showing here. The writer had a specimen of the latter which was put on display along with a group of *Cyrtanthus angustifolia.* Both plants were of interest to several specialists present.

Zephyranthes candida, Ajax, grandiflora and *Simpsonii* were suggested for the rock gardens, and the hardiness of *Clivia, Pancratium* and some *Hymenocallis,* such as *H. calthinus* and *H. tenuifolia,* were briefly touched upon.

During the question period that followed, identification of several plants was requested including *Haemanthus coccinus* and *Ismene.* The winter rest periods required by some strains of hybrid *Amaryllis* brought up quite a discussion. Unfortunately many amateur growers have lost bulbs due to decay during the winter months—with some strains this is a difficult problem, even with established bulbs. The trimming of all dried roots and pocketing of the bulb in sharp sand was advised, especially when fall or winter planting was undertaken, since it has been the experience of several here that root decay inevitably takes place with plantings where moist soil below 60° F remains about disturbed roots for any length of time.

Mr. Brown, whose rare charm and lovable personality makes friends of all, invited the audience to an open-house to be held at his home in Gilroy the following day, Sunday. These perennial open-house invitations are held during the height of the hybrid *Amaryllis* flowering season, and are indeed a rare treat. Apparently a number of members took his suggestion and made the 70 mile trip down the San Francisco peninsula past San Jose, for two weeks later the "Sunset Magazine", a western home and garden publication, paid tribute to his beautiful collection and hospitable reception, suggesting that others forget the chaotic troubles of the world for a spring day in the open and visit his garden. We congratulate Mr. Brown on his unique method of popularizing his splendid hobby.

VISITS TO GARDENS OF DAYLILY ENTHUSIASTS, 1942

ELMER A. CLAAR, *Illinois*

Part of March and April of the year, 1942, I spent in Florida. While there I went to visit the gardens of Mrs. Clifford C. Cole at Coconut Grove, an ardent daylily enthusiast; Mr. Wyndham Hayward, of Winter Park, our genial Secretary, and Mr. Ralph W. Wheeler, of Winter Park, our enthusiastic Treasurer. While in Orlando, the American Amaryllis Society was giving the National Amaryllis Show and there were some wonderful exhibits. The second evening of the show, I showed my moving pictures in Kodachrome of the gardens of daylily hybridizers together with the hybridizers themselves and their introductions.

In the middle of July I went to see the hybridizers in the eastern part of the United States. I visited Morgantown, West Virginia and saw the garden of Dr. L. H. Leonian; at Hyattsville, Maryland I saw Prof. J. B. S. Norton's garden; at Beltsville, Maryland, I saw Dr. Hamilton Traub's daylilies, at Chevy Chase, Maryland, I saw Mr. J. Marion Shull's daylilies; at New York I again saw the work of Dr. A. B. Stout at the New York Botanical Gardens and at Lowell, Massachusetts, I again saw the Fairmount Gardens of Mr. & Mrs. Thomas Nesmith. At Wilmette, I saw Mr. David Hall's daylilies and of course, my own.

MRS. CLIFFORD C. COLE. Mrs. Cole is an enthusiastic gardener especially interested in hybridizing daylilies. She has been crossing daylilies for some time but I have never been at her gardens when her choice hybrids were in bloom.

RALPH W. WHEELER. In my garden I am growing forty-four of Mr. Wheeler's hybrids—ten named varieties and 34 by number. None of these have bloomed typically for me so that I cannot report on them. I would estimate that Mr. Wheeler has considerably over an acre of daylilies. I arrived at Winter Park and Orlando just when the first blooms began to appear so that I did not see introductions of Mr. Wheeler and Mr. Hayward in their own gardens. Mr. Wheeler told me his favorite introduction is *Ruby Supreme.* I grow it but it has not bloomed for me.

WYNDHAM HAYWARD. I like Mr. Hayward's *Emperor Jones,* which is a flower about 6″ across, dark mahogany in color with a lighter golden stripe in the mid petal which makes it very contrasty. It's tops. I liked his *Minnie* very much. It is a pink dark crimson red to mahogany with a lighter orange center and white lines around the edges of the segments. Both of these flowers are "must haves."

E. W. Yandre is a bold, flaring type of flower, fluvous bronze in shade with creped edges. *Araby* is very pleasing. It is a gold flower with a faint bronze dusted eye. *Antares* is a deep orange to purplish brick red with fluvous black overtones. *Ralph Wheeler* has a delicate golden base with a smoky fluvous marking. *Ramona* is pleasingly curved, petals and sepals somewhat brick red in color with a light golden yellow base. Dr. Traub said that his *Golden Glow* was somewhat similar to Mr. Hayward's *Sally,* but that *Sally* blooms later. However, *Sally* and *Osceola* died for me and I have not seen either of them in bloom. *William Pelham* is a fluvous brown type that I do not care for.

I am growing the following later introductions of Mr. Hayward, but I have not seen them in bloom: *Crinkles, Flamante, Irene, Salmon Rose, Antoinette, Dom Pedro, Tahiti Belle, Babette, Rene,* and *Orlando.*

DR. HAMILTON P. TRAUB. I first met Dr. Traub, our editor, in Orlando, Florida, where he was growing a large group of daylily seedlings, which he estimated to be 20,000. Dr. Traub moved to Washington, took his seedlings with him and they are now planted at the Beltsville Horticultural Experimental Station.

Among his introductions are: *Duchess of Windsor* which is pastel cream with a very light fluvous eye and very large recurving petals. *Indian Chief,* distinctive because of its size, sometimes growing as large as a 9″ flower when fully expanded, has large coppery rose, long slender, recurving petals.

Granda is a red with yellow stripe in center, petals are rather narrow and the sepals are broader, somewhat darker with yellow striping. *Wekiwa* is a rich velvety red and a very fine flower. It's tops. *Dr. Stout* has petals that are rather narrow and recurving with an effect of light red dust sprinkled on them; the sepals are wider and orange with a heavier sprinkling of much lighter dust. Altogether it is very beautiful and in my opinion, will be popular for a long time. *Carnival* is a deep red with very large yellow throat. There is a yellow line in the center of the segments, the sepals are broader and darker red with a yellow line and very much twisted. The flower is very unusual. *San Juan* is a deep Spanish Wine color, very fine flower. *Victory Taierhchwang* is a Spanish wine with yellow lines down center of segments. A very fine flower. *Helen Wheeler* is the same color as Dr. Stout's *Bertrand H. Farr* but the form is different. *Mildred Orpet* has the effect of a bicolor. The sepals are narrow, peach color with a slight sprinkling of red dust. Petals are broader pastel pink with a light line in the midrib and a yellow throat. *General MacArthur* is a marvelous Vermilion Red.

In Dr. Traub's seedling beds at the Experiment Station he had some marvelous things. *Seedling* No. 156 is similar in color to *Black Falcon* but with different form. *Seedling* No. 48 is a small pastel pink with fluted edges and sepals which is very attractive. *Seedling* No. 157 is a large bright fire red with the petals small and evenly recurved, sepals larger and somewhat darker fire red with a yellow stripe in the center and twisted at the end. It is utterly lovely. *Seedling* No. 138 has the effect of a light bicolor. The petals are yellow suffused with a light red dust. The sepals are pink with yellow stripe in the middle. *Seedling* No. 249 is a general fire red in color, very evenly sized sepals, petals are fire red with crinkled edges and a yellow throat, which runs way up in the sepals to a brilliant eye zone of deeper fire red. *Seedling* No. 152 is one of the finest flowers I have ever seene. It is brilliant deep red, evnly distributed on both petals and sepals with a light yellow striped midrib which looks like it might be white. I should like to be growing this next to Mrs. Nesmith's seedling No. 38-345 and Mr. Hayward's *Emperor Jones* and one of the seedlings I saw in Dr. Leonian's beds. It has the foliage of *Cissie Guiseppi. Seedling* No. 250 is a brilliant red selected by Mr. Shull as outstanding.

PROF. J. B. S. NORTON. His seedlings are mostly yellows and orange. His *Garden Lady* I thought to be the best of his seedlings. It has a bicolor effect in light pastel colors. The petals are yellow with slight brushed red and raised in the center as if the edges were ironed out. The sepals are pastel pink. The color as I remember it, and as it appears in my pictures, is about the same as *Bertrand H. Farr* with a center stripe of light yellow which is almost white in the midrib of the sepal.

Mongol is a very large chrome yellow flower which is distinctive as to its size. I did not see *Louise Webster* in bloom. *Prince William* is described by Dr. Norton as a dull orange scarlet and "one of the nicest fire reds." As I grew it, it did not appear to me to be red or desirable. *Tacoma*, the Professor said, is his best bicolor but it does not compare with *Gay Troubadour*, *Harlequin* or *Festival*. The plant I received from Prof. Norton as *Woodridge* must have been mixed because the sepals were yellow, the petals dark red brown. The general effect was such that I took it out of my garden.

MR. J. MARION SHULL. *Georgio* was an utterly lovely flower, large yellow with almost white midriff on the center of the sepals. Its form could be improved. A "must have." *Gypsy Lass* impressed me as the most distinctive of Mr. Shull's introductions. It is a large orange with faint reddish flashings. The petals are orange with old gold in the center and the sepals are orange with red flashings. It has a light midriff and the edges are the most ruffled of any daylily I have seen. It has good form. Another "must have." *Musette* is an empire yellow self. *Anitra* is a light lemon yellow. Both of these I can get along without. *Seedling* No. 42-26 is a sort of a raspberry purple, unusually good form for a dark seedling. Certainly Mr. Shull should introduce this one.

DR. L. H. LEONIAN. Dr. Leonian's garden at Morgantown, West Virginia, contains some unusually fine seedlings: one which we thought could be described as a silver salmon, many deep reds, some striped, pastel colors, some reddish purple and one that I thought was especially attractive was a deep red with a light stripe down the middle. Dr. Leonian does not number or name his seedlings but at the end of the season he harvests his seeds and selects the better of his plants and sends them to Wayside Gardens, which organization is going to evaluate and later introduce those they think are worthwhile. Wayside Gardens does not see fit to secure the seedlings of the other hybridizers so I don't see how they can do a very good job in making comparisons. Before he made this present arrangement, Dr. Leonian sent me about twenty of his seedlings and three of them I have numbered. One has a more velvety texture than any other red that I have seed, the second impressed me as being somewhat similar to *Wekiwa* and *Dawn Play* so that I shall grow them next to each other to see which is the best. The third seedling was a very large red with a form like Mrs. Nesmith's *Massasoit* and it is very impressive.

DR. A. B. STOUT. Dr. A. B. Stout of the New York Botanical Garden, introduced some twenty new daylilies in 1941. Prior to 1941 he had introduced 28 clones and one species. He grows his daylilies back of the museum in an area of about two acres. From the museum it looked as

if it was about one-half planted in July, 1942. At the edge are the named varieties of daylilies of Dr. Stout and other hybridizers. Dr. Stout said no attempt had been made to secure the newer introductions of other hybridizers and I did not see any of the new ones.

Dr. Stout's Introductions Prior to 1941. Mikado—This daylily has consistently received the highest vote as being the best daylily for the last several years. Although it is a nice flower, I believe the vote is merely evidence of its wide distribution. I would prefer a dozen other Dr. Stout introductions to *Mikado,* but it is a nice flower and everyone should have it. *Roselind* is the best species I have seen. It should be in every garden. *Serenade* is a lovely flower but it is reedy. Too tall a stem for the flower and the total effect lacks proportion. *Bijou* is the first seedling introduced of the multiflora type. It is dull as compared with some of the other multiflora seedlings I have seen but is well worth the price asked for it. *Soudan* is a lovely formed flower, light yellow in color. A later *flava. Patricia* is a medium sized light yellow. I thought well enough of it to buy 31 plants and Dr. Stout says he thinks it an all time yellow. I have many three year old plants and I have not succeeded in growing any more than ten blooms per scape. This, also, is the experience of several other hybridizers that I know. The greenish tinge in the throat is also objected to by some. In spite of its lack of floriferousness, I think it should be in everyone's collection.

Majestic is a large orange self with a smooth finish and firm texture. Petals are ribbed and slightly ruffled at the edges. Sepals are undulated and recurving. It is also fragrant. Very fine. *Wolof* is a maroon with a clear orange throat which strikes me as a bit dull as compared with recent introductions but it is the best flower that I know in its color and price class. *Linda* has bright yellow sepals, large crinkled petals of golden yellow flecked with cinnamon, a rose eye zone in the throat gives a salmon pink effect. *Linda* is one of my favorites. *Rajah* and *Bagdad*—These flowers become less necessary to me every time I see them. *Circe* is a very fine clear yellow with an unusually fine form. *Festival*—This is one of my favorite daylilies. There are apparently two plants, somewhat different, by this name. The true *Festival* does not appear to me as being as interesting as the one with which it was mixed. It is not nearly as contrasty in coloring. This is a flower you should not miss. The petals are orange with reddish brown tinges, sepals are nearly English red with darker veins and an orange midstripe. The effect is a bicolor. A "must have." *Vulcan* has dark red coloring, greenish tinge of cadmium yellow throat, petals maroon with slightly darker midzone, sepals are maroon, petals are somewhat twisty and the sepals stiffly recurving. Several daylily enthusiasts have reported that this is not hardy. I have lost a number of plants where I planted them in preferred positions. This last year one of two came through for me. *Theron* is a dark red which approaches purplish black. I do not care much about the form of this flower but it is well worth the price asked. Color deep and fine. *Midas* is a medium size orange which I could get along without.

Waubun is a light yellow sprinkled with red in which the petals are slightly twisted in a very pleasing manner. This is a "must have." It is an intermediate bloomer. There are six plants that have been introduced by Dr. Stout that I think are especially interesting to hybridizers, but I do not think they have much garden value. *Summer* and *Fall Multiflora* species are in this class. *August Pioneer* is a medium sized orange flower whose principal merit is that it blooms quite late. *Boutonniere* is a pastel bicolor of the multiflora type whose principal merit is that it blooms late. *Autumn Prince.* a 1941 introduction, is a clear bright yellow, multiflora type, which was blooming for me after a severe frost on October 15. It is the latest thing to show bloom in the garden but it is unimpressive and I believe it will be more valuable to hybridizers than to our gardeners. I also feel this way about *Hankow.*

Dauntless—I have always liked this one but some people object to the band near the throat. *Sonny*—A lovely flower when I can get it to bloom. Very slow growing for me. *Princess*—This is a perfectly lovely pale canary yellow. A "must have."

Dr. Stout's 1941 Introductions. Bertrand Farr shows its *Patricia* parentage by its overlapping segment form. It is a pastel pink which I would like better if it were smoother instead of having darker coloring in the veins. A "must have" on account of its price. *Bicolor* has sepals of yellow orange with petals of pale fluvous red tinge, with rose and a midrib of yellow orange. I do not like this as well as *Cabellero,* the red coloring of which is darker and therefore, more contrasty. *Red Bird*—The dominant color approaches vermilion red with a somewhat deeper shade in the midzone. This is a "must have" and fine in every way. *Port* is a rich sprightly Brazilian red, small flower with a darker red eye zone. Very fine. *Zouave* is a rich bicolor. Petals rich red with darker midzone and sepals lighter. It bloomed for me again in the fall. I think it among the best new daylilies that I saw in 1942.

Buckeye resembles *Mikado* but it blooms three weeks earlier. I do not see why *Triumph, Yeldron, Hiawatha* and *Monarch* were introduced. *Triumph* is orange with a slight halo whose form I did not like. *Yeldron* is a small yellow orange flower whose form is somewhat like *Soudan.* I shall not propagate this one. *Hiawatha* is tangerine orange, multiflora type, blooms in June and July. I did not care for this flower. *Monarch* is a light cadmium yellow with a delicate halo which I did not care for.

Aladdin, Baronette, Mignon and *Sachem* did not bloom so I cannot report on these. *Afterglow*—This is described as caprician yellow with a pink tint. I did not care for it. *Cabellero* is a fine bicolor. The sepals are yellow with the outside edge sprinkled faint reddish. The petals are red carmine with a yellow stripe down the center. Segments are rather narrow and the form is rather straggly. I do not like it as well as *Gay Troubadour* but *Gay Troubadour* costs twice as much. Get it. It's lovely. *Symphony*—Perfectly lovely early bicolor in pastel shades; sepals almost yellow, petals greenish in throat, rose-tinted in the blade with a darker midband of light red. A "must have". *Brunette*—Chocolate colored and very early. It looked terribly dull as I grew it near some red peonies.

MRS. NESMITH'S DAYLILIES. *Introductions Prior to 1940. Burmah*—Late blooming orange overlaid with rose and copper. Mrs. Nesmith has much better in this class. *Dawn Play*—One of the finest Nesmith introductions; deep velvety rose with golden throat and golden midriff. One of the finest introductions that I know. *Dolly Varden*—Throat of creamy yellow, coral pink sepals and petals with slight lines of rose. This is a very nice pastel pink. *Heather Rose*—Pastel pink with a golden throat. Very nice flower. Large open flaring type. *Morocco Red*—Good velvety maroon red. Rich orange cup. *Persian Princess*—Petals deep velvety red with overflush of purple. Sepals a shade lighter. Very nice. *Starlight*—Very pale yellow, large delightfully fluted flower. One of the nicest of the creams. Should be compared with Sass's *Moonbeam* and Mrs. Popor's *Old Ivory* and Dr. Stout's *Princess*. Mrs. Nesmith prefers her *Canari* to this one. I did not see in bloom *Petra, Pink Lustre* or *Sweet Briar.*

1940 Introductions. Amulette and *Antimony* did not bloom for me. *Canari*—This is a very nice pale yellow with a smooth satiny finish. Perfectly lovely. *China Sea*—Light yellow with a salmon flush halo. *Coralline* and *Debonnaire*—I do not remember these although I grew them. *Dragon*—Sort of a rosy color with frilled petals and sepals, cadmium orange cup. Many of her named varieties and seedlings I like better than this one. *Gay Lady*—An early light chinese yellow which blooms for a long time. I do not need it. *Massasoit*—If you like them tall and large, you will like this one. Petals and sepals are ruffled at the edges. Sepals are reddish copper and the petals the same color with a touch of Indian red. *Matador*—Rich mahogany, sepals same color but not as velvety as the petals. Mr. Hall liked this the best of all the Nesmith plants that I am growing. *Moonray*—Pale yellow with a red halo. Petals are waved. Small. Form is very irregular. I cannot share Mrs. Nesmith's enthusiasm about this flower. *Royalty*—Maroon purple chrome yellow throat, velvety purple sheen. One of the best of this color class that I have seen.

1941 Introductions. Autumn Red has a nice color. Late bloomer with a yellow throat and a light line at the midriff of the sepals. *Bittersweet*—Bittersweet orange flushed with coral which gives the appearance of a rose color, white midriff and with white on the edges of the three petals. Golden throat. *Black Falcon*—This is a large star shaped type of flower of very dark purple color with a pale canary yellow throat. The edges of the flower are wavy. Segments are recurving. It is the best thing I have seen in its color class. *Bright Melody*—a red with flecks and dots of golden henna. Very nice. *Carmencita*—a large, flaring flower of rosy amaranth purple with a pale yellow center. Light midriff on the petals. *Charioteer*—throat yellow, sepals Brazilian red and cadmium yellow. The petals are the same color fluted at tips and with a yellow midriff. Flower has good form. *Debutante*—a dainty pink bicolor. Petals are smooth light pink and the sepals creamy yellow, pale yellow throat that is topped by a slightly deeper pink flush. Very lovely. *Gay Troubadour* is my favorite bicolor. Petals are creamy yellow with outside edges burnished with bright Indian red, the sepals

are cherry red, almost white midriff and a yellow throat. Form is sort of spidery or straggly, but is a lovely flower. *Purple Elf*—Dark maroon purple almost black. It is a small flower overlapping segments like *Circe*. *Regal Lady*—Bicolor. Petals rose with a deeper rose zone bordering the rim of pale yellow cup. Sepals are cream yellow faintly flushed with rose, giving the effect of a bicolor. *Su-Lin*—Petals are a light pink. Sepals light yellow. Very lovely bicolor. Especially liked by the ladies. *Thorobred*—Dark red with a yellow heart which I did not care much for. The form is poor.

1942 Introductions. Crimson Clover is a rose with a deep rose halo. Petals have a slightly raised midriff. The sepals are recurving and bordered with a lighter rose. *Honey Red Head*—The flowers are open, bright rose red, texture border of pale cream yellow around petals and sepals. Has a golden throat. Very good form. Utterly lovely. *Lustrous*—a large flower with a yellow throat, petals are pink pastel, sepals are also pink pastel and pinched. Very nice. *Noonday*—a light cadmium yellow self which I did not care very much about. *Purple Finch*—Purplish red with darker eye zone, yellow throat. When I saw this flower it was not at its best being somewhat pinched. *Purple Moor*—Dark purple with a deep yellow throat, segments pointed like *Theron*. *Royal Ruby*—Brilliant crimson red. Very smoothly finished, nicely branched. Really a gorgeous flower. TOPS.

MRS. NESMITH'S SEEDLINGS. Among the seedlings of Mrs. Nesmith that I like best, 39-129, deep mahogany with unusually fine form. 39-127, a medium sized flower of bright fire red with a throat of gold. Very contrasty. It will be named. 39-185 is a purple flower, very smooth with a form like that of Dr. Stout's *Circe*. 38-345 is one of the best of Mrs. Nesmith's seedlings. Red with an almost white line down the center. 42-28 is a pink that I like. 37-40 is a flower very similar to Dr. Traub's introduction *Dr. Stout*. Lovely. 42-40—a flower of raspberry color. 39-61 is a pastel pink which is very lovely. 41-133 is a pink with a deep red marking near a very yellow throat. 38-302 is a large flower with a light stripe down the center. 41-136 is a lovely pink with light sepals.

PROF. JOHN V. WATKINS. I am growing Prof. Watkins, 1942 introductions, *Kanapaha* and *Swan,* but I have not seen them in bloom. I am also growing his *Mrs. John J. Tigert* which I did not care for. To me it is just another fulvous daylily. However, I understand Dr. Watkins did not select this flower until after it had been grown four years so that I no doubt have not seen it bloom typically.

HANS SASS. Mr. Sass's *Golden West, Star of Gold, Hesperus, Nebraska, Moonbeam,* are still among the finest in their specific color class. His new introduction *Revolute* is a large imperial yellow with very good form. His seedling 45-40 is a big orange, the segments of which are recurving in a manner which gives it a very lovely form. Mr. Sass is particularly careful in selecting seedlings which have good branching. In a number of *Hesperus,* I have counted over fifty flowers on one scape. *Hesperus* is my favorite yellow daylily. It is a "must have." *Dorothy McDade,* a Sass Seedling, is by far the best late blooming daylily that I have seen.

DAVID HALL. His No. 39-2 is a twisted flower like *Taruga* but appears to be a more impressive flower than *Taruga* from comparison made from my pictures. His 39-7 is an exceptionally well branched yellow which produced up to 54 flowers per scape. The flowers were 7″ across and the flower was a complete monotone—even the throat was the same color as the outside of the segment. It will compare favorably with any of the yellows.

ERNEST PLOUF. Of all of Mr. Plouf's introductions the only ones that I am growing is *Craemore Henna* which I thought was very nice and *Craemore Ruby* which did not bloom for me, but I understand it is his best introduction.

MRS. POPOR. Her *Old Ivory* was perfectly lovely this year. It was the only one of this lady's seedlings that bloomed for me this year.

F. F. DONAHUE. *Golden Manny* was a distinct disappointment to me. It is just another yellow with no special reason for its introduction. I do not have any of the other introductions of Mr. Donahue.

H. F. FISHER. The only introduction I have of Mr. Fisher's is his bicolor *Chisea* which is not nearly as good as *Gay Troubadour, Festival, Bicolor* or *Cabellero.*

GEORGE YELD. His *Apricot,* which was the first daylily seedling of which we have any record still is an excellent plant. *Sovereign* is almost a duplicate of *Gold Dust.* These are both excellent plants. *Tangerine* is a good early orange and *Estmere* is still good. Among the other seedlings of Mr. Yeld which are still standard are *Sirius, Radiant* and the perfectly lovely *Winsome.*

AMOS PERRY. Of Perry's introductions, *Berenice* is nice; *Byng of Vimy* is a large loose type of flower; *Flavia* and *Golden Byng of Vimy* are large flowers of the same shape as *Byng of Vimy;* Mr. Perry has introduced entirely too many flowers that are very, very similar. I suppose this is largely due to the fact that he has been introducing them for a long time. I recommend that you see the other Perry introductions before you purchase them for the catalog descriptions are not always helpful.

CHARLES BETSCHER. I did not get to visit Mr. Betscher this year but his *Earliana* continues to be the finest early yellow that I have seen. His *Gloriana* is the finest orange intermediate and *Anna Betscher* is another "must have" of this gentleman. His *Golden Dream* and *J. A. Crawford* are good standard plants. Nearly all the rest of his introductions are yellows or oranges and very similar.

ELMER A. CLAAR'S SEEDLINGS. I do not intend to introduce any of my seedlings until I have had more time to appraise them. Out of several thousand that I have grown, I have named the following. *Prima* which is a multiflora type with a much more intense and vivid reddish color than any I have seen. *Twinkle Eye* which is an intermediate type with an eye zone which is a light bright red, and definitely distinctive. The over-all effect of the flower is pastel pink. It is distinctive because of the time of bloom and a good flower, in my opinion, at any time. *So Big* is distinctive because it is so little, yellow in color, trumpet shaped with flowers no bigger than 1½″ across and the sepals are very markedly

waved. *Vladimir Horowitz*—I have tentatively named a big red seedling Vladimir Horowitz with the consent of this great pianist, but I am not definitely persuaded this is good enough to name after Mr. Horowitz. I shall reserve the name and watch this flower another year. *Cadet* is a pink I thought very well of. *Buddie* is an unusually fine multiflora type. *Flamingo* is a rose colored seedling I thought well of.

H. M. RUSSELL. I am growing the following daylilies of Mr. Russell, but none of them have bloomed for me as yet so I cannot report on them this year. *Queen of Gonzales, Painted Lady, Mrs. B. F. Bonner, Purple Waters, Purple Flash, Seven Seas, Warpath, Annis Victoria Russell, Spitfire, Black Prince* and *Sylvia.*

CLINT MCDADE. I am growing *Queen Bess* and *Mermaid* but they have not bloomed for me as yet so I cannot report on them as yet.

ALSTROEMERID KODACHROMES

Mr. Harry L. Stinson is preparing a comprehensive set of Kodachrome color transparencies of Alstromeria and Bomarea, mounted between glass, for lantern projection. When this set is completed, it will be available for loan to responsible officers of garden societies and clubs for public showing. The service will be free, but postage and insurance must be paid both ways.

Similar comprehensive sets will be prepared for the amaryllids and will be loaned for public showing.

2. COLOR DESCRIPTION

DRYING FLOWERS IN THREE DIMENSIONS

Frances R. Williams, *Massachusetts*

Drying flowers in three dimensions to keep their natural shape and color is a fascinating hobby. The method is to completely cover the flower and leaves with some powder for three weeks, leaving it at ordinary room temperature. The results are often amazing and unexpected, and you never know what you will find at the end of the drying period.

Many flowers will keep their natural shape and color and appear as if just picked, while some will lose all original color. The success seems to depend upon whether the color is in the cell structure of the flower or whether the color is in the liquid within the cell, and whether the color will disappear when dried. Many chemical processes enter into the final results. A lovely snapdragon of vivid pink or yellow will look almost as it did three weeks before when you put the living plant away to dry. A *Crimson Bedder* nicotiana will turn from its dark, rich red to a dull dark gray. A *Heavenly Blue* morning glory changes to a bright pink.

At the large herbaria of the colleges, they tell you that the faster you dry the better color you are likely to have in your dried, flattened plant specimens. In 1937, I found chicory blossoms a hard thing to press, as they shrivel quickly and lose their blue color. But I remember how I used alum to put on muskrat skins, that I had dried as a child, and I added some alum on top of the chicory that I was pressing. I was not much impressed with the result, though I imagined it helped a little. The next year I tried again with about the same result.

In 1939, I tried alum on some gardenias that I was trying to press. Some gardenias I pressed with nothing added. The results were better with for the flower did not turn that dark brown, that gardenias usually turn when pressed, nor has it turned to date, over three years later.

I happened to watch a plaster cast being made, and was amazed at the way the plaster took up the moisture. When I got home, I took the last partly faded gardenia and found in the cellar a very little plaster of Paris. This I threw over the sad gardenia and left it on a shelf in the cellar, of all damp places, for what was, by chance, about three weeks. When I finally took the gardenia out of the plaster of Paris, it was just about as I had put it in,—a light cream color and in excellent shape, though a little shrunken. It certainly was a surprise to find anything like that.

From that start, I went on to other things. Skunk cabbage was my next venture. I dried skunk cabbage flowers in alum and in plaster of Paris. They came out in excellent shape, and color. A *Marica* flower came out well in 1939, and is still in good condition. Some Narcissus were fairly successful, and held well for several months. I had poor results with *Iris*. Larkspur kept excellent shape and color. I was still using plaster of Paris and alum, separately or mixed. In the summer of 1939, a pharmacist suggested borax. That seemed to do a much better job, and then I started to try about everything on the kitchen shelf, and have tried almost everything that anyone has suggested to me.

White Plantain-lilies, dried two and a half years ago, are still white. The reds of marigolds and carnations dulled somewhat, while a handsome red and yellow chrysanthemum turned dirty, light brown. Two and a half years ago, in 1939, I did some stalks of snapdragons, and they have kept well, the yellow has held better color than the pink. Part of the time these snapdragons have been shut up in a box, and for several weeks they were at Horticultural Hall, Boston, Mass., in the Library for an exhibit, in their box with cellophane over the top.

There seems to be a certain toughness to flowers dried in some of these materials, as if they absorbed something into their cell structure. They have seemed to stand more handling than some that were dried with nothing added. Observation over a period of three years indicates that the specimens dried in plaster of Paris and talcum powder are more pliable than those dried in borax. After a few years the plants dried in borax are becoming very fragile and crumble readily if pressed.

Last summer I dried a number of plants in borax to show different flower forms. I took a dozen of these from Boston to Chattanooga last December by train, and brought them back part way by train and part way by plane. They came through well, and are in good condition. This shows that they will stand a good deal of handling, as they were shown several times on the way.

One plant I put in powder in a tin pan, and applied bottom heat. This made it very brittle. Plants should be dried slowly. I generally dry flowers three weeks, and mushrooms six weeks.

I have tried several methods—drying and pressing at the same time with powders, or drying in three dimensions in powders and pressing flat afterward, so that the specimens could go in an herbarium. Those pressed with borax are too crumbly, and I shall try more in plaster of Paris and talcum powder. These have helped keep the white of *Nicotiana,* roses and *Actinidia.*

If the specimens are stuck in a little lump of plastacine, they will stand upright for an exhibit. The plastacine can be pressed into a saucer, before the flower is put into it.

I generally keep my specimens shut up in cardboard boxes or in cellophane boxes. When the moisture of the air gets at some flowers, especially sweet peas and *Narcissus,* they droop and fade. I painted some sweet peas with several transparent liquids to try to keep the moisture away so that they would not shrivel and droop. Duco cement mixed with banana oil has kept a sweet pea blossom for over a year. I painted this on with a small camel's hair brush. The white sweet pea blossom is cream color with wavy petals as in fresh specimens. Japanese chrysanthemums, pond-lilies, milkweed and others came out well and were painted with liquid court-plaster. They are holding well also.

I wonder if some flowers are acid and some alkaline, and if they ought to have a corresponding powder. Some red flowers tested acid, and the blue did not seem acid, but nearer neutral. I like borax for an alkaline powder. For a neutral I like Fuller's earth or talcum powder and for an acid powder. I am also trying boric acid powder and salicylic acid.

Hemerocallis fulva blossoms, apparently identical, were dried in several different powders and turned various shades of orange or orange-

red. Twelve red begonia flowers tested with litmus paper gave reactions as acid as vinegar. All turned various tones of sand color and some had tones of pink. The reds generally vanish in the drying, and the flower is left sand color, or a very dull reddish.

I have dried over 200 specimens in various materials. During this past winter, I made transparencies of cellophane, and tried dried flowers in the window in the transparencies. Larkspur has been in full sun all winter, in the window and neither the bloom nor leaf has changed color. A goldenrod as a transparency lost its bright yellow in three weeks in the sun, but has kept a pleasant buff all winter. *Chenopidium Botrys* in three weeks in the sun turned very light green-gray.

To dry a flower in three dimensions, take a cardboard box, larger than the flower and several inches high. Put in the box about half an inch of the drying powder—Make a mound of powder at the spot that will be below the flower. Lay the flower on this mound, so that it is up in the air and not being flattened by lying on the bottom of the box. With a spoon or the hand put powder very carefully all around under the flower. When the powder is half way up, put a little powder in the flower. A very little powder spreads the flower open more than is natural so do not put in much at first. Keep putting the powder about the flower and into it until it is completely covered and with about a half inch of powder over the flower. It will dry the way you fix it.

Leave this box with the flower in it in a room at ordinary temperature for three weeks. At the end of that time uncover very carefully. A box that will undo at the corners, so that the sides will open out flat, will let the powder fall away from the plant on the sides, and make it much easier to remove the rest of the powder, or to pull the flower out of the powder.

Of what use are dried flowers? I do think that they may be useful for class work and for educational exhibits. One town is using dried ragweed as an exhibit, in their attempts to eliminate this weed. I have been using transparent corsage boxes to show off the flowers. Such boxes show off the flowers more effectively, and protect them when passed about. Dried flowers are not the thing to use in place of bouquets and in flower arrangements. One day I looked at some artificial flowers, and it seemed to me that to look real, such flowers must be quite artistic, not made as an exact copy, but with much left to the imagination, to give the impression only, of the plants that are imitated.

If these dried flowers can be used for formal, artificial decoration, as perhaps in a church, or as models for class study and for transparencies, fitting panes of the windows, then they will serve a distinctly useful purpose. I know of invalids in a hospital who have enjoyed holding the light transparencies and looking at the flowers. So don't try to use these flowers in place of the fresh flowers. If they meet some especial need, they may be worth having. One person said they reminded him of the old faded flowers in the bridal wreath of Miss Havisham, in Dickens "Great Expectations." Another said they were ghosts, others said they were mummified, or crystalized, or pickled, or embalmed, or petrified, dessicated, and dehydrated.

I have never yet found a name for them so they are just flowers dried in three dimensions.

Harry L. Stinson, Seattle, Washington

The pink forms of Alstroemeria Ligtu

Plate 227

3. DESCRIPTION, CLASSIFICATION AND PHYLOGENY

ALSTROEMERIDS CULTIVATED IN THE UNITED STATES

HARRY L. STINSON, *Washington*

To the general gardening public the name of R. P. Louis Feuillet has little or no particular significance but to the "Alstroemerian" it is the introduction to a long sequence of events relating to the Peruvian Lillies. Feuillet during the years from 1707 to 1712 travelled throughout South America and recorded his discoveries in a two volume "Journal of the Physical, Mathematical and Botanical Observations in the West Indies and South America." In this journal are to be found the descriptions of the first three Peruvian Lilies ever to be recorded. The identity of these plants was entirely unknown to our travelling botanist and he unwittingly mistook them for new species of *Hemerocallis* which he probably cultivated in his own home garden.

He prefaces each of the three descriptions briefly with a sentence: 1st. A hemerocallis with purplish and streaked flowers, commonly known as Ligtu (See Plate 226.). 2nd. A hemerocallis with purplish and spotted flowers, commonly called Pelegrina. 3rd. A climbing hemerocallis with purple flowers, called Salsilla. These today are cultivated respectively in our gardens as *Alstroemeria Ligtu,* (?); *A. pelegrina;* and *Bomarea salsilla.*

Feuillet published his journal in 1714 and Linnaeus in 1762 commented that it was a comparatively rare book even at that time. For the pleasure and information of those who might not have access to a copy of it, and for the benefit of those students of the Alstroemerids who are interested in ascertaining the true *A. Ligtu,* which he describes, I am here taking the liberty of quoting translated excerpts from Feuillet's original Journal.

The first species which he described was, "A hemerocallis with purplish and streaked flowers, commonly known as Ligtu.

"The roots of this plant go obliquely deep into the soil, it has on its length some knots (thickened places) covered with some short hairs, it is round, three lines thick, and covered with a whitish skin.

"The stem arises obliquely to a heighth of a foot, following the same direction as its roots; it is winged, (I am of the opinion that *winged* in this instance means leafed: *"ailée"*, in the old French did carry the meaning of "having leaves like wings", and not winged in the modern botanical sense), covered with a reddish-brown bark, round, crowned with six or seven leaves, from between which emerge as many branches bearing several flowers at their summits.

"The leaves which are borne the length of the stem are placed on all sides, they embrace half the stem by their bases, their length is in the vicinity of two and three quarter (2-3/4ths.) inches, their width some five lines, they are bright green, end in a point, and are traversed throughout their entire length by several little ribs which all originate at the base, and continue till they end themselves at the extremity of the leaf.

"The flowers are carried on the young fruit (ovary) at the end of a beautiful green peduncle. This young fruit is ridged on its length with five ribs, (Why did Feuillet write five?), and they bear a flower of a beautiful red, which is divided into six parts, two of which are streaked by some white bands which form acute angles with the rib of the same color which traverse their length. These two are narrower and more acute than the other four, which are one and five sixth (1-5/6ths.) inches long from the point where they separate, and nine lines wide; I have not seen the fruit, having been obliged to leave before its maturity.

"This plant is found along streams, I took notice of this one along the river which passes through the center of the villege of Conceptión in the Royalty of Chile".

The second species which Feuillet described is *A. pelegrina* or Lily of the Incas, or Lily of Lima. This description the author prefaced with a short and somewhat fanciful account of the gardens of the Inca kings which is of interest to all gardeners.

"The flower of this plant merits by its beauty to have had a place in the gardens of the Incas, and perhaps we would have seen it there in its season if we should have lived in their times. The grounds of the gardens of these Great Kings had this advantage over others, as spring seemed to be continual and to maintain the plants in all their beauty; but as soon as they started to wither away and Nature seemed to take a rest, there was substituted in their place some new plants formed from gold and silver which the artisan had imitated quite perfectly, and which maintained the grandeur and magnificence of these sovereigns. The trees made of this precious metal formed long walks. The fields were filled with Mais, of which the tip ends of the stems, the flowers, and the ears were of gold and all the remainder of silver, the whole soldered together, were as marvelous as the centuries to come will ever see. And the only thing lacking to the Incas was the knowledge of the true God, whom we worship, to make them the most perfect Prince of Mankind."

Since there is no confusion as to the identity of this species I shall not give the balance of the description of it here. Likewise I shall omit the description of *Bomarea salsilla.*

Undoubtedly travel in this new, vast, and unexplored country had brought so many new and unknown plants to the attention of Father Feuillet that the discovery and recording of a few more or less became such a routine matter that they failed to elicit much enthusiasm from the weary traveller, otherwise he could have facilitated the work of the present day followers a great deal if he had given his descriptions in greater detail, but how was he to know that his discoveries were to be the first of a long list of Peruvian Lilies yet to be found and described?

The next account we find of the alstroemerias is in Linnaeus' Amoenitates Academicae, under the title of "Alstroemeria Planta". And again permit me to make a translation from the above reference for your general information, as it explains just how and where it

happened to be found in Spain. I quote, "The years taken up by these academic tasks had hardly been completed, when Don Claudius (Alstroemer), already eminent among those interested in the Natural Sciences, prepared himself for a journey, to wander over the ever-flowering lands of Europe, I refer to Spain, France, Italy and others. Certain of his opinions and purposes, he set out on the sea and with favorable winds arrived on the 28th. of April of the next year (1754) at the port of Gaditanus (now the city of Cadiz), Spain. Scarcely had he set foot upon the land, when at the home of the Swedish Consul, Don Bellman, he came in contact with a whole bunch, of a certain liliaceous plant of very rare beauty, and of such a singular structure that he was unable to refer it by any method to a genus thus far known. Inspired with delight of such a remarkable plant, he was unable to calm himself until he had contracted a much closer friendship and intimacy with it. Also, in this same city at a fortunate time he met a certain Noble Matron, to whom, sometime before, it had been sent by her husband while residing in the Peru of America.

"Now his first care was, to sketch such a pleasing plant, to describe and dry a cut flower so that he might present all these to his former most esteemed instructor in Natural Science. (Alstroemer was a student under Linnaeus). And furthermore, after the elapse of a certain interval of time he was able to secure fertile seeds, which he likewise sent. I testify to have seen how pleased his Noble Chief was to have received such a rare gift from his most beloved Alstroemer, how carefully he immediately entrusted the seeds to the soil, which by care and attention he conducted through the subsequent mild winter in a special propagating bed; until in the end he displayed the most delightful (plant) in the Academy garden and eventually (it) produced mature seeds. This strange plant, the first to have been seen by us, has been distributed by the Academy gardner and by us all under the name of Alstroemer's Plant or Alstroemer's Lily."

"This plant has been given the name *of Hemeroçallis,* so as to correspond to the following, but in reality the name *Hemerocallis* was introduced a short time ago to designate the Genus of the Asphodel Lily of Tournefort, hence this name cannot be admitted in as much as it applies to both. And now this plant, of a separate family, should have a distinct Generic Name, lest it be confused with the plants of a different genus. No synonyms are left, and for this reason a new name must be given; and since we owe this to Don Claudius Alstroemer; who found it, described it, and made a drawing of it, and introduced it correctly defined to the botanical world, and shared it with the gardens of Europe,—What prohibits us then from naming this plant, ALSTROEMERIA?"

Space prohibits giving the entire translation of Linnaeus' discussion on *Alstroemeria* as interesting as it may be. Also it might be found of little interest to those members not particularly acquainted with this branch of the amaryllids.

Linnaeus accepts the three alstroemerias listed by Feuillet in his Journal, but gives his entire attention to *A. pelegrina* which he says "will be a favorite". No reference is made to *A. Ligtu* and *A. (Bomarea) salsilla* as having been found by Alstroemer under cultivation in Spain. Jacquin asserts that Linnaeus made it a practice not to describe plants which he had not seen. So evidently these two were not in cultivation in Europe at this time. Herbert in his Amaryllidaceae states that Linnaeus confounded *A. caryophyllaea* and *B. edulis* for the two in question. I have just received material from the Library in Cincinnati, Ohio, which shows *A. Ligtu* of Linnaeus, Jr. in his supplement, page 207, which is certainly not the A. Ligtu which Feuillet described.

The Index Kewensis may be taken as the most authoritative tabulation of the recorded species to date. In it and its nine supplements are listed over a hundred species. Linnaeus started with the three of Feuillet, and his son in his supplement adds *A. pulchella* and *A. (Bomarea) multiflora.* Ruiz and Pavon enumerate in their Flowers of Peru and Chile some six species of *Alstroemeria* and seventeen species of what are now classed as *Bomarea.* William Herbert probably had the most up-to-date collection of them at that time. In his Amaryllidaceae (1837) he describes twenty-nine species and many varieties of the *Alstroemeria* alone. Many of which he also illustrates, and gives some pertinent information concerning them from his personal observation. About a decade after Herbert's Amaryllidaceae, Kunth came out with his Enumeratio and gives an excellent compilation of the then known species. The number of species has now grown to thirty-nine. Baker in his Handbook of the Amaryllideae (1888) admits that he made no search of the literature but merely studied the Herbarium specimens and rewrote the descriptions. Subsequent writers accuse Baker of not being careful enough in his observations and letting many minute points escape his notice.

A brief discussion of some of the species actually being grown in our gardens at Seattle may be of interest to our members not familiar with them. These plants have been collected by my many friends and correspondents in this and many foreign countries who have been so very generous in sharing with me their plants for study and observation. Others have been imported from England, Australia, Holland, Germany, Ireland, Chile, Costa Rica and Colombia.

At this point it may not be out of place to acknowledge to the members of the Amaryllis Society the deep debt of gratitude I owe to my many friends and correspondents who have been of great assistance to me in this interesting avocational pursuit—to Mr. Hayward for originally mentioning the need of a study of this little known family of plants, the late Dr. Griffith who supplied the first tubers and started the collection, the Messrs. James, Orpet, Brydon, Houdyshel, Vollmer, McCoy, and Hannibal, who have been most unselfish in sharing with me their good fortune when receiving new seeds, Mr. C. A. Weddigen, secretary to The Mens Horticultural Society of Cincinnati, Ohio, for looking up and copying valuable material from very old botanical journals, Senor Don Hernando G. Barriga of Bogota, Colombia, and Senor Don Salvador

Izquierdo of Santiago, Chile, who put themselves to much trouble and inconvenience to secure seeds of the alstroemerids indigenous to their respective countries.

Linnaeus wrote, that "out of this set of three companions, our *Alstroemeria* pelegrina will be a favorite". This is the true Lily of the Incas (Inca Lilies) or Lily of Lima, and to Mr. James goes the recognition of apparently being the first to import this beautiful flower to this country about 1932. There are two varieties of this in general cultivation. The *type* is a light lavender with green on the outer tips of the sepals and in their center is a large area of reddish-lavender, the two upper petals have the same light lavender on the outer portion while the inner portion is white with a beautiful flush of golden yellow, and over the entire are many spots and dashes of dark maroon. The variety *alba* is pure white over cast with a tinge of chartreuse green in the center of the sepals and a little toward the outer ends also a flush of golden yellow in the center of the two upper petals. The flowers are open to a diameter of about two and a half inches and are carried on stems from one and a half to two feet high. In the frost free regions they may be grown out in the open ground, but with us they must be grown in a coldframe which is covered with glass and heated to exclude all frost. The tubers of this species are quite long and fleshy and the plant does not seem to resent being grown in pots. This is the plant which Ruiz and Pavon write about as being "carefully cultivated in earthen pots in the gardens of America and Spain for its beautiful flowers", and in their observations they explain in detail how the Chileans used the tubers to make a farinaceous material which was used in the diet of invalids suffering from stomach ailments. This material also was dried and stored for future use.

A great deal of confusion and perplexity has existed constantly in the minds of botanist and horticulturist as to just what plant Father Feuillet had before him when he described his famous *A. Ligtu.* It seems odd that with all the exploration and botanical work which has been done over this same territory for the past two centuries, no plant has since been found that perfectly fits his description. Ruiz and Pavon in their "Flowers of Peru and Chile" give a description of their *A. Ligta,* (this is spelled LIGTA) which they consider as being synonymous with the *A. Ligtu* of Linnaeus Junior's Supplement, page 207. This plant definitely is not the *A. Ligtu* of Feuillet. According to both Prof. Lindley in Bot. Reg. 1844, t. 58. Misc. 6. and Les Liliacées, by P. J. Redouté, this *A. Ligtu* is *A. caryophyllaea* of Jaquin.

At the end of Ruiz and Pavon's description of their *A. Ligta,* they append an observation that "Sketches and dried specimens of this and of the subsequent species *(A. revoluta)* which are indigenous to the Royalty of Chile, we have lost in some of our well remembered shipwrecks, therefore we do not give drawings of them here".. This loss is most unfortunate for us as it might have been the one thing which would have positively identified the plant which Feuillet so poorly described and illustrated.

A closer examination of his description convinces me that we do not have the true *A. Ligtu* in cultivation in this country at this time. (See Plates 226 and 227.) To begin with he states that it "arises obliquely to a heighth of one foot". This growing out obliquely is definitely characteristic of the species *A. haemantha* and its many varieties. None of the plants being grown under this name *(A. Ligtu)* are as dwarf as one foot, but grow to a height of three to five feet. Although under cultural conditions they might be expected to grow more robust than in the wild state. Feuillet says further that "the stem is winged (ailée). If this were true it would definitely set it out as distinct, but no species which I have examined has shown any tendency to be winged and no authority since mentions any such phenomenon. Consequently I have come to the conclusion that it undoubtedly is the old French way of saying that the stem bears leaves, and not "winged" as the term is used in modern botany. Furthermore, the stems are "covered with a reddish bark". Strangely enough, none of the plants which I have growing under this name have this color of bark, but *A. haemantha,* and here and there throughout the planting of *A. chilensis* are many which do have reddish bark.

His description of the leaves is too general to be of specific value in identification. Neither Feuillet nor Ruiz and Pavon say a single word about the leaves being ciliated on their edges and yet it is so evident upon all the so called *A. Ligtu* specimens examined by me that they either overlooked it completely or else described other plants. According to both Herbert and Kunth the matter of ciliation definitely places them in the *A. haemantha* group. Schultes in his Systema Vegetabilium, page 735, did not help the situation any when he describes a variety of *A. Ligtu* with ciliated leaves. I have this one (from seeds which I received under the name of *A. Ligtu)* but it is not Feuillet's. Dr. Sims, in the Botanical Magazine, t. 2353, further complicates matters by confusing *A. haemantha* with *A. pulchella* of Linnaeus Junior. Again referring to Feuillet's description we find that he probably unintentionally says that the capsule has five ribs instead of the usual six.

The so called *A. Ligtu* grows from three to five feet high with leaves (ciliated) scattered along the stem, which gradually start defoliating as the flowers begin to open. The flowering stems terminate in an umbel of three to fifteen peduncles which bear three to five florets each. The flowers are about two inches long and one and three quarter inches across and come in all the shades of pink. The sepals are a solid color while the two upper petals have the same color as the sepals on their tips, immediately under this is a large area of golden yellow, this merges into a lighter shade of pink, these petals are streaked with dashes of deep maroon which converge toward the midrib and give the impression that they are winking at you. As a cut flower for flower arrangements or corsage work they are excellent. Whether we have the true *A. Ligtu* or not should not prevent our enjoyment of these beautiful flowers.

Since the appearance of Linnaeus Junior's supplement to Species Plantarum, the name *pulchella* has been a favorite appellation and has been applied to several species. I must admit that it is euphonic and ought to be given to a beautiful flower. It was first used by Linnaeus Junior in connection with a plant, a drawing of which Alstroemer had sent to him, but which plant he had never seen. Herbert is of the opinion that a badly mutilated specimen in the Banks Herbarium might possibly be this same plant which Linnaeus Junior described, and according to all reports has not been again identified.

This name is now erroneously applied to a species which we cultivate in our gardens, and which should be called *A. psittacina,* or "Parrot Alstroemeria". The main volume of Index Kewensis inadvertently gives *A. pulchella* as being synonymous with *A. psittacina.* And Baker falls in the same error, which he surely would not have done if he had gone to the trouble of looking up the literature which he gives as references. The eighth supplement to the Index corrects the mistake. *A. psittacina* was correctly described by Lehmann in Cat., Hort., Hamb., in 1826. Herbert gives it correctly in his Amaryllidaceae; Prof. Lindley correctly describes and illustrates it in Bot. Mag. t. 1540; also in Sweet's British Flower Garden. n. s. t. 15.; Hooker in Bot., Magazine, t., 3033. I am not able at this time to account for this error and it seems to persist only in America, as it is not found in foreign catalogs as *A. pulchella.*

A. psittacina is not perfectly hardy in our gardens here on Puget Sound, and we have to keep it planted in a glass covered cold frame during the severe winter. Being indigenous to Brazil it would prefer a warmer climate than our long cool damp winter months. The plant grows about two feet high and has an umbel of five or six usually simple peduncles, if they branch it is well below the center of the peduncle. The flower is about two inches long and inclined to be somewhat nodding or slightly above the horizontal. It is tubular in shape with the perianth segments unequal in length, the upper sepal being the longest and slightly incurved at the tip. The color is most striking, being a dark purplish red at the base of the segments, gradually changing to a brilliant red upwards toward the tips, which is a vivid green. On the inside all six segments are punctuated with many little black dots. The stamens evince an interesting precaution to self pollenated—as they mature and before the pistil is receptive they curve downward and outward so as to be completely out of the way of invading bees and humming birds seeking the honey hidden away in tubular bases of the two upper petals. This species will probably never achieve any great popularity among gardners, but should be valuable in breeding experiments.

Another species of similar characters is the *A. brasiliensis.* It seems to be somewhat hardier and survives outdoors. It grows about eighteen inches high. Flowers about the same shape as *A. psittacina* and of a rich wine red color without any green on the tips of the segments.

A. inodora, which was distributed a few years ago by the U. S. Dept. of Agriculture, turned out to be *A. psittacina,* and did not agree with the description or illustration in Herbert's Amarylidaceae. One plant had varigated leaves with a white margin.

Some tubers imported from Australia under the name of *A. braziliensis* turned out to be *A. psittacina,* and this bears out a footnote in Kunth's Enumeratio under this species that C. Bouchée states that "there was in cultivation in the Royal Horticultural Gardens of Berlin a species *A. braziliensis* which was really *A. psittacina*".

There is another species with flowers about the same size and shape as these tubular species but it is classed with *Bomarea.* It grows to a height of about three feet and its flowers are a sordid yellow dotted on the inside with black dots, tubular and with that characteristic incurved upper perianth segment. The stems show no tendency to climb like the bomareas but are rather stiff and erect. However it answers the description of *B. campaniflora* as given and illustrated by Handel-Mazzetti. It is not likely that this species will ever be a commercial sort, but is interesting as a botanical species and for breeding experiments. The seed of this plant (See Plate 229.) were kindly sent by our friend Major Pam to our Secretary, Mr. Hayward.

While this latter species seems to want the full sun, Major Pam also sent seeds of another species which wants treatment similar to that given to orchids. It is *A. nemorosa,* and answers the description of it as given by Gardner in Bot. Mag. t. 3958. It is evergreen and blooms during July and August. The flowering stem is about two feet high with the stem leaves reduced to long scales and a large rosette of leaves at the top in the form of a involucre, with three to five simple peduncles arising from the center of this. The flower is about two inches long, tubular, but expands at the end to about an inch in diameter. A dark red color and dotted on the inside with many black dots. It also will not prove popular with the florist, but should be valuable in breeding experiments.

A recent acquisition to our garden is *A. pulchra,* variety *tricolor,* imported from Holland. It withstands our winters here if given sufficient protection to keep the tubers from freezing. It grows to a height of twelve to eighteen inches, and has two to four peduncles with one to two flowers on each. Each flower is white with a flush of light maroon taking away the starey white and giving to it a soft delicate cast. On the back of the sepals there is a broad band of lively maroon which extends from the base to the extreme tip ends, while the sepals are tipped on the inside with a patch of maroon. The two upper petals are white below the middle and pencilled with many little dots and dashes of light maroon, immediately above this a broad band of golden yellow runs across the petal, between this and the tip is a large spot of dark maroon with just a narrow white line setting off the pointed tip, the bottom has a few dashes of maroon on the tip just as if the two top petals could not carry it all and some dripped upon the lower one. A patch of these nodding in the breeze look like a bevy of butterflies basking in the sunshine and flapping their wings preparatory to flight. While this species was still new to me I was cultivating around them when I accidentally broke off one of the stems and imagine my surprise when I noticed a newly formed tuber adhering to it just below the ground level. Further examination showed this to be a common habit

of this species. I thought I had something here, but Herbert beat me to it by about a hundred years for he mentions the same characteristic in his description of it.

In a few places along the Pacific Coast from British Columbia to Southern California a yellow *Alstroemeria* has been grown for many years. It is the most common one in cultivation, and is *A. aurantiaca,* variety *lutea* (see Fig. 85.) Sometimes it is given specific rank as *A. lutea.* In the Bay region near San Francisco it is grown in commercial quantities for the florists' trade along the coast. It grows to a height of three to four feet and bears flowers of a clear butter cup yellow. The flowers are in umbels of three to five peduncles and usually two on each. They are about two inches across and open out quite widely. The leaves stay green while they are in bloom which adds much to their general appearance for florist's purposes.

The orange colored form is frequently seen—*A. aurantiaca.* Recently another form was imported under the name of *A. revoluta* which does not conform to Herbert's description or illustration but seems to be a beautiful orange red form of *A. aurantiaca.* These are of the easiest cultivation when once established and require very little attention and give an abundance of flowers for the garden and for cutting.

As one looks back through the literature on the alstroemerias one is struck with the fact that there has always existed a great deal of uncertainty in their taxonomy. Lemaire in his description of *A. chilensis* comments upon this point for he writes, "Few plants, in reality, thrive, to speak in terms of the horticulturist, as much as the Alstroemerias in their native country. The winds and insects carry adulteratingly the pollen from one to the pistil of the others and produce without end new hybrids, among which, even while singling out the family, it becomes difficult to point out the original types. Also, in the exceedingly great number of species described and figured by authors, or preserved in herbaria, one does not hesitate to recognize that many are but variations and should be referred back to such and such types. We have acquired the conviction by our own research that any botanist who would wish to look into the subject would soon come to our point of view. Now in order to furnish a few proofs, What specific differences will be established between *A. aurea* and *A. aurantiaca?* Could not both of these arise from *A. haemantha,* or vice-versa? *A pallida* and *A. nellii* seem to have a close enough parentage. Can they cite *A. pulchella* as distinct? (he refers here to Sims confusing *A. haemantha* with *A. pulchella).* No one would know how to dispute the knowledge of our most distinguished horticulturist, M. Jacques, chief gardner for the Royal Domains at Neuilly, having a few years ago received some seeds of a species of *Alstroemeria* which a traveller had brought back to him from Chile, he planted them, and cultivated the plants with care, which prospered. What was his surprise, when on seeing them in flower for he counted eight very distinct varieties, in which he believed that he recognised, *A. aurantiaca, A. tricolor, A. Flos-Martini, A. pallida, A. neillii, A. haemantha, A. pulchella,* and *A. aurea,* etc."

The dilemma which faced Lemaire has not materially improved since his time in so far as it is possible to determine the true types, for just as he states "the winds and insects adulteratingly carry the pollen from one to the other" until now after almost one hundred years of cultivation in our gardens it is little wonder that we can detect characteristics of many species in one and their seedlings have a tendency to show segregation, which makes identification still more complicated.

Botanical authorities generally concede that the species *A. haemantha* and its varieties, *A. chilensis,* and others, is determined by the ciliation on the margins of the leaves. From my observations I am of the opinion that practically all the pink and pastel shades of the alstroemerias being grown today are but forms and varieties of *A. haemantha.* This species grows about three feet high, and has an umbel of three to four comparatively long peduncles with three flowers on each. The stems are decidedly reddish and the leaves are sparse and spirally twisted on the floriferous stem while they are longer and wider and more abundant on the shorter sterile stem. The cilia on the margins are about two mm. long and quite conspicuous. The flower is a beautiful cinnabar color, but it does not open as wide as some of the other varieties. While the flower is still in bud, the tips of the sepals recurve slightly and give it an urn-like shape, and the upper sepal is decidedly recurved when the flower is opened, this and the lower petal are very much abbreviated and the two upper petals are very acute. Ruiz and Pavon described the first *A. haemantha* and this species agrees very closely with their records, and the *A. ciliata* of Poeppig, which Herbert claims should be var. *pilosa* because of priority.

Poeppig who did a great deal of botanizing in Chile and Peru from 1827 to 1832 writes in his Fragmentum Synopses Plantarum that "there is preserved in our herbarium a very smooth variety which is lightly ciliated. The colors are very changeable, but they are outstanding alternately as a single individual or in groups or in a mass, burdened with flowers of cinnabar, brick-red, golden orange, golden yellow, lemon yellow, and white, however the two uppermost segments always marked with deep purple". Practically all these colors are seen in what we grow as *A. chilensis,* and they are just as Poeppig says "outstanding either singly or in mass", with all these colors blending into a perfect sea of color. *A. chilensis* grows about four to five feet high and carries from five to fifteen peduncles with three to five flowers on each. The flower is rather open, about two inches across and a little longer, and the same markings as given previously under *A. Ligtu.* Kunth writes that there are many forms grown in the Berlin Herbarium Gardens under the name of *A. chilensis.* Several variations are quite noticeable in a planting of these, but they are all characterized by very short cilia on the edges of the leaves.

Several plants in my collection received as *A. angustifolia* do not agree with the illustration or description of Herbert, and again they are ciliated, so I do not believe them to be the true type of *A. angustifolia.*

Mr. Orpet kindly sent me two tubers of a species to grow and identify, this I succeeded in doing and it proved to be *A. Hookeriana.* It is about two feet in height and has a very light pink flower about two and one quarter inches across and opened out perfectly flat. (See Fig. 70.) It fits perfectly the description in Bot. Cab. 1827. t. 1272. Some three or four years ago the University of California sponsored a botanical trip to the Andes of South America, and from reports they were successful in obtaining several species of both *Alstroemeria* and *Bomarea* not previously in cultivation. These they are propagating in their trial grounds, and we shall be awaiting with interest further reports. Mr. Brydon kindly furnished me with some seeds of a promising new species, *A. violacea,* but so far I have not been too successful with it under our Northern winter conditions.

The bomareas presented some interesting problems which had to be solved before their culture was assured. About a dozen species are thriving in my garden. They include the following species,—*Bomarea campaniflora, B. multiflora, B. caldasiana, B. sp., B. costaricensis, B. Ovata, B. salsilla, B. Lehmanii, B. frondea, B. oligantha, B. sp.* Several of them have bloomed and the others are growing so splendidly that they surely will reward me soon with their golden bells. Dr. Killip of the U. S. National Herbarium is doing some excellent work on this little known Genus and I am sure the alstroemeridians will be looking forward to the consummation of his studies on *Bomarea.*

At this time and as this edition of the Herbertia goes to press, it is with the fullest realization that just a beginning has been made in study of this Family, Alstroemer's Lilies. There is still much literature to be looked into and much translating yet to be done. With me this is only an avocational pursuit, but future editions of Herbertia will include additional findings as they are made.

IMPORTANT BOOKS AND PERIODICALS CONSULTED

(In addition many other sources were consulted)

1. Feuillet, Journal of Observations in South America and W. Indies, vol. ii. 710-716, and 3 plates. 1714.
2. Hooker and Jackscn, Index Kewensis, Main volume. 1895. Supplements, 1-9 inclusive, 1895-1938.
3. Linnaeus, Planta Alstroemeria in Amoenitates Academicae, vol. vi. 247:62, 1 plate. 1762.
4. Linnaeus, Systema Sexuel Des Vegetaux, (French Edition) Page 268. Paris, 1798.
5. Linnaeus, f., Supplement to Spec. Plantarum. 206:7. 1781.
6. Herbert, Alstroemeria in Amaryllidaceae, 1837. 88:103, supplemental Observations, 396:7, plates 1-8 incl.
7. Baker, Alstroemeria in Handbook of the Amaryllideae, 1888, 132:142, no plates.
8. Roemer, Alstroemeria in Ensatae, Synopses Monographicae, 1847. Fasc. iv. Part 1. 247:263. no plates.
9. Kunth, Enumeratio Plantarum. Pl. v. 758:781. no plates. 1850. 40 species described. Best since Herbert's Amaryllidaceae.
10. Schultes, Alstroemeria in Systema Vegetabilium, vol. vii. Part i. 732:742. no plates. 1829.
11. Ruiz and Pavon, Alstroemeria in Flora Peruviana, et Chilensis, vol. iii. 58:64. 10 Plates. 1802.
12. Martius, Alstroemeria in Flora Brasiliensis, vol. iii. Part i. 172:180. Plate 20, 21. 1842-1871.
13. Redoute, Les Liliacées. 40:46. 2 plates in color. 1802.
14. Lemaire, A. chilensis in Fl. des Serres. Ser. i. i. 1845. 98:101, 1 plate.
15. Poeppig, Frag. Synopses Plant. 1833.
16. Philippi, Alstroemeria in Linnaea. xxix. 1857-8; xxxiii. 1864-5.

17. E. Meyen, ex Presl. Reliquias Haenkeanae, vol. ii. 121:122, Plate xxii. 1825.
18. Herbert, A. Ligtu No. 13 in Bot. Reg. 1839; Misc. No. 6. Bot. Reg. 1844.
19. Lindley, Alstroemeria lineatiflora, Misc. No. 6 in Bot. Reg. t. 58. 1843.
20. Baker, Brasilian Species of Alstroemerias. 259:263, Journ. Bot. 1877.
21. Lehmann, A. psittacina in Linnaea, vol. v. 372:373. 1830.
Lehmann, A. psittacina, Cat. Hort. Hamb. ex. Schultes f. Syst. vii. 739. 1826.
Lindley, A. psittacina, in Bot. Reg. t. 1540. 1832.
A. psittacina, in Sweet's Brit. Flow. Gard. n. s. t. 15. 1879.
Hooker, A. psittacina, in Bot. Mag. t. 3033. 1830.
22. Cavanilles, A. (Bomarea) ovata, Icones et Descriptiones Plantarum. vol. i. t. 76. 54:55. 1791.
23. Hill, J, A. pelegrina in Decade of Trees and Plants, 3:4. Fig. 1. 1773. London.
24. Kranzlin, Alstroemeria in Engl. Jahrb. l. Beibl. Supplement 112, 1:7. 1913.
25. Sprengel, Alstroemeria in Systema Vegetabilium, vol. ii. 80:81. 1825.
26. Sims, A. pulchra in Curtis's Bot. Mag. vol. L. No. 2421. 1823.
Lindley, A. Flos Martini in Bot. Reg. vol. ix. No. 731. 1823.
27. Sims, A. pulchella in Bot. Mag. t. 2353. October 1822.
28. Herbertia, Volumes 1-8 inclusive, 1934-1941.

THE IXIOLIRION TRIBE*

HAMILTON P. TRAUB

From the morphological standpoint, the Ixiolirion Tribe is the most primitive of Subfamily III, EUMARAYLLIDEAE. All members of the other tribes of this Subfamily—*Callicoreae, Haemantheae, Cyrtantheae, Amarylliseae, Zephyrantheae, Galantheae* and *Narcisseae,* have a leafless scape, and the flowers are borne in an umbel which is fully established as a general rule. In *Ixiolirion* and *Kolpakowskia,* the two genera of the Ixiolirion Tribe, however, the scape is more or less leafy and the umbellate flowering habit has not been completely fixed, and may be described as a near-umbel. These morphological characteristics at once set off this Tribe from the rest of the members of this Subfamily and entitle it to tribal rank.

[In connection with the problem of the umbellate inflorescence in the AMARYLLIDACEAE, it is worth while to point out that this is a very suitable subject for a doctorate thesis in plant science. Important genera showing transitional stage are *Hemerocallis, Agapanthus, Ixiolirion, Kolpakowskia,* and possibly others. Mr. L. S. Hannibal, who is studying the *Callicoreae,* has pointed out to the writer that he has observed the incomplete fixation of the umbellate flowering habit in *Callicore rosea.* At the other extreme of the evolutionary development we have the umbel with a few to a solitary flower as in the *Zephyrantheae,* and some species of *Cyrtanthus,* and *Narcissus.*]

On account of its distinct divergence in vegetative morphological characters from the more typical amaryllids, systematists have differed widely in their opinion as to the phylogenetic position of the Genus *Ixiolirion.* William Herbert (1837) placed it among strangers in the section *Ixiaeformes,* under his sub-order *Agaveae.* Ker (1817) and Griffith (1851) considered *Ixiolirion* synonomous with *Alstroemeria,* and this precedent probably influenced Bentham and Hooker (1883) and Baker (1888) who placed it with the *Alstroemerieae* where it clearly did not belong. Pax (1887) was the first to perceive the closer relationship of *Ixiolirion* to the typical amaryllids, and to accommodate it he founded the subtribe *Ixiolirinae,* changed to *Ixioliriinae* by Pax and Hoffman in 1930. These workers placed it however between the subtribes *Crininae* (=Tribe 6. *Callicoreae* in the present work) and *Eucharidinae* (=Tribe 13. *Eucharideae,* in part, in the present work), where it was undoubtedly out of place. Hutchinson (1934) followed Pax and Hoffman, but raised the subtribe *Ixioliriinae* to the rank of a tribe, *Ixiolirieae.* Traub (1938) on the basis of the external morphology, characterized this tribe as the most primitive of the amaryllids with inferior ovaries (=Subfamily III. EUAMARYLLIDEAE), and placed it at the beginning of the group. However, neither Hutchinson (1934) nor Traub (1938) gave any literature citations for the tribal name, *Ixiolirieae.* This deficiency is made good in the present Chapter.

* This is abridged from Chapter 11. The Ixiolirion Tribe (Tribe 5. **Ixiolirieae**) of the writer's unpublished manuscript monograph on the **Amaryllidaceae.** It is published at the request of members interested in this tribe.

Tribe 5. IXIOLIRIEAE (Pax) Hutchinson et Traub *comb. nov.*

Hutchinson, Fam. Fl. Pl. II. monocotyl., 1934, p. 134, without citations; Traub, Herbertia 5:112. 1938, without citations; *Ixiolirinae,* Pax, nat. pflanzenfam. II. 5 abt. 1887, pp. 109-110; *Ixioliriinae,* Pax & Hoffman, nat. pflanzenfam. 15a., 2 aufl. 1930, p. 410.

Type genus.—*Ixiolirion* (Fischer) Herbert.

Diagnosis.—Rootstock a bulb; scape leafy; flowers regular, inflorescence subumbellate; perigone without or with a tube; ovary, inferior, fruit a capsule, seeds numerous, oval-oblong, angled.

KEY TO THE GENERA OF TRIBE 5. IXIOLIRIEAE

A. Perigone without a tube, stamens attached to the tepals for a short distance at the base (Asia Minor, to central Siberia and Baluchristan) ---------- Genus 32. *Ixiolirion*

AA. Perigone with a tube, stamens attached to the tube (Turkestan, and Karateginjugum) ---------- Genus 33. *Kolpakowskia*

The Genus Ixiolirion

The Genus *Ixiolirion* was founded by Herbert in 1821. The group is so distinct that its validity has been beyond question from the first. However, its phylogenetic position has been in doubt until recently. The species on which the Genus is based was originally described by Pallas as *Amaryllis tatarica* in 1776. Herbert originally recognized two species, *I. montanum,* and *I. tataricum,* and additional species were proposed by others as indicated in the literature citations below, but Regel (1879) showed conclusively that there was but one species involved.

Genus 32. IXIOLIRION (Fischer) Herbert

Herb. Append. pp. 37-38. Bot. Mag. 49. 1821; Herb. Amaryll. 1837, p. 125.

Diagnosis.—Rootstock a tunicated bulb; leaves linear, mostly aggregated at the base of the slender erect stem; inflorescence subumbellate; perigone regular, without a perigone tube, ovary inferior; segments free, equal to subequal; stamens, of two sets of lengths, shorter than the pistil and segments; filaments attached to the tepals; anthers basifixed; ovary clavate, 3-celled, ovules many, superposed; capsule loculicidally 3-valved; seeds small, oval-oblong, angled, black; one species; distribution—Asia Minor to central Siberia and Baluchristan.

DESCRIPTION OF SPECIES

1. Ixiolirion tataricum, (Pallas) Herb., Herb. Append. Bot. Reg., p. 37, 1821; Herb. Amaryll. 1837, p. 125, t. 19, 20; Regel, desc. pl. fasc.

7, pp. 206-208; Regel, pl. semenov. n. 1037; Roem. et Schult. syst. VII., I., p. 752; Kunth. enum. V., 1850, p. 818; Regel, gartenfl. 1878, p. 264.

Syn.—*Amaryllis tatarica,* Pallas, reise russ. reichs, 1776, pp. 727, t. D. fig. 1; Georgi, beschr. d. r. reichs, III. 4, p. 890; Ledebour, fl. alt. II. p. 40; *Amaryllis montana,* Red. lil., p. 241; Labill., syr. dec. 2. p. 5. t. 1; *Ixiolirion montanum,* Herb. Append. Bot. Reg. 1821, p. 37; Herb., Amaryll. 1837, p. 125, t. 20; Herb., bot. reg. 1844, t. 66; Kunth., enum. V. p. 817, 1850; *Ixiolirion Pallasi,* Fisch. et Meyer, Ledb. fl. ross. IV. p. 116. 1853; Regel, gartenfl. 1873, t. 775, fig. 3, 4; Ledebour, fl. ross. 6: 116-117, 1853; Regel, gartenfl. 1877, p. 226, t. 910; *Ixiolirion Ledebouri,*

Figure 71. Camera lucida drawings of typical 2x chromosomes from root tips of Ixiolirion tataricum (Pallas) Herbert; upper, typical metaphase plates, left, received as I. montanum, right, received as I. Pallasi; lower, typical chromosome pairs arranged in order of size. All approximately 2800X.

Fisch. et Meyer, Ledb. fl. ross. 6:117. 1853; Fisch. et Meyer, Bong. et Meyer suppl. fl. alt. n. 293; Regel, gartenfl. 1878, p. 264; *Ixiolirion macranthum,* hort., Baker, amaryll. 1888, p. 132; *Alstroemeria montana,* Ker, jour. sci. & arts 2:370-371. 1817; *Alstroemeria triflora,* Griffith, Ic. t. 273; nota pl. asiat. III. pp. 240-241. 1851.

Chromosomes.—The comprehensive review of the literature on chromosome numbers in the AMARYLLIDACEAE by Flory and Yarnell in 1937 (Herbertia, vol. 4, 1937, pp. 163-181.) revealed that no chromosome counts had apparently been recorded for *Ixiolirion* species. The follow-

ing preliminary results were secured by the writer in 1941.* Bulbs of *Ixiolirion tataricum* were secured from two American dealers under two different names. One lot was labeled *I. montanum* and the other *I. Pallasi.* As pointed out elsewhere, these two names are synonyms of the first.

The actively growing root tips were killed and fixed for six hours in a modification of Belling's and Randolph's formulae of Navashin's solution; were then washed three times in 50 per cent ethanol and stored in 70 per cent ethanol. The material was dehydrated in ethanol, cleared in cedar oil (1/3, 2/3 and pure); embedded in paraffin at 54 degrees Centigrade. The sectioned material (cut to 20 microns in cross section) was transferred to slides and after removal of paraffin, was stained by the usual procedure with Crystal Violet-Iodine-Picric, and mounted in balsam. The prepared slides were studied under the high power compound microscope.

Camera lucida drawings of typical metaphase plates, shown in Fig. 71, indicate that the two lots of bulbs are of the same species. The results show that the somatic or 2x chromosome number of *Ixiolirion tataricum* (Pallas) Herbert is 24, the size of the chromosomes varying from short to relatively very long. Since *Ixiolirion tataricum* is the most primitive member of Subfamily III. EUAMARYLLIDEAE, the basic or x chromosome number of this Subfamily may be considered as 12. This haploid number is in itself not proof of primitiveness, but if taken together with the leafy scape, the incomplete fixation of the umbellate flowering habit, we may be quite certain that we are dealing with the most primitive member of this group.

Description.—The descriptions of *Ixiolirion tataricum* in the literature as a rule are lacking in important particulars, and some statements made are incorrect. Baker (1888) for instance claims that the bulb is "necked." The following description is based on the study of several hundred plants grown in Maryland. It will explain how such errors came about. This description contains details that are usually frowned on by one school of "herbarium" botanists, but such details are vitally needed in progressive systematics.

SIBERIAN LILY, TARTAR LILY. Bulb ovoid, up to 2.5 cm. diam., without a neck, dormant during summer and early fall; stem produced to soil surface in late fall or early winter, bearing from 3 to 8 long linear ascending leaves aggregated in a tuft that persists through the winter; scape produced in spring, arising from center of tuft of leaves; scape 25 to 40 cm. tall, bearing up to 3 smaller leaves; spathevalves 2 to 3, green or membraneous, bractioles usually on single pedicels, and sometimes on branched pedicels within the umbel, branches subtended by a single bract below the pedicel; rudimentary flowers, blue in color, in the nature of short, single relict tepals, and subtended by bractioles appear occasionally on the pedicels below the flowers; pedicels

* The work here reported was carried out in the cytological laboratory of Dr. Delmar C. Cooper, while the writer was on leave of absence at the University of Wisconsin in 1941. This opportunity is taken to acknowledge with thanks the encouragement and inspiration received from Dr. Delmar C. Cooper, and Dr. R. A. Brink of the Genetics Dept.; Dr. A. E. Allen and Dr. R. C. Bryan, of the Botany Dept.

unequal in length; flowers from 2 to 8 in the umbel, and usually 1 to 2 below it, light blue to dark blue in color; 3 to 4 cm. long, tepals free, oblanceolate, acute, with 3 to 5 distinct ribs; filaments filiform, attached to base of tepals, anthers basifixed; when flower first expands 3 stamens are much longer than the other 3 and the pistil, but when flower is mature, the pistil is almost as long as the longer stamens which are much shorter than the tepals; stigma trifid; ovary inferior, clavate, 3-celled, ovules many, superposed; capsule loculicidally 3-valved; seeds small, oval-oblong, angled, with black testa. Soon after the seeds ripen in late spring the stem dies and the bulbs remain dormant until late fall or early winter.

Habitat.—Asia Minor, to central Siberia and Baluchristan.

Notes.—Discovered by P. S. Pallas between 1772 and 1773, and described by him as *Amaryllis tatarica* in 1776. The foremost authority on *Ixiolirion*, the late Dr. E. Regel, examined many specimens of the various forms of this species that had been proposed as separate species, including the specimens in the Semenov herbarium. He felt that the contrasts between straight and curved, long and short anthers, more open and more closely placed tepals, are not sufficiently important to be used as the basis of specific distinctions. Besides the type, he recognized four forms,—*intermedium, Ledebouri, crispum, and brachyanderum.* He found however that there were intermediate forms between them. It is for this reason that the forms are not recognized in the present work. Baker, in 1888, refers to the work of Regel, but unfortunately he neglected to make use of Regel's researches who showed that the correct name for the species is as now recognized. Baker chose the name *I. montanum* Herb., but gave no reason for doing so.

Ixiolirion macranthum Hort., apparently known only from the brief reference made to it by Baker (Amaryll. 1888, p. 132) is described as a form with an unusually large flower. Baker does not cite the original description, unless his brief note is to be considered as such. Anyone having further information about this form should publish the facts in HERBERTIA since there is now keen interest in this species.

In Maryland, this species begins to bloom toward the end of April, and the last flowers fade late in May.

The bulbs of *Ixiolirion tataricum* are entirely hardy in the North, and should also give good results in the Middle South as tests in Maryland have shown. In central Florida the results were negative. Bulbs should be planted in the fall; the writer planted his from 3 to 4 inches deep. For forcing indoors cold treatment will be needed. Bulbs stored for two months in a refrigerator at 36 to 40 degrees Fahrenheit and then potted, flowered normally whereas the controls not so treated either made flower scapes that did not emerge from the neck of the bulb when the abortive flowers opened, or did not flower at all.

In Europe, *Ixiolirion tataricum* has been cultivated to some extent but in America this plant has been mostly neglected until a few years ago when Wayside Gardens and Rex D. Pearce offered considerable numbers of bulbs to the retail trade. More recently, the Oregon Bulb Farms, a wholesale concern, has offered thousands of bulbs to retail

dealers. Such quantity production is encouraging and will insure a steady supply of this beautiful subject to the American gardener.

Recently Baranov and Poddubnaja (Bull. Univ. de Asie Cent. Tachkent, No. 11, pp. 1-14. 1925) have reported on the embryology of *Ixiolirion tataricum*. According to these authorities the archesporial mother cell by two successive divisions forms four macrospores. The three upper disintegrate while the lower one gives rise to the embryo-sac which is of the type with eight nuclei.

The Genus Kolpakowskia

This Genus dates from 1878, when it was described by Regal on the basis of *Kolpakowskia ixioliriodes*, but he erased it the following year and proposed it as a synonym of *Ixiolirion*. Baker (1888) followed Regal. However in *Ixiolirion* the perianth segments are free but in *Kolpakowskia* they are united into a tube for part of their length at the base. On the basis of this evolutionary change the Genus *Kolpakowskia* is retained in the present work.

In 1901, Lipsky described *Ixiolirion karateginum*, a species also characterized by the presence of a perigone tube. It therefore must be placed with the Genus *Kolpakowskia*.

Both of these species are apparently unknown in America.

Genus 33. KOLPAKOWSKIA Regel

Regel, acta h. petrop. 5:634. 1878; Gartenflora 1878: 294-296, t. 953.; *Ixiolirion*, desc. pl. fasc. 7, pp. 206-208. 1879; Baker, Amaryll. 1888, p. 133.

Type species.—*Kolpakowskia ixiolirioides* Regel.

Description.—Chromosomes undetermined; rootstock a bulb, leaves mostly aggregate in a basal tuft, and one or more above it on the stem; inflorescence sub-umbellate, flowers 2-7, perigone tubular for part of its length at the base; ovary inferior, stamens attached to tube for part of their length at base; two species.

KEY TO THE SPECIES OF THE GENUS KOLPAKOWSKIA

A. Filaments similar in form (Karateginjugum) ---------- 1. *Kolpakowskia karateginum*

AA. Filaments not similar in form, 3 filiform, 3 broader. (Turkestan) ---- 2. *Kolpakowskia ixiolirioides*

DESCRIPTION OF SPECIES

1. Kolpakowskia karateginum (Lipsky) Traub *Comb. nov.; Ixiolirion karateginum*, Lipsky, acta horti petropol. 18:108-110. 1901.

Description.—BOKHARA LILY. Plant 5 cm. to 15 cm. or almost 30 cm. high; bulb ovate to oblong-ovate, tunics gray-brown; stem mostly with greater part sunk in humus, the free part straight, much exceeded by the leaves; leaves 3 or 4, linear, plicate, long-attenuate toward apex;

flowers 2-7, small, to very small, pale lilac or almost white, subumbellate, subtended by scarious-margined spathe valves; perigone rotate, tube short, segments spreading, 4 times longer than tube, the inner segments obovate, the outer linear-elliptic, all green-mucronate-apiculate at apex and attenuate at base, forming a tube; ovary inferior, anthers subglobose or a little longer than wide, sulfur-yellow, the filaments white.

Habitat.—Central Asia; Buchara, Prov. Karateginjugum.

Notes.—Lipsky states that in "habit, method of growth and flower color near to *I. Kolpakowskianum,* Regel, but differing however in much smaller flowers, in the proportions of the perigone, the segments broader and of different shape, the tube proportionately shorter, the anthers punctiform, the filaments conform, not unequal." He observes that "At first view it suggests *Scilla.*"

2. KOLPAKOWSKIA IXIOLIRIOIDES Regel, acta h. petrop. V. p. 634, 18; Regel, gartenfl. 1878, pp. 294-296, t. 953. *Ixiolirion Kolpakowskianum,* Regal, descr. pl. fasc. 7. p. 208, 1879; Baker, amaryll. 1888, p. 133.

Description.—TURKESTAN LILY. Bulb 1.3 cm. diam., producing bulblets on short stolons; leaves ascending, about 4 aggregated in a basal tuft and 1 and 2 smaller ones above it; flowers 2 to 4, generally all in the terminal near-umbel; perigone tubular for part of its length; tepal-segments, whitish-violet, 2 to 2.5 cm. long, very narrow; ovary inferior, stamens attached to tube, 3 filaments filiform, 3 broader.

Habitat.—Turkestan; alt. 900 to 1800 m.; sandy hills.

Notes—Discovered by Dr. Albert Regel in 1878. According to the late Dr. E. Regel, it over-wintered without protection in the open in his nursery, and bloomed during the last third of May.

NOTES ON ZEPHYRANTHES BIFOLIA FROM ITS NATIVE COUNTRY

GEORGE H. HAMOR, *Barahona, Dominican Republic*

A little over four years ago, while taking an automobile ride over a rough, hilly, back country road here in the Dominican Republic, my wife and I located a colony of *Zephyranthes bifolia* in one of its native habitats. Way back in the bush and miles from human habitation, we were astonished to see a pink *Zephyranthes* which at first we thought to be a specimen of *Z. grandiflora.* No great attention was paid at the time, but later investigation proved that the plant was *Z. bifolia,* and various trips back for observing and collecting disclosed the fact that a considerable colony existed at that place.

This species is unquestionably one of the most beautiful of the genus and merits much attention for its ornamental value alone. However, it also is of unusual interest because of certain varying characteristics of which, so far, I have seen no mention in any publication. Neither have I seen any mention of its simple cultural requirements, for lack of which knowledge I believe efforts to grow it in the U. S. A. have failed. The species is native to the island of Santo Domingo and doubtless the progenitors of the plants in the Brace garden of the Bahamas were taken there from this country or from Haiti in the western end.

Neither of the specific names applied, *bifolia* or *cardinalis,* is properly descriptive as it is very polymorphic, especially in the flowering characteristics of different plants.

The particular habitat where the colony was discovered lies in Barahona province in the southwestern part of the Dominican Republic, at 1200 ft. above sea level; in conditions of light shade, well drained soil of decomposed shale and considerable limestone, with little organic matter; climate subtropical with intermittent rains from May to November, the other months very dry. Several hundred plants and several dozen flowers have been observed in this locale and from there we have brought about four hundred plants to the garden. As a result the general habits, characteristics and requirements of the species are well understood at least in so far as they are related to the conditions under which we have made observations.

Z. bifolia is distinctly a dry land species and during the long rainless periods the foliage dies down completely on many plants. Under garden conditions where water is available for sprinkling they can be kept evergreen but are better contented if given a vacation from growing. Of their various habitats in the Island some writer remarked "Of wide distribution but apparently much localized," and I believe this opinion to be correct for with the exception of the plants in the colony mentioned no others have been located though a fairly diligent search has been made over a rather large area in the vicinity.

Where these plants were found all propagation is by seeds. In no instance has a clump of bulbs been observed. Due, no doubt, to rather poor soil and long dry periods, growth is apparently slow and the percentage of small plants is relatively high. Many of these young plants

bear only two leaves and it must have been from observation of similar growth elsewhere that the name "bifolia" came to be applied. Also it is evident that flowers of the red type only were used as specimens for description.

For the purpose of disseminating information about the species, I am giving its unusual morphological features as they have been observed and noted from time to time; such notes having been based on observations made both in the wild and in the garden. Also I am describing its cultural requirements.

Leaves 6-8, sometimes more, 15-25 cm. long, 6-8 and occasionally 10 mm. wide; flowers from 1¾ to 4½″ diameter; color from light to rose-pink to deep cardinal red, position from very nearly upright to definitely declined; scapes from 3 in. to 13 in. long. Many of our garden plants have numbered stakes set alongside for the purpose of

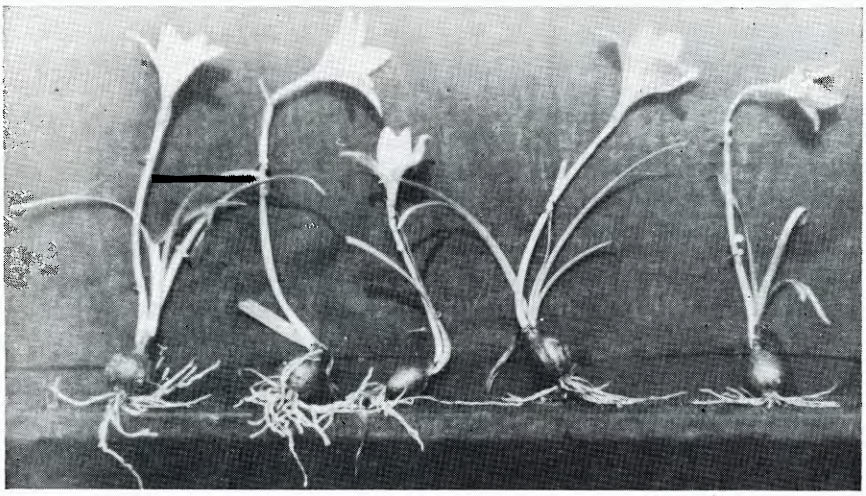


Fig. 72. Zephyranthes bifolia
Photo by G. H. Hamor, Dominican Republic

keeping individual records, and the notes taken indicate clearly that any particular plant maintains its own special characteristics through any number of flowering periods. The following data, taken from the record book, show sufficiently well the varied characteristics of the species as shown in twelve different plants: 1.—Very light pink; scape 3″; 2.—Very dark pink; scape 12″; 3.—Medium pink; scape 8″: 4.—Red, 1¾″ diam., acute apex, scape 12″; 5.—Red, free flowering, 6 flowers during May and June, 1941; scape 13″; 7.—Salmon red, 4″, segments broad, not acute; scape 4″; 11.—Red, 4¼″, segments broad; scape 8″; very handsome; 13.—Pink, 1¾″; scape 5″; poor; 17.—Very light pink, 2¾″; scape 5″; 20.—Light red, 4″; scape 10″; very handsome; 22.—Light red, 4¼″; scape 6″; very handsome; and 23.—Rose Pink, rather vivid, 4½″ scape 6″.

Any variation from the measurements given for different flowers produced by the same plant is very small, in other words, for any given plant these characteristics are very much fixed. In all the flowers, but particularly noticeable in the pink shades, there exists an effect as of a minutely grained, glistening, silvery powder, sprinkled over the upper surface of the segments, a feature which I have not observed in any other species known to me.

In view of the fact that no color other than red has been reported heretofore, an assumption may arise to the effect that this colony of plants had its origin in some hybrid flower, but such a theory would seem untenable. The locale is a very long distance from the habitations of people who might take an interest in ornamental plants, and the one other species indigenous in Santo Domingo and Haiti—*Z. Plumieri*—is a plant of acid soils which are non-existent in this part of the country. Moreover, the morphological characteristics of the spathe, stipe, stamens and pistil, conform perfectly with the description of these parts given by Dr. H. Harold Hume for *Z. bifolia* in the 1939 issue of "Herbertia."

Under garden conditions the plants increase both by seeds and by bulb offsets, but in this respect too they are very variable. Some of our plants have never matured seeds; No. 5 for instance has produced many flowers but has matured no seed capsules even with hand pollination. I do not claim definitely that the plant cannot be hand pollinated; I say only that I have been unable to do it. Other plants mature seeds from every flower if permitted to do so. The increase by bulb offsets is very slow compared to the rate of other species. In one of our garden plots which has over one hundred plants brought in and set there more than two years ago, there are some which still have only the original bulb, while others have made considerable increase. Plant No. 5, mentioned above as producing no seeds, has now increased to four bulbs of flowering size. Another plant recently had five flowers open at once, indicating the presence of not less than that number of flowering sized bulbs.

As to cultural requirements: these plants, taken from their habitat in light shade at 1200 ft. elevation, have performed in a very satisfactory fashion in full sunlight here, just a few feet above sea level. They appreciate a mulch to keep the ground cooler and to conserve moisture, but will get along well enough without it. Like other plants, their growth and general vigor are better in good soils, but they will survive and flower in those of poor quality. Noting these traits, it is evident that the species possesses a very considerable degree of adaptability. There is one condition however which should not be overlooked by anyone desiring to grow the plants well; *they are definitely natives of alkaline lands and under cultivation should be limed liberally.* If provided with a rather light, friable, fairly rich, well-drained, well limed soil, in my opinion there is no reason why the amateur as well as the skilled gardener cannot grow them successfully.

In view of the unusual beauty of the flowers of *Z. bifolia* and the great variation in color types, size, etc., I believe that the species offers greater possibilities than any other for highly interesting development through selection and crossing.

A REVIEW OF THE SPECIES OF CRINUM

J. C. Th. Uphof, *Washington, D. C.*

One of the largest genera of the Amaryllidaceae is *Crinum*. Baker in his revision of *Crinum* in 1888, recognized 79 species, but since that date no less than 61 additional species have been described, often on very flimsy type material. In order to bring all of this new material under one roof, I wish to present a review of the species of *Crinum*, including brief historical data, followed by the detailed descriptions of the species. No attempt has been made to go into the matter critically at this time as would be required if a monograph were presented. No attempt has been made to reduce species to synonyms, to make new combinations, or to propose new species.

I.

The name *Crinum* was given by Linnaeus and it is clearly established in his Genera Plantarum[1]. It is a name which the great Swedish botanist used to replace the compound word *Lilio-Asphodeli* as understood by Dillenius[2]. The word *Crinum* is derived from the Greek meaning lily. Linnaeus mentions this name in his Critica Botanica[3] under: "*Nomina Generica patrum botanices, Graeca vel Latina, si bona sint retineri debent, ut etiam usitassima & officinalia,*" and goes further on to state, "*a Greaca: quae apud Dioscoridem, & alios Graecos, praefertum The ophrastum (Th.) obvia sunt.*" There under a long list of names of various genera, we find alphabetically also the name of *Crinum*. In his Philosophica Botanica[4] very little is said about this genus. Of far more importance is Linnaeus' Species Plantarum[5] where we find in his first two editions the names of *C. latifolium, C. asiaticum, C. americanum* and *C. africanum*, names that are still in use except the last one.

Crinum latifolium is mentioned first and is therefore the type with which all of the other species are to be compared. Among the older writers Rheede van Drakenstein[6] may be mentioned. In his beautiful work he describes this species as *sjovanna-pola-tali* and illustrated it in plate 39. Linnaeus described the plant as "*Crinum foliis ovato-lanceolatis acuminatis sessilibus planis.*"

The second species is *C. asiaticum* and was first mentioned by Linnaeus[7] in Flora Zeylanica as "Crinum foliis carinatis," and which in earlier days was described by Hermannus[8] as "*Lilium zeylanicum bulbiferum & umbelliferum.*" Rumphius in his famous folio work[9] has used the name *Radix toxicaria* for this species.

---

1 **Linnaeus, Carolus.** Genera Plantarum. 97 Lugduni Batavorum 1737.
2 **Dillenius J. J.** Hortus Elthamensis. 161 Londini 1732.
3 **Linnaeus, Carolus.** Critica Botanica. 103 Lugduni Batavorum 1737.
4 **Linnaeus, Carolus.** Philosophica Botanica. 155 Stockhomiae 1751.
5 **Linnaeus, Carolus.** Species Plantarum Tom. 1, Ed. I Holmiae 1753. Ed. II Homiae 1762.
6 **Rheede van Draakenstein, Henricus.** Hortus Malabaricus. Tom. XI:77 Pl. 39. Amstelodami 1690.
7 **Linnaeus, Carolus.** Flora Zeylanica 127 Holmiae. 1747.
8 **Hermannus, Paulus.** Horti Academici Lugduno Batavo. 686 Pl. 683. Lugduni Batavorum 1687.
9 **Rumphius, Georgius.** Herbarium Amboinense. Tom. 1:155. Pl. 69. Amsterdam 1740.

Considering the early nomenclature of *C. americanum* we find that Linnaeus had already described this species in his Hortus Cliffortianus[10] as "*Crinum corollarum apicibus introrsum ungviculatis.*" Several years previously we find a description and beautiful illustration of this plant by Commelin[11]. He gives this American plant the name of *Lilio-Asphodelus americanus sempervirens maximus polyanthus albus.* Another early known *Crinum* species that should not be overlooked is *C. zeylanicum L.* Linnaeus first named it *Amaryllis zeylanica* in his Species Plantrum, Ed. I 421 (1753) but was later renamed by him *C. zeylanicum* in his Systema Vegetabilis 263. An excellent illustration of this plant has been given by Commelin[12], who calls it *Lilio-Narcissus ceylanicus lati-folius, flore niveo, extrene linea purpurea striato.* Like all of his descriptions of plants, they are partly given in Latin as well as in Dutch. He mentions that the root (he probably means bulb) of this plant was sent in 1685 from Ceylon under the name of "Tolabo." He states, among other details, that the fruits are three sided, although its seeds never came to full development. The plant had flowered several years in the Botanical Garden of Amsterdam during June. Rumphius called the plant apparently *Tulipa javanica*[13].

The name *Lilio-Asphodeli* as understood by Dillenius and which Linnaeus superceded with *Crinum,* must have made some confusion among earlier writers. However, it will not be necessary to go into this in great detail. It is worth mentioning that Boerhaave[14] describes two species of *Lilio-Asphodelus—luteus* and *puniceus.* He gives no illustrations, but it is clear from his descriptions that he has no *Crinum* in mind as we understand the genus at the present. Moreover, he refers to different authors, among whom is Clusius.[15]. In his work we find excellent descriptions and illustrations in wood-cuts of *Liliasphodelus luteo flore* which is clearly a *Hemerocallis.* Also Tournefort[16] includes under this group a number of plants that have been transferred to entirely different genera.

Herbert[17], who figured so largely in the description of the Amaryllidaceae, redescribed the various known species of *Crinum* and these were adapted with but little change from Roemer's Monograph and from Kunth's Enumeratio[18]. Another important contributor to this subject at the beginning of last Century was Roxburgh in his excellent Flora Indica[19].

Herbert[20] places the genus *Crinum* L. between *Ammocharis* Herb. and *Callicore,* Link. (syn. *Amaryllis* Herb. non Linn.). These are

10 **Linnaeus, Carolus.** Hartus Cliffortianus 127 Amsterdam 1737.
11 **Commelin, J.** Plantae Rariorus 14 Pl. 14 Amsterdam 1706.
12 **Commelin, J.** Horti Medici Amstelodamensis Rariorum. Tom. 1:73 Pl. 73 Amstelodami 1697.
13 **Rumphius Georgius.** Herbarium Amboinense Tom. V:30 Pl. 105 Amsterdam 1740.
14 **Boerhaave, Hermanus.** Intex Alter Plantarum quae in Horto Academico Lugduni Batavo. Tom. II:110. Lugduni Batavorum 1720.
15 **Clusius, Caroli.** Rariorum Plantarum Historia. Liber II:137, Antwerpiae 1601.
16 **Tournefort, J. P.** Institutiones Rei Herbariae. Tom. I:344 Tom. II: pl. 179. Parisiis 1700.
17 **Herbert, William.** Amaryllidaceae, 1837.
18 **Kunth, C. S.** Enumeratio Plantarum. 1833.
19 **Roxburgh, W.** Flora Indica. 1832.
20 **Herbert, William.** Amaryllidaceae. London, 1837.

placed with 12 other genera under the *Amaryllidiformes* of Suborder 4. *Amaryllideae*, under the "Third Division—Scapaceous." This "Division" comprises those plants with a succulent scape, spathaceous, not articulate below the spathe and it forms with two other divisions, namely the *Ramosae* and the *Caulescentes*, the family of the *Amaryllidaceae*.

He describes the genus *Crinum* as—"Germen thickest in the middle; tube cylindrical, slender; filaments inserted just outside the tube, more or less recurved; anthers incumbent, versatile; stigma 3-cornered or trifid; capsule soft, deformed, without valves or furrows; dissepiments obsolete. Seeds very irregular in form, size, and number. Leaves properly tubular at the base." He divides the genus into two subgenera, namely *Patentes* and *Semipatentes*. Up to that time 46 species were known to exist.

Herbert gives the first comprehensive account of hybrid crinums ("hybrid or mixed crosses"). In his Amaryllidaceae (1837) he includes twenty-three different names.

It appears that previous to the year 1880, the interest in the genus *Crinum* had diminished considerably. We note a statement by Baker—"During the last few years an interest in the genus *Crinum* which has pretty much slumbered for a whole generation, has revived, and a considerable number of new species have been discovered, and some of the old ones that were lost from cultivation, such as *C. purpurascens* and *C. Forbesianum* have been introduced afresh." There was no important advance in the study of this genus until Baker[21] in the Gardeners Chronicle proposed the division of *Crinum* into three subgenera, under the following names and diagnosis:

I. *Stenaster*, with *C. asiaticum* L. as the central type. The species of this group bear flowers that are relatively erect, having the linear segments of the limb either spreading or reflexing, which are not more than ¼ to ⅓ inch wide. The filaments are suberect, diverging, as he states, equilaterally on all sides from the ascending style.

II. *Platyaster*, with *C. americanum* L. as the principal species, is composed of species with the following characters: perianth tube either straight or slightly curved; lanceolate segments of the limb spreading or ascending when entirely expanded; filaments equilaterally divergent from the suberect style.

III. *Codonocrinum*, centering around *C. latifolium*. It contains species with perianth tube more or less curved from the beginning to end of anthesis; limb horizontal or sub-erect; the oblong segments standing forward so that they are permanently connivent or imbricated in the lower half; filaments declinate, close together and nearly parallel with one another, and style declinate.

Baker's fundamental principles of classification of this genus are still followed by botanists, including Pax and Hoffmann, the authors of the Amaryllidaceae, in Die Naturlichen Pflanzenfamilien[22]. In this modern work of systematic botany, *Crinum* has been placed in the sub-

21 **Baker, J. G.** A Synopsis of the known species of Crinum. Gardners Chronicle 15:763, 1881.

22 **Pax, F.** und **K. Hoffmann.** Amaryllidaceae in **Engler** und **Prantl.** Die Natürlichen Pflanzenfamilien. Bd. 15 a :409. Leipzig. 1930.

family *Amaryllidoideae,* tribus I, 1 *Amaryllideae,* and Subtribus I *Crininae.* We find that the first genus is *Chlidanthus* Herb., and this is followed by *Crinum* L., *Ammocharis* Herb., *Cyrthanthus* Ait., and *Stenolirion* Bak.

Interesting and important is a study by Otto Staph about *Crinodonna Corsii* in Curtis Botanical Magazine, Tab. 9162. It is a garden hybrid between *Callicore rosea* (pistillate parent) and *Crinum Moorei* (staminate parent). This hybrid was first described by Attilio Ragioneri. According to Stapf it is not surprising that a cross between

TABLE I

Distribution of **Crinum** species throughout the World. (after Koshimiza)*

Locality *	Littoreal species	Island species	Marsh or stream-side species	Total number of species	Species per cent
Tropical Africa	59	7	—	**66**	40.244
South Africa	23	3	2	**28**	17.073
India	15	4	1	**20**	12.195
South America	13	1	2	**16**	9.756
Australia	13	—	—	**13**	7.926
Indian Ocean	8	1	1	**10**	6.097
Coast of Red Sea	10	—	—	**10**	6.097
New Guinea & Isles	7	—	—	**7**	4.268
Philippine Islands	6	—	—	**6**	3.658
Madagascar	3	3	—	**6**	3.658
Malay-Peninsula	3	—	2	**5**	3.048
China	5	—	—	**5**	3.048
Jamaica	3	1	1	**5**	3.048
Borneo	2	—	2	**4**	2.439
Burmah	4	—	—	**4**	2.439
Mexico & Central America	3	—	1	**4**	2.439
Cochin-China	2	1	—	**3**	1.829
Sumatra	3	—	—	**3**	1.829
Hawaiian Islands	2	1	—	**3**	1.829
Himalaya Mts.	—	2	—	**2**	1.219
Japan	1	—	—	**1**	0.609
Ogasawara Is.	1	—	—	**1**	0.609
Formosa	1	—	—	**1**	0.609
Java	1	—	—	**1**	0.609
Norfolk Is.	1	—	—	**1**	0.609
West Indies	1	—	—	**1**	0.609

* **Crinum americanum,** Linn., native to southeastern United States of America, was apparently overlooked by Koshimiza.

Callicore rosea Link. (syn. *Amaryllis belladonna* Herb. non Linn.) and *Crinum Moorei* is successful, since the relationship between the two parents is very close, although they are grouped under different genera. He further goes on to say that morphologically the first is merely a *Codocrinum,* "with a perigon whose congenital basal growth is arrested at a very early stage and with a leaf-bearing axis of extreme shortness, whilst physiologically it is characterized by the well known seasonal duration of its foliage." According to him the Cape Belladonna Lily

was differentiated, due partly to climatic factors, from ancestors of the *Codocrinum* group.

According to Koshimizu[23] the ancestor of *Crinum* must have been an inland plant from tropical Africa where it grew on sandy soil. From this type originated different forms and species, adapted to various localities. Through the aid of ocean currents the seeds were distributed over considerable distances, the plants thriving especially in tropical and in subtropical regions. Koshimizu supposes that *Crinum* was brought to Japan in recent geological times after the Glacial Period. He found that *Crinum asiaticum* L. var. *japonicum* Baker was spread over sandy shores in Japan by the "Warm Pacific Black Current."

The same author states[24] in a more recent paper that the number of *Crinum* species is 164. Of these 16 are inland plants, 7 are marsh or stream-side species, whereas the rest are all littoral. About 57 percent are native to Africa. It is assumed that this Continent is the birth place of *Crinum*. Koshimiza gives us an interesting table of the distribution of *Crinum* species through the world as shown in Table I.

That *Crinum* species may be easily distributed by water can be readily understood from the bulbiform seed endosperm which contains a considerable amount of air and is protected by a thick corky layer[25].

In 1939 appeared the important paper by Milne-Redhead and Schweickerdt (Jour. Linn. Soc. LII:159-196, pl. 2, 3, 4, 1939) which has cleared up some matters concerning *Crinum* and *Ammocharis*. These workers show that *Crinum* species parading under the name *Crinum longifolium*, Herb. Amaryll. 271, becomes *Crinum bulbispermum* (Burm.) Milne-Redhead & Schweickerdt. *Crinum Tinneanum*, Kot. & Peyrit., *C. heterostylum*, Bullock, *C. angolense*, Benth., and *C. Baumii*, Harms, are transferred to the genus *Ammocharis*. *Crinum Bainesii*, Baker, *C. Thruppii*, Baker, *C. Lastii*, Baker, *C. rhodanthum*, Baker, and *C. ammocharoides*, Baker, are reduced to synonyms of *Ammocharis Tinneana*. *C. curvifolium*, Baker, becomes a synonym of *Ammocharis angolensis* and *C. coccineum* (Pax) Fritsch (Bull. Herb. Herb. Boiss. ser. 2, p. 1108, 1901), of *Ammocharis coranica*. These workers further point out that *Crinum nerinoides*, Baker, and *C. ondongense*, Baker, probably belong with *Ammocharis*, but this is left for further study.

In 1940, Hayward (Herbertia 7:92, 94, 1940) reported on the flowering of *Crinum erythrophyllum*, Carey (Bot. Mag. 47, 2121, p. 7) a species recognized by Herbert (Amaryll. 1837, p. 258), but ignored by Baker in 1888.

---

23 **Koshimizu, Takuji.** On the "Crinum Line" in the Flora of Japan. Botanical Magazine (Tokyo) 52:135-139, 1938.

24 **Koshimiza, Takuji.** Phytogeographical distribution of Crinum throughout the world. Botanical Magazine (Tokyo). 52: 32-39, 1938.

25 **Koshimiza Takuji.** Carpobiological studies of Crinum in Japan (in Japanese) Botany and Zoology 1933. **Bremekamp, Cornelis, E. B.** Over zaden die van het gewone type afwijken en over broedknoppen, die aan zaden doen denken. (in Dutch) Tropische Natuur (Java) Spec. no. 77-82, 1936. **Mery, James** Formation of periderm in the endosperm of Crinum asiaticum. Papers. Mich. Acad. Sci. 22 (1936): 159-164, 1937.

TABLE II

Complete List of Crinum Species

[For the species marked (*) complete descriptions in English are given in the text.]

Subgenus 1. STENASTER Baker

1. **asiaticum**
*2. **Rumphi**
*3. **Douglasii**
*4. **cortiflorum**
5. **sumatrana**
6. **amabile**
7. **augustum**
8. **defixum**
9. **Wattii**
10. **stenophyllum**
11. **serrulatum**
12. **pusillum**
13. **pedunculatum**
14. **macrantherum**
15. **Bakeri**
*16. **macrophyllum**
17. **bracteatum**
18. **Welwitschii**
19. **mauritianum**
20. **ligulatum**
21. **firmifolium**
22. **leucophyllum**
*23. **Poggei**
*24. **Belkianum**
*25. **amboense**
*26. **onodongense**
*27. **somalense**
28. **buphanoides**
*29. **Braunii**
*30. **biflorum**
*31. **nerinoides**
32. **caribaeum**
33. **cruentum**
*34. **longitubum**

Subgenus 2. PLAYTASTER Baker

35. **humile**
36. **Cumingii**
37. **amoenum**
38. **gracile**
39. **Stracheyi**
40. **Balfourii**
41. **pratense**
*42. **Woodrowi**
43. **Northianum**
44. **brachyandrum**
*45. **intermedium**
*46. **brevistylum**
47. **venusum**
48. **uniflorum**
49. **angustifolium**
*50. **brisbanicum**
*51. **pestilentis**
52. **modestum**
53. **purpurascens**
*54. **natans**
*55. **Roosenianum**
56. **subcernuum**
57. **Hildebrandtii**
*58. **Forgetii**
59. **crassicaule**
*60. **Harmsii**
61. **erubescens**
62. **americanum**
*63. **oliganthum**
*64. **palustre**
65. **Commelyni**
66. **strictum**
67. **undulatum**
68. **Kunthianum**
69. **concinnum**
*70. **argentinum**
71. **graciliflorum**

Subgenus 3. CODONOCRINUM Baker

72. **zeylanicum**
73. **latifolium (generic type)**
*74. **Johnstoni**
75. **brachynema**
76. **flaccidum**
77. **pauciflorum**
*78. **parvum**
*79. **Samueli**
*80. **Wimbushi**
81. **Careyanum**
82. **abyssinicum**
*83. **yemense**
*84. **Schimperi**
85. **distichum**
86. **yuccaeflorum**
*87. **majakallense**
88. **Sanderianum**
89. **scabrum**
*90. **pedicellatum**
*91. **Boehmii**
92. **fimbriatulum**
93. **crassipes**
*94. **Vassei**
95. **Kirkii**
*96. **Stapfianum**
97. **podophyllum**
*98. **Rattrayii**
99. **giganteum**
*100. **Bequaerti**
*101. **congolense**
*102. **suaveolens**
*103. **stenophyllum**
*104. **polyphyllum**
105. **lineare**
106. **variabile**
107. **campanulatum**
108. **imbricatum**
109. **Moorei**
110. **Forbesianum**
111. **bulbispermum**
112. **Macowani**
113. **submersum**
114. **longiflorum**
115. **virgineum**

UNCLASSIFIED SPECIES

*116. **Esquiroli**
*117. **acaule**
*118. **Voyroni**
*119. **Rautanenianum**
*120. **Lugardae**
*121. **crispum**
*122. **gigas**
*123. **Eleonarae**
*124. **glaucum**
*125. **scilliflorum**
*126. **toxicarium**
*127. **Stuhlmanni**
*128. **Menyharthii**
*129. **tanganyikense**
*130. **erythrophyllum**

SPECIES OR SYNONYMS IN GENUS AMMOCHARIS

1. **Tinneanum**
2. **heterophyllum**
3. **angolense**
4. **Baumii**
5. **Bainesii**
6. **Thruppii**
7. **rhodanthum**
8. **ammocharoides**
9. **curvifolium**
10. **coccineum**

After making the deductions and additions necessary due to the work cited above, there remain a total of 57 species of which descriptions are not readily available. Descriptions of these 57 species are here presented. Where necessary the descriptions have been translated into English from the Latin or other foreign languages. The names

and literature citations of all species in Baker's Amaryllideae, 1888, that are still recognized, are also included. This brings the review up to March 1942, and those interested now have access to all species descriptions of the genus *Crinum* by consulting this article and Baker's Amaryllideae, 1888.

I wish to take this opportunity of thanking the staff of the United States Department of Agriculture Library for the very efficient help that I received during the great amount of time I spent in the Library, and also for supplying microfilms and photostats of many articles needed.

II.

The subgenera set up for the Genus *Crinum* by Baker are recognized in the present review. A number of species have been placed under the heading "Unclassified" since the authors of these gave no clues as to the affinities of these with reference to species already described. The ten species formerly included in *Crinum* that Milne-Redhead and Schweickerdt have shown to be either species or synonyms in the Genus Ammocharis are also indicated. For the convenience of the readers a complete list of the species is given in Table II.

Description of Species

Subgenus I. STENASTER Baker

1. Crinum asiaticum, Linn., Sp. Pl. 419; Gawl. Bot. Mag. Pl. 1073; Baker, Amaryll. 1888, p. 75; *C. toxicarium* Roxb. Hort. Bengal.; *C. asiaticum* var. *toxicarium* Herb. Amaryll. Wight, Ic. Pl. 2021-2022.

Notes.—This species is widely spread in Tropical Asia. It has been illustrated by Rumphius in 1750. Baker mentions that there is a specimen in the British Museum sent from Tranquebar by the Moravian brethren in 1784. Linnaeus gives as geographical distribution "Malabaria, Zeylona, America". This will explain that the synonyms that have been cited under *C. asiaticum* Linn. contain *C. erubescens* Ait., *C. longifolium* Thumb. and *C. deflexum* Ker. *Crinum asiaticum* Linn. has been reported from the Aru Islands. Baker distinguishes a number of varieties, namely var. *declinatum* Herb. in Bot. Magaz. Plate 2231; Bury, Hexand. Plate 43. Its peduncles are assurgent and plicate. The bud is slightly cernuous; tube and limb longer than in the type. The limb is tinged with red. Known from Sillet. var. *sinicum* Roxb. Bot. Magaz. Plate 2121. Has leaves that are 12 cm. wide; their edges are clearly undulate. The scape is 90 cm. in length. Tube and segments are longer than those of the type. Reported from China.—var. *procerum* Carey; Herb. Bot. Magaz. Plate 2684. The leaves are 1.5 m. in length and at the base about 30 cm. in width. The perianth tube and limb are each 12 cm. in length, the latter being tinged with red on the outside; reported from Rangoon. *C.* var. *anomalum* Herb. App. Bot. Magaz. Plate 2121. *C. plicatum,* Livingst. Bot. Magaz. Plate 2908. Herbert states of this form, "It is very remarkable, because it differs from the whole genus in having the leaves split on opposite sides alternately to the base of the bulb, so that the bulb is imperfect in all its coats." He gives China as country of origin.

Hallier in his study on *Amaryllidaceae,* in Lorenz, Nova Guinea résultats de l'expedition scientifique en 1907-1909. 8:899, Leiden, 1912, indicates the occurence of this species on the Island of Wamar in low moist lands from Merauke (South New Guinea). He also mentions that there are in the Government Herbarium in Leiden specimens from Sumatra, Java, Madura, and Celebes.

2. C. Rumphi, Merrill, An Interpretation of Rumphius Herbarium Amboinense, Manila 1917.

Description.—The plant is entirely glabrous; leaves numerous, about 70 cm. in length, 18 cm. wide; petiole 20 cm. long; peduncle not known; flowers white, numerous, about 20 to each cluster; spathe-valves 18 cm. long, and 3 cm. wide, narrowed toward apex; pedicels 1 to 1½ cm. long; tube of the perianth slender, including the ovary 15 cm. long; segments linear-lanceolate, about 14 cm. long, 6 mm. broad, acute; filaments lilac; fruit unknown.

Notes.—This species, according to Merrill, belongs to the same group as *C. asiaticum, L.* from which it differs in many characteristics. Conspicuous are the large leaves and the long slender perianth-tube. Merrill states that Haskarl, Neue Schlüssel (1866) 177, thought that *Radix toxicaria II terrestris* might be the same as *C. procerum,* Carey, which, however, is synonym of *C. asiaticum, L.*

3. C. Douglasii, Bailey, in Botany: Contributions to the Queensland Flora. Bull. 4: 27, 1890.

Description—Leaves several, deep green, about 75 cm. in length, 10 to 12 cm. wide, becoming narrower above the middle, the apex rather blunt, veins numerous, reticulated; scape somewhat compressed, dark mottled, about 75 cm. long, carrying about 20 flowers; pedicels thick, of the same length as the ovaries; bracts of the involucre membranous 10 to 12 cm. long and 2 cm. wide toward the base; tube of the perianth about 13 cm. in length; segments of the perianth short pointed, 9 cm. long; the outer, (sepals) longer and broader, 1.5 cm. wide, margins undulate; filaments about ¾ the length of the segments; segments slender, purplish-red, except near the base; anthers very slender, 1.5 cm. in length; style of same length as segments, purplish, except toward the base: stigma short, three-lobed.

Notes.—This species has been described from a specimen that flowered in the garden of Mr. L. A. Berray in Brisbane who received the plant from the Hon. John Douglas of Thursday Island. Bailey mentions that it differs from *C. asiasticum* by its columnar stem.

4. C. CORTIFOLIUM, Hallier, in Lorenz, Nova Guinea, 901, 1912.

Description.—A large herb; leaves broadly lorate, to 1.20 meter long, of equal width throughout, but becoming acute and subcarinate-quadrangular at the apex and terminated by a short, fleshy, semiterete, obtuse tip; thick coriaceous-herbaceous but fleshy as well at the base and along the midrib, when dry, about 1.5 mm. thick at the middle of the base, with quadrate lacunae between the nerves in transverse section, gradually becoming more slender toward the margin, at the very margin narrowly membranaceous, veinless and subpellucid; nerves and veins disappearing in the fleshy parts of the lamina, subsulcate at the margin and toward the apex on both sides; the spaces between the veins quadrate, rhomboid, becoming black, elliptic in cross-section at apex, 28 mm. long, 15 mm. wide; spathe large about 12 cm. long, 3.5 cm. wide, consisting of 2 opposite leaves, the outer clasping, the margins 2-keeled on the inside; umbel about 20-flowered; the bud including the ovary and stipe, 8 cm. long, each subtended by a linear bracteole, 2-4 mm. wide, 8-10 cm. long; external petals 3, about 3.5 cm. long, subcucullate at the apex, the 3 interior petals shorter, the anthers linear, attached dorsally a little below the middle, when young 17 mm. long; fruits pear-shaped, about 3.5 cm. long, 2 cm. thick, with the stipes about 2.5 cm. long, 2-edged, 5mm. wide, terminating in a thick, cylindric beak irregularly broken off at the apex.

Notes.—Native to Southwest New Guinea, growing along river banks in virgin forests; Von Romer nr.189. This species is larger and much more robust than any other species known from southern Asia, Indinesia and Micronesia.

5. C. SUMATRANA, Roxb. Hort. Bengal. 23; Lindl. in Bot. Reg. Plate 1049. *C. rigidum* var. *sumatranum* Herb. Amaryllidac. 248; Baker, Amaryll. 1888, p. 75.

6. C. AMABILE Donn, Hort. Cantab. ed. 6, 83. Ker. in Bot. Magaz. Plate 1605; Baker, Amaryll. 1888, p. 75-76; *C. superbum* Roxb.

7. C. AUGUSTUM, Roxb., Hort. Bengal. 23. Herb. in Bot. Mag. Pl. 2397, Bury, Hexand. 64; Baker, Amaryll. 1888, p. 85; *C. amabile* var *augustum* Gawl. in Bot. Reg. Plate 679.

8. C. DEFIXUM Ker. in Journ. Sci.; 105; Lodd. Bot. Cabinet. Plate 362; Herb. in Bot. Magaz. Plate 2208; Baker, 1888, p. 76; *C. asiaticum* Linn. ex parte; Roxb.; *C. Roxburghii* Dalz et Gibs. *Amaryllis vicipara* Lam.

Notes.—To this species may belong var. *ensifolium* Roxb., *C. ensifolium* Herb. Bot. Magaz. Plate 2301. The flowers are deeper red on the outside. Its leaves are more acute. The plant has a less robust appearance. Has been reported from Pegu. Herbert considers this as a species, though closely allied to *C. defixum* Ker. See also J. B. Key's Review etc. in Journ. of the Sciences and the Arts. 3:106, 1817.

9. C. WATTII, Baker, Amaryll. 76 (1888).

10. C. STENOPHYLLUM, Baker, Gard. Chron. 786 (1881); Baker, Amaryll. 1888, p. 76.

11. C. SERRULATUM, Baker, in Gard. Chron. 786 (1881); Baker, Amaryll. 1888, p. 76-77.

12. C. PUSILLUM, Herb. Amaryllid. 255 Plate 32 fig. 3; Baker, Amaryll. 1888, p. 77.

13. C. PEDUNCULATUM, R. Br. Prodr. 297; Ker. in Bot. Reg. Plate 52; Bury, Hexand. Plate 11; Baker, Amaryll. 1888, p. 77. *C. taitense* Red. Lil. Plate 408. *C. canaliculatum* Roxb. Bot. Magaz. Plate 2121. *C. australe* and *exaltatum* Herb. Amaryll. 246, 1837.

Notes.—This plant has been described from a specimen that flowered in Kew Gardens in 1878. Native to Australia. Bailey, who describes this species in Queensland Agric. Journ. 4:47-48, 1899, states that *C. pedunculatus* occurs along creeks of the Brisbane River. He makes the remark "As there exists considerable confusion in the nomenclature of the Australian species of this genus, I deem it necessary to publish fresh descriptions, drawn up from living plants of the Queensland species, as opportunities offer."

14. C. MACRANTHERUM, Engl. Jahrb. 5:448; Baker, Amaryll. 1888, p. 77.

15. C. BAKERI, Schumann, in Engl. Bot. Jahrb. 4:194; Baker, Amaryll. 1888, p. 77.

16. C. MACROPHYLLUM Hallier in Lorenz, Nova Guinea 899, 1912.

Description.—Bulb unknown; leaves glabrous, large, lanceolate, acute, to 12 cm. long and 12 cm. wide, clearly parallel veined; scape carries about ten flowers; spathe 13 cm. long, the base 2 cm. wide; tube of perianth slender, cylindric, white, greenish

toward the outside; ovary 13 to 16 cm. long, about 2 mm. thick; filaments 7 to 8 cm. long, upper half purplish; anthers straight, 2 to 2.5 cm. long and 1mm. wide.

Notes.—Native to Southeast New Guinea, along the river banks between van Weels Camp and Sabang. Versteeg nr. 1219. This species differs from *C. macrantherum*, Engl. by its smaller leaves with closer veins, shorter perianth tube and much larger and broader lobes of the corolla; anthers arrow-like at the base. Hallier states that this species can easily be distinguished from *C. Bakeri*, K. Schum.

17. C. BRACTEATUM, Willd. Spec. Plant. Tom. II:47; Jacq. Hort. Schoen. IV: Plate 495; Gawl. in Bot. Reg. Plate 179. Baker, Amaryll. 1888, pp. 77-78; *C. brevifolium* Roxb. Hort. Bengal. *C. asiasticum* var. *bracteatum* Herb. Amaryllidac. 243.

18. C. WELWITSCHII, Baker., Gard. Chron. 40 (1881); Baker, Amaryll. 1888, p. 78.

19. C. MAURITIANUM, Lodd., Bot. Cab. Plate 650; Baker, Amaryll. 1888, p. 78.

20. C. LIGULATUM, Baker, Journ. Linn. Soc. 20:270; Baker, Amaryll. 1888, p. 78.

21. C. FIRMIFOLIUM, Baker, Journ. Linn. Soc. 20:270; Baker, Amaryll. 1888, p. 78.

22. C. LEUCOPHYLLUM, Baker, Bot. Magaz. Plate 6783; Baker, Amaryll. 1888, p. 78.

23. C. POGGEI, Pax, Engler Bot. Jahrb. 15:141, 1893.

Description.—Bulbs and leaves unknown; scape robust, short, 1 cm. in diameter; There are to 30 flowers to each umbel; spathe-valves 3.5 cm. long, 2 cm. wide at the base, dry membranceous, yellowish; pedicels hardly 6 to 12 mm. in length; ovary 3 cm. long; flowers probably pure white; length of the perigon-tube 8 cm.; segments of the perigone 3 to 5 cm. in length; anthers about 5 mm. long.

Notes.—This species has been reported from Quango. L. Pogge nr. 422. It is related to *C. leucophyllum*, Baker, from which it differs by the long, thin narrow tube of the perigone and the very narrow segments of the perigone.

24. C. BELKIANUM, Schinz, Bull. Boiss. IV App. III 47, 1896.

Description.—Leaves ensiform, about 35 cm. in length and about 3.5 to 5 cm. wide at the base, the apex attentuate, the margins scabrous; scape many-flowered, flowers pedecellate; perianth tube erect, about 10 cm. in length; segments elliptic, acute and attentuate at the base and about 5 cm. or slightly more in length and nearly 5 cm. wide; filaments about 5 cm. long.

Notes.—According to Schinz this species is related to *C. leucophyllum*, Hook. and *C. Bainesii*, Baker. The former has much broader leaves, whereas *C. Bainesii* has a shorter flower tube and shorter petals. Both species show affirnity to *C. Tinneanum*, Kotschy. The plant is known from Tropical Africa.

25. C. AMBOENSE, Baker, Schinz, Beitrage zur Kenntnis der Afrikanische Flora. Bull. Herb. Boiss. 3 II Ser.:666, 1903.

Description.—Bulb of medium size; leaves lanceolate, 90 cm. in length and 3 poll wide, apex attenuate, glabrous, flaccid, margin denticulate; peduncle about 6 lin. in diameter; peduncle about 6 lin. in diameter; umbel many-flowered, pedicels 12 to 15 lin. long; Spathe-valves ovate-lanceolate, 2 poll. in length; ovary cylindric; perianth-tube slender, erect, 4 poll long; segments lanceolate, open or recurvate, 2 to 2½ poll long and 2½ to 3 lin. wide, 5 to 7 veined, white; anthers 3 lin. in length.

Notes.—Collected in Southwest Africa: Amboland, Olukonda. This species shows relationship with *C. Belckianum*, Schinz.

26. C. ONDONGENSE, Baker, in Schinz, Beitrage zur Kenntnis der Afrikanische Flora. Bull. Herb. Boiss. 3 II Ser. 666-667, 1903.

Description.—Bulb globose, 4 poll in diameter, neck distinct; Leaves lanceolate, 1 poll wide, apex attentuate, margins denticulate; scape is 1½ lin. in diameter; umbel 10 to 12 flowered; spathe valves lanceolate, pedicels 6 to 12 lin. long; perianth reddish, tube slender, erect, 2 poll long; segments of the limb lanceolate, 5 to 7 veined, 1½ poll long; stamens shorter than the perianth; filaments reddish; anthers linear, yellow.

Notes.—Native to South West Africa: Amboland, Ondonga. Rautanen p. III, 1886.

27. C. SOMOLENSE, Chiovenda, in Resultati Scientifici della Missione Stephani-Paoli, nella Somalia Italiana. Vol. I:229-230, 1916.

Description.—Bulb unknown; leaves strap-shaped, about 30 cm. long, subcoriaceous, closely veined, margins carthilageous; scape more or less compressed; umbel 15 to 20-flowered; spathe-valves 10 to 13 cm. long, broad ovate, 2.5 to 3 cm. wide;

pedicels 1.5 to 4 cm. long; ovary oblong, perianth tube about 5.5 cm. long, 3 mm. in diameter; limbs linear-lanceolate, red, segmented; filaments 2/3 of the length of the segments, purple; anthers linear, 14 mm. long; style filiform; capsule sub-globose about 7 cm. long and 6 cm. wide.

Notes.—This species is related to *C. ammocharoides,* Baker. This species is a native to Somaliland.

28. C. BUPHANOIDES, Welwitsch, MSS.; Baker, in Journ. Bot. 195 (1878); Baker, Amaryll. 1888, p. 80.

29. C. BRAUNII, Harms, in Notizblatt Kgl. Bot. Garten und Herb. Berlin. 1:19-21, 1895.

Description.—Bulbs large, above the ground, 10 to 12 cm. in diameter, covered by dirty-red, thick solid scales; leaves more or less linear, 70 to 100 cm. in length, toward the center 5 to 5.5 cm. wide; margins sharp, white-edged; very finely, irregularly dentate; leaves have, in the middle, along their entire length a deep, broad furrow, apex is bent downward; type specimen had 12 leaves; scape about 70 cm. long, elliptic in cross section; about 6 flowers per umbel; spathe-valves broad, about 5 cm. long, brownish-yellow, membranaceous; flowers erect, sessile, without scent; perigone-tube narrow, about 15 cm. long, furrowed, light green, the upper part whitish; segments linear, 10 cm. long, toward the middle about 8.5 mm. wide, inner side and part of outside white, pink along the margins; filaments about 5.5 to 6 cm. long, the lower 1/3 white, the upper part dark red; anthers a little over 1.25 cm. long; ovary 1.8 cm. long; style 20 cm.

Notes.—Native to Madagascar; introduced by J. Braun. It flowered during 1894 in the Botanical Garden of Berlin. Harms states that this beautiful species can not properly be compared with any others. On account of the linear leaves it belongs to the subgenus of *Stenaster.* It differs from the madagascarian *C. firmifolium,* Baker, by its narrow leaves. There is some resemblance to *C. mauritianum,* Loddiges.

30. C. BIFLORUM, Baker, in Warb. Qunende Sambesi Expedition 565, 1903.

Description.—Bulb unknown; leaves linear, 8 to 9 lin long, attentuate; scape two-flowered, pedicels short; spathe-valves lanceolate; ovary cylindrical; perianth tube 5 poll long; segments lanceolate, 3 lin long; anthers linear, 5 to 6 lin long.

Notes.—This species is native to Kuito, Longa at an elevation of 1150 meter. Her. nr. 543, 1899.

31. C. NERINOIDES, Baker, in Schinz, Beitrage zur Kenntnis der Afrikanische Flora. Bull. Herb. Boiss. 3 II Ser. 666, 1903.

Description.—Bulbs and leaves unknown; peduncles slender, short, 1 to 1½ lin. in diameter; umbel composed of 7 flowers; pedicels 9 to 12 lin. long; spathe-valves lanceolate, membranous, 18 lin. long; perianth red, tube slender; perianth segments 17 lin. long and 1½ to 2 lin. wide, 5-veined; anthers 2 lin. long.

Notes.—Native to Southwest Africa: Hereroland. Dr. Done p. 17. XII, 1892.

32. C. CARIBAEUM, Baker, Gard. Chron. 40 (1881). *C. floridanum* Griseb. Flora Brit. West Ind. 583 non Fraser; Baker, Amaryll. 1888, p. 80.

33. C. CRUENTUM, Gawl., Bot. Reg. Plate 171; Lodd. Bot. Cab. Plate 346; Bury, Hexand. Plate 22; Baker, Amaryll. 1888, p. 80.

34. C. LONGITUBUM, Pax, Engler Bot. Jahrb. 15:141-142, 1893.

Description.—Bulbs and leaves unknown; scape robust, short, 1.25 cm. or less in diameter; 20 flowers or more per umbel; pedicels 3.5 cm. long; Spathe 8 cm. long and 3.2 cm. wide, dry-membranaceous, yellowish; flowers probably white; perigone tube nearly 12 cm. long or longer; perigon segments nearly 7 cm. long; anthers less than 1.25 cm. long, versatile; ovary 1.2 cm. long and less than 6 mm. wide.

Notes.—Native to Angola (Teuscz Exped. v. Mechow nr. 294). This species is related to *C. leucophyllum,* Baker, its flowers are, however, longer pedicelled, and have longer perigone-tubes, whereas the segments are narrower. *C. Poggei,* Pax, is a distant relative.

Subgenus 2. PLATYASTER Baker

35. C. HUMILE, Herb., Bot. Magaz. Table 2636; Baker, Amaryll. 1888, p. 81.

36. C. CUMINGII, Baker, Gard. Chron. 72 (1888); Baker, Amaryll. 1888, p. 81.

37. C. AMOENUM, Roxb., Hort. Bengal. 23; Baker, Amaryll. 1888, p. 81.

38. C. GRACILE, Meyer, Presl Rel. Haenk. 2 : 120; Baker, Amaryll. 1888, p. 81.
39. C. STRACHEYI, Baker, Gard. Chron. 72 (1881); Baker, Amaryll. 1888, p. 81-82.
40. C. BALFOURII, Baker, Bot. Magaz. Plate 6570; Baker, Amaryll. 1888, p. 82.
41. C. PRATENSE, Herb., Amaryllidac. 256 (1837). *C. longifolium* Roxb. in Hort. Bengal. 23 non Thunb; Baker, Amaryll. 1888, p. 82.
42. C. WOODROWI, Baker, Bot. Mag. Plate 7597, 1898.

Description.—Bulbs round, about 10 cm. in diameter, without distinct neck; bulb surrounded by brown, membranous scales; leaves few; contemporaneous with flowers; 30 cm. leaves ligulate, blunt, glabrous, bright green, 30 cm. in length and 7 to 10 cm. wide; not ciliated along the margins; flower-stalk compressed, arising from bulb on side of mass of leaves, 30 cm. in length; 6 to 7 flowers per umbel; pedicels about 2.5 cm. in length; spathe-valves two, ovate, opposite; perianth tube cylindric, 7 to 78 cm. in length; segments white, lanceolate, equally spreading and of same length as tube; filaments deep red, half the length of segments; anthers linear, 8.5 mm. in length; style overtops anthers.

Notes.—This species is native to Central India. Baker states that several bulbs were sent to the Royal Botanical Gardens at Kew in 1897 by Mr. G. W. Woodrow. The species is allied to *C. Balfourii,* Baker, from the Island of Socotra, to *C. Northianum,* Baker, from Borneo, apparently; to *C. amoenum,* Roxb., and also to *C. pratense,* Herb. The last two are native to India.

43. C. NORTHIANUM, Baker, Gard. Chron. 671 (1882); Baker, Amaryll. 1888, p. 82.
44. C. BRACHYANDRUM, Herb., Amaryllidac. 249 (1837); Baker, Amaryll. 1888. p. 83.
45. C. INTERMEDIUM, *Bailey,* Queensland Agric. Journ. N. S. 1:124, 1919.

Description.—Bulbs 5 to 7 cm. in diameter, and without stem above ground; leaves end in a more or less blunt point, and are furnished by numerous longitudinal veins, the horizontal ones form a faint tesselation; scape, compressed, glacous, showing a reddish tinge at base; bracts large; bracteoles slender; perianth segments with apiculate yellow tips.

Notes.—This species has been reported from Wai Weir Island. The name because it resembles both *C. Douglasii, Bail.,* and *C. brevistylum, Bail.* The plants were sent from Wai Weir Island in June 1911 to the Director of the Brisbane Botanical Gardens.

46. C. BREVISTYLUM, Bailey, Queensland Agric. Journ. 2:197-198, 1898.

Description.—Bulb roundish, egg-shaped, 10 to 12 cm. in diameter, without distinct neck, instead it forms yearly a crown of 12 to 14 slaty-green leaves; leaves ensiform, somewhat erect, 60 to more than 90 cm. in length, and 6 cm. broad toward the middle, the apex rather blunt; often more than one scape grows from between the leaves; scape 60 to 75 cm. in length, flattened, 2 to 2.5 cm. wide; bracts of involucre 6 to more than 7 cm. in length, somewhat blunt, and 2.5 cm. wide at base; 8 to 10 flowers per inflorescence; pedicels thick, short, sometimes as long as the ovary which is about 1.25 cm. in length; flowers white, slightly scented; tube erect, green or greenish, 7 to 12 cm. long, somewhat angular; segments linear-lanceolate, about 6 cm. long, 2 to 2.5 cm. wide toward center; outside segments with green tips; stamens erect, and reach half the length of segments; upper half of the filaments purplish-pink, in some cases white; anthers narrow, 1.25 cm. in length; style surrounded by the tube, upper 2/3 of style purplish; stigma obtusely lobed.

Notes.—Bailey reports this species from Turtle Island, Queensland where plants were found on sandy patches above high-water mark. He states "The species agrees in some respects with the lost species *C. brachyandrum,* Herb., but not in my opinion sufficiently to allow being placed under that name." For this reason I place *C. brevistylum* in this contribution close to *C. brachyandrum.*

47. C. VENOSUM, R. Br., Prodr. 1:297; Baker, Amaryll. 1888, p. 83.
48. C. UNIFLORUM, Muell. Fragm. 3:23; Baker, Amaryll. 1888, p. 83.
49. C. ANGUSTIFOLIUM, R. Br., Prod. 1:297; Baker, Amaryll. 1888, p. 83-84; *C. australascium,* Herb., var *angustifolium,* R. Br.
50. C. BRISBANICUM Bailey Contrib. to Queensland Flora in Queensland Agric. Journ. 4:47-48, 1899.

Description.—Bulbs to 4 cm. in diameter, without a neck; leaves 5 to 6, deep green, 50 cm. long, and about 1.25 cm. wide, linear, the margins somewhat rough;

scape to 40 cm. long, flat, cylindrical, hardly 1.25 cm. in thickness at the base; flowers about 10 per umbel, erect; bracts 2, 5 to 7 cm. long, inner-ones or bracteoles thread-like; pedicels 1.2 to 1.5 cm. long; ovary 6 mm. long; perianth tube slender, 7 cm. long; segments white with greenish tips, lanceolate, 5.5 cm. long and 1.25 cm. wide; stamens to about half the length of the segments, the ones situated opposite the outer segments are shorter than the others; filaments deep pink; anthers 6 cm. long; slightly longer style has the same color as the filaments; flower-buds drooping, pink on the outside.

Notes.—This species has been reported from sandy land near the coast, Brisbane River, Queensland. Judging from the description, it occurs that this species might be grouped under the subgenus of *Platyaster*.

51. C. PESTILENTIS, Bailey, Queensland Agric. Journal 2:198, 1898.

Description.—Bulb eggshaped to roundish, 7 to 10 cm. in diameter, growing about 25 cm. below the surface of the soil; leaves, linear, deep green, 60 cm. or more in length, of firm texture, with rough margins; flower-stalk, compressed, 30 to 45 cm. long; flowers, pure white, sometimes pinkish on outside; about 10 flowers per inflorescence; bracts of the involucre about 7 cm. long, and 2 cm. wide at base; narrowed to a point toward apex, in other cases almost linear with a broader end; pedicels 1.25 to 1.3 cm. in length; "ovaries beaked, about equal in length with the pedicels"; perianth tube 8 cm. long; segments 7 to 10 cm. long, 2.5 cm. wide in the middle, outer ones with subulate points; filaments white, not declinate, about half the length of the segments; anthers about 8.5 mm. in length; style, slender, almost as long as the segments; its upper half slightly green; stigma very small.

Notes.—This species was found along the Bulloo River, Queensland. Bailey states "I was led to give the above name to the present species from the fact that persons camping in places where it is flowering in quantities being apt to be seized with violent vomiting. I myself felt unwell from the odour of a single flower in a room." This species may be related to *C. angustifolium,* R. Br., var. *blandum,* Roem. However, it is apparently placed by Bentham in Flora Austral. under the name of *C. flaccidum,* Herb .

52. C. MODESTUM, Baker, Journ. Linn. Soc. 22:528; Baker, Amaryll. 1888, p. 84.

53. C. PURPURASCENS, Herb., Amaryll. 250 (1837); Baker Bot. Magaz. Plate 6525; Baker, Amaryll. 1888, p. 84.

54. C. NATANS, Baker, Thiselton-Dyer, Flora of Tropical Africa. 7:396, London 1898.

Description.—An aquatic species; bulbs small, narrow-ovoid, forming many long roots; leaves to 20, submersed, strap-shaped, membranous, waved, 90 cm. in length and 2.5 to 3.5 cm. wide at the middle; umbel, flowers and stamens resemble those of *C. purpurescens,* Herb. though they "are more strongly developed."

Notes.—This species has been reported from Upper-Guinea. Sierra Leone near Franziga, *Scott Elliott nr. 4732,* near Kurusa, *Scott Elliott nr. 5542.* Gold Coast, *Burton and Cameron.* Fernando Po in fresh water streams. *Mann nr. 1416.* Niger Delta found in running water. *Kirk.*

55. C. ROOZENIANUM, O'BRIEN, Gard. Chron. 9, III, Ser.:701, 1891.

Description.—The morphological description of this species is very wanting; no special data are given. The plant comes closer to *C. americanum, L.* than it does to *C. erubescens, Ait.* O'Brien considers it distinct enough to make it a separate species. Though its growth resembles somewhat *C. erubescens Ait.,* it is like *C. americanum L.* in the longer, more slender perianth tube, curved at the top. It is also stated that "it more nearly resembles *C. purpurascens, Herb.,* than any other species."

Notes.—*C. Roozenianum* came from Jamaica and was included in the collection of Ant. Roozen & Son, Overveen, Netherlands. It has been reported to have flowered in the collection of Sir Chas. W. Strickland, Bart, at Hildenley, Malton, Yorks.

56. C. SUBCERNUUM, Baker, Gard. Chron. 180 (1881); Baker, Amaryll. 1888, p. 84.

57. C. HILDEBRANDTII, Vatke, Monat. Kgl. Acad. Wiss. Berlin 863 (1876), Baker in Bot. Magaz. Plate 6709; Baker, Amaryll. 1888, p. 84.

58. C. FORGETTI, Wright, Bull. Misc. Inform. Kew. 283-284, 1925.

Description.—Leaves oblong-lanceolate, acute or short acuminate, amplexicaule at the base, 35 cm. long and nearly 7 cm. wide, margins minutely denticulate; scape lateral, sub-cylindric, about 30 cm. high and 1.2 cm. in diameter, five-flowered;

spathe deltoid, 8 cm. long; flowers sessile; perigone tube green, 20 cm. long, 5 mm. diameter; segments ligulate, acuminate, white, revolute about 8 cm. long, less than 1.2 cm. wide; filaments subulate, red, to 5 cm. in length; anthers oblong, 1.2 cm. long; ovary oblong, somewhat over 1.2 cm. long, greenish; style red, a little longer than the stamens; stigma roundish.

Notes.—Native to Peru; no definite locality is given. This species shows some affinity to *C. Hildebrandtii,* Vatke, on account of its long perigone tube but the leaves are shorter. This species has been described from a plant flowering in Kew Gardens which was received from the firm Sander & Sons.

59. C. CRASSICAULE, Baker, Amaryll. 1888, p. 85.

60. C. HARMSII, Baker, Warb. Kunene Sambesi Expedition, p. 565, 1903.

Description.—Bulb unknown; leaves 2 poll wide; distinctly denticulate and ciliate; peduncle 6 to 7 lin in diameter; 3 flowers to the umbel; pedicels short; spathe-valves lanceolate, 4 to 5 poll long; ovary cylindrical; perianth tube erect, red, 4 poll long; segments of the limb oblong-lanceolate, 6 to 7 lin wide, attenuate at the apex and base; anthers yellow, 4 lin long.

Notes.—Reported from Kuebe, Matangue, Sambesi at an elevation of 1250 meters. Her. nr. 330, 1899.

61. C. ERUBENSCENS, Ait., Hort. Kew. 1:413; Red. Lil Plate 27. Jacq. Hort. Schoen. Plate 494; Lodd. Bot. Cab. Plate 31, Gawl. in Bot. Magaz. Plate 1232, Baker, Amaryll. 1888, p. 85.

62. C. AMERICANUM, Linn., Spec. Plant. 1; 419 (1753); Gawl. in Bot. Magaz. Plate 1034; Baker, Amaryll. 1888, p. 85-86.

Notes.—Occurs in marshes, swamps and banks of rivers in the southern part of the United States from the Coastal Plain, Florida to Texas.

63. C. OLIGANTHUM, Urban, Sertum Antillarum IV in Rep. Spec. Nov. Reg. Veg. Fasc. 15:100, 1919; *C. erubescens* Griseb. Cat. Cub. 250, 1866 (non Soland); *C. americanum* Ch. Wright in Anal. Acad. Cienc. Habana 8:52, 1871. Sauv. Flore Cub. 166 nr. 2496 (non L.)

Description.—Bulb cylindric to 5 cm. long, and 2 cm. thick; leaves 3 to 4, linear, 30 to 35 cm. long, 1.2 to 2.5 cm. wide, erect, margins minutely denticulate; scape 20 to 25 cm. long, compressed, 4 to 6 mm. thick; bracts linear, apex obtuse, 3.5 to nearly 7 cm. long; umbel 1-2 flowered; pedicels absent or almost absent; perianth tube 8 to 12 cm. long; segments linear-lanceolate, acuminate at the apex, 5 to 6 cm. long and 8 to 10 mm. wide; stamens somewhat shorter than the perianth segments; anthers linear, 9 mm. long; stigma minutely lobed; ovary 1.20 to 1.50 cm. long.

Notes.—Native to Cuba. Wright nr. 3244 in the province of Habana prope Batábano.

64. C. PALUSTRE, Urban, Sertum Antillarum IV. in Rep. Spec. Nov. Rep. Veg. Fasc. 15:101, 1919.

Description.—Bulbs and leaves unknown; scape compressed, 7 mm. thick; bracts lanceolate with an obtuse apex, about 7 cm. long and 2 cm. wide; about 6 flowers per inflorescence; pedicels wanting; perianth tube 15 to nearly 20 cm. long, erect and arcuate; segments of the limb lanceolate to linear-lanceolate, acuminate toward the apex, 7 to 8 cm. long and 8 to 12 mm. wide; stamens shorter than the segments; anthers linear, 15 mm. long; style shorter than the corolla; stigma small; ovary oblong-lanceolate, about 3 cm. long.

Notes.—Native to Haiti, near Port-au-Prince where it grows in marshes. Jaeger nr. 149.

65. C. COMMELYNI, Jacq., Hort. Schoen. Plate 202; Baker, Amaryll. 1888, p. 86; *C. Commelinianum,* Herb., Amaryllidac. 254 (1837); *C. attenuatum,* Willd.; *C. Lindleyanum,* Herb., Amaryllidac. 252 (1837); *C. revolutum,* Lindl.; *C. viridifolium* Roemer.

Notes.—Native to Guiana and the Amazone River; closely related to *C. erubescens.* The plant was named in honor the Johan Commelin, Councelor of the City of Amsterdam who published the beautiful illustrated folio Horti Medici Amstelodamensis Rariorum. Beschrijfinge en Curieuse Afbeeldinge van rare vreemde Oost—West Indische en andere Gewassen. Amsterdam 1697 and 1701. The name *C. Commelyni* given by Jacquin, and being the first, is maintained.

66. C. STRICTUM, Herb., Bot. Magaz. Plate 2635; Baker, Amaryll. 1888, p. 86; C. Herbertianum, Roem. et Schultes.

67. C. UNDULATUM, Hook., Exot. Flora. Plate 200; Baker, Amaryll. 1888, p. 86.
68. C. KUNTHIANUM, Roem., Amaryll. 80; Baker, Amaryll. 1888, p. 86; *C. erubescens*, H. B. K., non Ait.
69. C. CONCINNUM, Mart., Roem. et Schultes, Syst. Veg. 7:857; Baker, Amaryll. 1888, p. 87.
70. C. ARGENTINUM, Pax, Engler Bot. Jahrb. 11:325-326, 1890.

Description.—This species is known from its flowers only; outer bracts of the spathe membranaceous, the inner filiform; perigone tube erect, broad, cylindric, segments obovate-oblong, white; filaments erect, little shorter than the segments, anthers versatile; style filiform as long as the perigone; stigma trifid.

Notes.—Native to Argentina: San Javier; Sierra de Tucuman (11.80 leg. F. Schultz). This species is of interest from a geographical standpoint on account of the extreme distribution toward the southernmost part of South America. It's known from an andine, extra tropical region in contrast to all other species of the subgenus Platyaster which are native to the tropics or subtropics. *C. argentinum*, Pax, is characterized by its three-parted stigma, which gives it an isolated place among the species of this genus.

71. C. GRACILIFLORUM, Kunth et Bouche, Ind. Sem. Hort. Berol. 1844; Baker, Amaryll. 1888, p. 87.

Subgenus 3. CODONOCRINUM

72. C. ZEYLANICUM, Linn., Syst. Veg. 263; Baker, Amaryll. 1888, p. 87; *Amaryllis zeylanica*, Linn., Spec. Plant. 1:421 (1753). *A. ornata* Bot. Magaz. plate 1171. *C. Herbertianum* Wall. Pl. Asiat. Rar. Plate 145. *C. Wallichianum* Roem. *C. ornatum* var. *zeylanicum* and var. Herbertianum.
73. C. LATIFOLIUM, Linn., Spec. Plant. 1:419 (1753). Lindl. in Bot. Reg. Plate 1297; Wight Ic. Plate 2019-2020; Baker, Amaryll. 1888, p. 87-88; *C. ornatum* var. *latifolium*, Herb Amaryllidac. 263 (1837).
74. C. JOHNSTONI, Baker, Bot. Magaz. 128 : Plate 7812, 1902.

Description.—Bulbs globose, 7 to 10 cm. in thickness; without a distinct neck; leaves about 20, bright green, 1.2 to 1.5 meter in length, and 5 to 6 cm. wide, outer ones are ensiform, inner ones linear; flower-stalks relatively stout, 60 cm. in length; many flowers per inflorescence; pedicels about 2.5 cm. in length; spathe-valves two, lanceolate, deltoid, 5 to 7.5 cm. in length; perianth-tube slightly curved, tinged with green, 10 cm. long; limb shorter than the tube; segments acute, ovate to oblong, slightly colored pink on the outside; stamens declinate, almost as long as the limb; anthers linear, 80 mm. long; style overtops the anthers.

Notes.—This species has been reported from British Central Africa; bulbs of *C. Johnstoni* were sent in 1899 from Mount Zoma (40 miles from Blantyre, British Central Africa) by Mr. McClonnie to the Royal Botanical Gardens at Kew. This species stands between *C. latifolium*, L. and *C. longifolium*, Thunb. It resembles the former species in the flowers and the latter in relation to its long narrow leaves which gradually end in a point. It should also be noted that the leaves of *C. Johnstoni* are bright green whereas those of *C. longifolium* are described as glaucous. The plant has been named in honor of the late Sir Henry Hamilton Johnson, K. C. B., Administrator of the Uganda Protectorate.

75. C. BRACHYNEMA, Herb., Bot. Reg. Plate 1842, Misc. No. 28; Hook fils in Bot. Magaz. Plate 5937. Flore des Serres Plate 2303; Baker, Amaryll. 1888, p. 88.
76. C. FLACCIDUM, Herb., Bot. Magaz. Plate 2133; Baker, Amaryll. 1888, p. 88; *Amaryllis australasica*, Ker. in Bot. Reg. Plate 426.
77. C. PAUCIFLORUM, Baker, Journ. Bot. 195 (1878); Baker, Amaryll. 1888, pp. 88-89.
78. C. PARVUM. Baker, Kew Bull. 284, 1897, ex affinitate *C. pauciflorum*, Baker.

Description.—Bulb egg-shaped, small; leaves 5 to 7; linear and glabrous, 6 to 9 poll long, and in the middle 6 to 7 lin wide; scape slender, one-flowered and almost as long as the leaves; spathe-valves lanceolate; perianth sessile; tube cylindrical, erect, 3 poll long; segments laciniate, red striped, 3 poll long and 6 lin wide; anthers 3 to 4 lin long.

Notes.—Native to Tropical Africa, known from along the banks of the Zambesi River. One of the first specimens flowered in the collection of W. E. Gumbleston, Queenstown, Ireland in May 1896.

79. C. SAMUELI, Worsley, Gard. Chron. 32. 304, 1902.

Description.—Bulbs and leaves have not been described in detail; Worsley states that *C. Samueli* resembles *C. Wimbushi;* flowers sessile, 11 cm. across; umbel 2-flowered; perianth tube erect until full anthesis when it inclines slightly due to its weight; stamens spreading; anthers gray; style not as ascending as in *C. Wimbishi* to which this species is related.

Notes.—According to Worsley this species is native to Central Africa although there exists some doubt as to the exact locality.

80. C. WIMBUSHI, Worsley, Gard. Chron. 32: 303-304, 1902.

Description.—Bulbs round, 7.5 cm. in diameter, and 6.5 cm. in length; neck distinct, but short; tunics loose and brittle; leaves from 11 to 12, deeply channeled, spreading, edge entire, apex long, finely pointed; leaves 1.2 meter in length and 6.3 cm. in width; scape erect, 4 to 5 cm. in height, bearing two to six flowers; flowers sub-erect and sub-campanulate, white shaded with pink, fragrant; pedicels hardly 1.2 cm. in length; perianth tube 7.5 to 9 cm. long, somewhat curved; inner segments 2.5 cm. in width, the outer less than 2 cm. wide; limb cone-shaped, with narrow apex; filaments somewhat shorter than segments; upper half of filaments pink; style ascending and larger than the stamens; stigma capitate, not distinctly lobed.

Notes.—Native to Kota-Kota by Lake Nyassa, Central Africa where this species was first collected by the Rev. John Wimbush. The first plants flowered in 1898 in the collection of Mr. Worsley, Isleworth, England. It is regarded that this species is related to *C. pauciflorum,* Baker, from which it differs in the leaves and the number of flowers. The perianth tube is shorter. The flowers resemble those of *C. longiflorum,* Thumb.

81. C. CAREYANUM, Herb., Bot. Magaz. Plate 2466; Baker, Amaryll. 1888. p. 89.

82. C. ABYSSINICUM, Hochst., Schimp. Pl. Abyss. no. 1374; Baker, Amaryll. 1888, p. 89.

83. C. YEMENSE, Deflers, Voyage en Yemen, Journal d'une Excursion Botanique faite en 1887. 209 Paris 1889.

Notes.—There is apparently no description of this species. It is indigenous around Mount Schibam (Haraz) and Mount Kahil at an elevation of 23 to 2400 meter. (Exs. nr. 335). This species is related to *C. abyssinicum,* Hochst., hb. Schimp. Abyss. sec. II, nr. 1374, from which it mainly differs by its umbel, (more than 10-20 flowered) and by the very amplified dimensions of the perianth which attains a length of 20 to 22 cm.

84. C. SCHIMPERI, Schumann, Gartenflora. 38:561, plate 1309, 1889.

Description.—Bulb depressed globose, covered by yellow-grayish scales, 5 to 6 cm. in diameter, neck distinct; leaves 6 to 7, lorate, erect, arcuate, bluish-green, 40 to 50 cm. in length and 2.5 to 3 cm. wide; scape 15 to 20 cm. in length, and 2.5 to 3 cm. in thickness; spathe valves fleshy-red, 3.5 cm. in length; ovary 0.8 to 2 cm. in length and 8 mm. in diameter, distinctly sessile; perigone-tube white 8.5 to 11 cm. long; segments 6 to 7 cm. long and 1.8 cm. wide; stamens 3.5 to 5 cm. in length; anthers black, moon-shaped nearly 1.2 cm.; style 15 cm. long.

Notes.—This species is, according to Shumann, probably related to *C. abyssinicum,* Hochst., from which it differs by its blue-green and longer leaves, the non-green bracts of the spathe, the considerable length of the perigone-tube, and the relatively long filaments.

85. C. DISTICHUM, Herb., Amaryllidac. 260 (1837); Baker, Amaryll. 1888, p. 89; *Amaryllis ornata,* Gawl., in Bot. Magaz. 1253.

86. C. YUCCAEFLORUM, Salisb., Parad. Plate 52; Baker, Amaryll. 1888, pp. 89-90; *C. yuccaeoides,* Herb., var. of *C. Broussonettianum,* in Herb. Amaryllidac. 260 (1837). Lodd. Bot. Cab. Plate 668; Bury Hexand. Plate 21; *Amaryllis Broussonetii,* Red. Lil., Plate 62. *A. spectabilis,* Sndr., Bot. Rep. Plate 390. *A. ornata,* Ait.

87. C. MAJAKALLENSE, Baker, Thiselton-Dyer, Flora of Tropical Africa. 7:399. London 1898.

Description.—Bulb unknown; leaves linear, firm, 2 cm. in width; margins denticulate; scape relatively slender; three flowers per umbel; pedicels very short; spathe-valves oblong, acute, 7.5 cm. in length; perianth tube curved, 10 cm. in length; segments oblong, acute, connivent, 7.5 cm. in length, bright red with a broad band on the back; stamens considerably shorter than the perianth segments.

Notes.—Native to Lower-Guinea where it has been reported from Majakalla near the Kuango River. *Mechow nr.* 520. Baker states that this species is apparently related to *C. yuccaeflorum.* Salisb.

88. C. SANDERIANUM, Baker, Gard. Chron. 22:102; Florist and Pomol. 157 (1784); Baker, Amaryll. 1888, p. 90; *C. ornatum,* Bury Hexand. Plate 18. *C. Broussonetianum* var. *pluriflorum,* Herb. Amaryllidac. 260 (1837).

89. C. SCABRUM, Herb., Bot. Magaz. Plate 2180. Bury Hexand. Plate 32; Baker, Amaryll. 1888, p. 90; *C.* scaberrimum, Herb.

90. C. PEDICELLATUM, Pax, Amaryllidaceae africanae. Engler Bot. Jahrb. 15:142, 1893.

Description.—Bulbs and leaves unknown; scape robust bearing about 9 flowers; pedicels 5 cm. in length; spathe of original specimen was dried and partly dropped off, about 6 cm. long, the base 2 cm. wide, acute; perigone curved, funnel-shaped, perigone-tube 10 cm. long; segments 8 to 9 cm. long, 2 cm. wide; anthers curved, about 0.6 to 1.2 cm. long; ovary a little over 1.2 cm. in length, and 0.6 cm. thick; style about 10 cm. long.

Notes.—Native to East Africa; Victoria Nyansa; between Maga and Kagehi. Fischer nr. 592. This species is related to *crinum scabrum,* Herb., which is widely distributed in Africa; it differs from it by its pedicellate flowers.

91. C. BOEHMII, Baker, Schinz, Beitrage zur Kenntnis der Afrikansiche Flora. Bull. Herb. Boiss. 3 II Ser. :666, 1903.

Description.—Bulbs unknown; leaves lanceolate, 60 to 90 cm. in length and 2 poll wide, the apex becoming gradually attenuate, closely veined, the margins denticulate; scape lin. in diameter; umbel sessile, 6-flowered; spathe-valves ovate-lanceolate, ascending, 4 poll long; perianth tube adnate, 4 to 5 poll. long; segments of the limb oblong lanceolate, 4½ poll. long and 9 to 10 lin. wide, white, reddish on the back; stamens declinate.

Notes.—Reported from East Africa: Wala River in meadows. R. Böhm 124. This species shows affinity with *C. scabrum,* Herb.

92. C. FIMBRIATULUM, Baker, Journ. Bot. 196 (1878); Baker, Amaryll. 1888, P. 90.

93. C. CRASSIPES, Baker, Gard. Chron. 126; (1887); Baker, Amaryll. 1888, pp. 90-91.

94. C. VASSEI, Boiss., Bull. Mus. d'Hist. Nat. Paris. 13:444-445. 1907.

Description.—Bulb ovoid, about 10 cm. in diameter, without a distinct neck, bulb scales bright brown; leaves about 12, those toward center of the leaf-rosette are much narrower, the outer ones are 50 to 60 cm. long and 5 cm. wide at the base, becoming gradually pointed toward the apex, light green, margins rough; scape originates laterally, reaching a length of 60 cm., considerably flattened, green, tinted with brown, glaucous; spathe not described; flowers slightly scented, 16 to the umbel, opening successively starting from the outside; perianth funnel-shaped, tube slightly curved, 10 to 12 cm. long, pink; segments linear-lanceolate, three outer narrow; All parts of perianth somewhat recurved at the tip; stamens and pistal curved toward one direction; filaments white with pink, a little shorter than the perianth; anthers linear, yellowish-brown, 5 mm. in length; style bright-red, reaching nearly the same length as the perianth segments; stigma capitate; ovary green.

Notes.—This species is native to Tropical Africa, especially Mozambique. Bois placed the plant between *C. crasipes,* Baker and *C. pedicellatum,* Pax. It differs from the first by its smaller leaves, shorter pedicels and curved perianth which is pink instead of greenish. It differs from *C. pedicellatum* by its more numerous flowers per umbel, and much shorter pedicels. The Musée d'Histoire Naturelle in Paris received in 1905 from Mr. Vasse from Portuguese East Africa.

95. C. KIRKII, Baker, Bot. Magaz. Plate 6512; Baker, Amaryll. 1888, p. 91.

96. C. STAPFIANUM, Kränzel, Bull. Misc. Inform. Kew. 191-192, 1913.

Description.—Bulbs globose, about 7.5 cm. in diameter, neck 5 to 6 cm. long, and 2.5 to 3 cm. thick; leaves have not been fully described; scape 20 to 30 cm. long, two-flowered; differs from most other species by its long-flower-stalk, 5.5 cm. in length; perigone white, nearly 12 cm. long, funnel-shaped, 3 to 5 cm. in diameter; tube relatively short; perigone segments divided a little above the lower third, gradually forming a relatively narrow funnel; stamens 3.5 to 5 cm. long; ovary short, ellipsoid or elongate-oboyate 1.2 to 2 cm. long.

Notes.—This species is known from Brazil, mainly from Goyaz (Glaziou nr. 22, 204). Kränzel states that this species resembles at first sight *C. americanum,* L.

and *C. erubescens,* Ait. It also shows some resemblance to *C. podophyllum,* Baker, especially in the two-flowered scape.

97. C. PODOPHYLLUM, Baker, Bot. Magaz. Plate 6483; Baker, Amaryll. 1888, p. 91.

98. C. RATTRAYII, Hort., Gard. Chron. 38:11 with Supplem. illustr., 1905.

Description.—There is no complete morphological description of this species, although the illustration is very clear and excellent. The flowers are pure white and fragrant. The leaves are ascending, dark green. "Botanically it appears to be the most crenate of the *C. giganteum* section."

Notes.—For this plant Sir Trevor Lawrence Bart received a First Class Certificate at the Royal Horticultural Society in 1905. The plant was introduced by Major Rattray who sent the first bulbs from his garden at Eutelobe. It is stated that the plant is indigenous in the Victoria Nyanza district. "Later Major Rattray sent to the neighbourhood of Lake Albert, where it is said to be indigenous, and secured the bulbs which are now in cultivation." It has been claimed by the natives that when Mtera was King of Uganda, this species was dedicated to his use and to the highest chiefs of the country, and penalties were imposed on others who were found to possess this plant.

99. C. GIGANTEUM, Andr., Bot. Rep. Plate 169, Red. Lil. Plate 181; Bury Hexand. Plate 17; Baker, Amaryll. 1888, pp. 91-92; *C. petiolatum* var. *spectabile,* Herb. Amaryllidac. 260 (1837); *C. vanillodorum* Welw.; Baker in Journ. Bot. 196 (1878); Illustr. Hort. n. s. t. 617. *Amaryllis gigantea,* Ait. *A. latifolia,* Lam., *A. ornata,* Gawl. in Bot. Magaz. Plate 923. *A. candida,* Tratt. Tabb. Plate 488.

100. C. BEQUAERTI, De Willd., Plantae Bequartinae. Etudes sur les recoltes botanique du Dr. J. Bequart chargé de missions du Congo Belge. (1913-1915) 46-47, 1921.

Description.—Bulb unknown; leaves ensiforme, reaching a length of over 110 cm., and a width of 3 to 5 cm., the margins denticulate-ciliate; Peduncle thick, compressed, about 35 cm. long and 10 to 15 mm. thick; 5 to 6 flowers per umbel, white; spathe-valves oval, pointed, reaching a length of 10 cm. and a width of 5 cm. toward the base; perianth tube including the ovary, 18 to 22 cm. in length, slightly curved toward the top; segments oblong, 10 to 11.5 cm. and 4 to 5 cm., apiculate; filaments curved toward the center of the flower, about 10 cm. long; anthers 20 mm. long and 2 mm. wide; style as long as the stamens.

Notes.—This species is native to the Belgian Congo. The type specimen was taken near Malisawa (Lesse) on March 9th., 1914 by J. Bequart, nr. 3003. It may be related to *C. giganteum.*

101. C. CONGOLENSE, De Willd., Mission Emile Laurent (1903-1904); Etat Independant Congo. 1:370-371, Plates CIX, CX, CXI, 1905-1907.

Description.—Bulb thick, subglobose, 9 cm. in diameter, leaves about 17, 75 cm. long, 6.5 cm wide, acute, deep green, gradually becoming narrow at the base, petiole somewhat gutter-shaped; scape robust; umbel 5 to 6 flowered; spathe valves oval, pointed; perianth tube stretched, longer than the free lobes, reaching a length of more than 10 cm., 5 cm. wide at base; flowers beautiful white; stamens as long as the style, much shorter than the perianth; anthers half-moon shaped, pollen yellow.

Notes.—Native to the Congo (Em. and M. Laurent), exact locality is not known. This species was found between a number of bulbs of *C. giganteum* and *C. Laurentii* to which it shows relationship.

102. C. SUAVEOLENS, A. Chevalier, Novitates Flor. Africanae, Mem. Soc. Bot. France. 2:212-213, 1911 (1912).

Description.—Bulbs thick; leaves many, wide spreading to erect, often undulate; scape 50 to 70 cm. high, bearing at the top 2 to 5 sessile flowers, strongly scented; bractioles lanceolate, obtuse, green, nearly 7.5 cm. long, 2 cm. at the base; perianth tube greenish, 15 to nearly 18 cm. long, erect rather cernious, lobes white, ovate-oblong, attenuate on both sides, obtuse, suddenly apiculate, 8 to 10 cm. long, 3 to 5 cm. wide; anthers sickle shaped, 2 to 2.5 cm. in length.

Notes.—Common in open parts of virgin forests of the Ivory Coast, between Bingerville and Akandie nr. 20074 (type), and other places. This species is apparently related to *C. congolense,* De Willd, but may be a variety of *C. giganteum,* Andr. This species was first introduced to Horticulture by Mr. Joly.

103. C. STENOPHYLLUM, Baker, Warb. Kunene Sambesi Expedition 566, 1903.

Description.—Bulb ovoid, 1 poll in diameter, neck elongated; leaves 4 to 5, erect, linear, flaccid, 1 to 2 lin wide; margins smooth; peduncles 2 lin in diameter;

umbel two-flowered, sessile; spathe-valves lanceolate, 2 poll in length; perianth white; tube somewhat curved, 4 poll in length; segments of the limb oblong, 9 to 10 lin wide; base attentuate; stamens declinate; anthers linear, yellow, 4 lin long.

Notes.—Collected in Kubango at an elevation of 1100 meter. Hèr. nr. 406, 1899.

104. C. POLYPHYLLUM, Baker. Schinz, Beitrage zur Kenntnis der Afrikanische Flora Bull. Herb. Boiss. 3 II Ser. :667, 1903.

Description.—Bulb unknown; leaves 15 to 20, erect, linear, 8 to 10 poll. in length, 3 lin. wide, flaccid, glabrous; umbel 6-flowered, pedicels short; spathe-valves ovate, acuminate, 2 poll long; perianth tube suberect, 3 poll long; segments of the limb oblanceolate to oblong, tube 5 to 6 lin. wide, white back shaded with red; stamens declinate; anthers 3 lin long.

Notes.—Native to Southwest Africa; Hereroland, east of Windhoek (Seidlungsfarm) Dinter 826.

105. C. LINEARE, Linn. fil., Suppl. 195; Baker, Amaryll. 1888, p. 92; *C. revolutum* Herb. Amaryllidac. 267 (1837), *Amaryllis revoluta,* L'Herit.; Gawl. Bot. Magaz. Plate 915. *A. revoluta* var. *gracilior* Bot. Magaz. Plate 623. *Crinum algoense,* Herb.

106. C. VARIABILE, Herb., Amaryllidac, 268, Plate 44 fig. 23 (1837); Baker, Amaryll. 1888, p. 92; *Amaryllis variabilis,* Jacq. Hort. Schoen. 4:14 Plate 429. *A. recoluta* var. *robustior* Gawl. in Bot. Reg. Plate 615, *Crinum variabile* var. *roseum* Herb. in Bot. Reg. Plate 9. *C. crassifolium,* Herb. see Amaryllidac. 268 (1837).

107. C. CAMPANULATUM, Herb., Bot. Magaz. sub. Plate 2121: Baker, Amaryll. 1888, p. 92; *C. aquationum* Burchell; Bot. Magaz. Plate 2352. *C. caffrum,* Herb. Amaryllidac. 272 (1837), *Haemanthus hydrophilus,* Thunb.

108. C. IMBRICATUM, Baker, Gard. Chron. 784 (1881); Baker, Amaryll. 1888, pp. 92-93.

109. C. MOOREI, Hook fils., Bot. Magaz. Plate 6110; Garden. Chron. fig. 101, (1887); Baker, Amaryll. 1888, p. 93; *C. Makoyanum,* Carriere in Rev. Hort. 417 (1877), *C. Colensoi, C. Mackenii* and *C. natalense,* Hort.

110. C. FORBESIANUM, Herb., Amaryllidac. 267 (1837); Baker in Bot. Magaz. Plate 6545; Baker, Amaryll. 1888, p. 93; *Amaryllis Forbesii,* Lindl.

Notes.—Schinz in Bull. Herb: Boiss. IV App. III, 47, 1896 states that a drawing of this species by his friend Dr. Fleck and an incomplete specimen agree with the description of Baker and the illustration of the plant in Bot. Magaz. Plate 6545. The leaves in the Dr. Fleck drawings are somewhat toothed, whereas according to the description of Baker they are conspiciously ciliated.

111. C. BULBISPERMUM, (Burm.), Milne-Redhead & Schweickerdt, Jour. Linn. Soc. Bot. LII:159-162. 1939; *Amaryllis bulbisperma.* Burm. Prodr. Cap. p. 9, 1768; *Crinum capense* var. *riparia,* Herb. Bot. Mag. t. 2688. 1826; Baker, Amaryll. 1888, p. 93-94.

Notes.—This is the species that is listed as *Crinum longifolium,* Thun. Prodr. 39, in Baker's Amaryllideae, 1888, on pages 93-94. See the reference to Milne-Redhead & Schweickerdt cited above for full explanation.

112. C. MACOWANI, Baker, Gard. Chron. 298 (1878); Bot. Magaz. Plate 6381; Baker, Amaryl. 1888, p. 94.

113. C. SUBMERSUM, Herb., Bot. Magaz. Plate 2463; Baker, Amaryll. 1888, p. 94.

114. C. LONGIFLORUM, Herb., Amaryllidac. 271 (1837); Baker, Amaryll. 1888, p. 94; *Amaryllis longifolia* var. *longiflora,* Ker. in Bot. Reg. plate 303.

115. C. VIRGINEUM, Mart., Roem. et Schultes. Syst. Veg. 7:855; Baker, Amaryll. 1888, pp. 94-95; *C. petiolatum* var. *virgineum,* Herb. Amaryllidac. 261 (1837).

UNCLASSIFIED.

116. C. ESQUIROLI, Lévl., Mem. Pontifica Acad. Romana dei Nuovi Lincei 24:343, 1906.

Description.—Bulb unknown; stem 45 to nearly 90 cm. in length; leaves narrow, 12 mm. wide; 7 to 12 flowers per inflorescense; ovary sessile; tube 10 cm. long, limb about 7.5 cm. long; perianth segments lanceolate, 1.2 cm. wide, acuminate; stamens inclus; style slender, 10 to 12 cm. long; stigma minute.

Notes.—Reported from Kouy-Tcheou, China (18 June, 1904 no. 134 Jos. Esquirol) *C. Esquiroli* is a peculiar species, having sessile ovaries, inclus stamens and narrow leaves. According to the collector Mr. Jos. Esquirol this plant is used by the natives as a remedy in case of sprains.

117. C. ACAULE, Baker. Thiselton-Dyer Flora. Capensis. 6:532, 1896-97.

Description.—Bulb unknown; leaves linear, 45 cm. long and 1.2 cm. wide, more or less firm, glossy; stem one-flowered; spathe-valves linear, green; perianth-tube cylindrical erect, 5 cm. long; segments lanceolate, erect and recurved at the end, double the length of the tube, 1.2 to 2 cm. wide at the middle, keeled with pale red; stamens half the length of the segments; anthers linear-oblong, reaching a length of 0.6 to 8.5 cm.; style as long as the perianth.

Notes.—Native to Zululand; Sambaans Territory. Collected in 1896 by Charles Saunders. This species was cultivated in the collector's garden and a drawing of the plant was sent by Mrs. Saunders to the Royal Botanical Garden at Kew.

118. C. VOYRONI, Jumelle, Revue Horticole 19:205, 1924.

Description.—Bulbs 10 to 12 cm. in diameter; somewhat spherical, though elongated toward neck; neck about 4 cm. long; leaves about 12, somewhat coreaceous, exterior ones 50 cm. long; scape flattened, about 40 cm. long, 2 cm. thick; inflorescence 20 flowered; flowers with agreeable odor, almost sessile; perianth tube greenish, about 20 cm. long, 4 mm. in diameter; perianth lobes white, somewhat reflected during anthesis, about 9 cm. long; stamens slightly shorter than perianth lobes, 6 cm. long, bearing yellow anthers; style red, 8 cm. long.

Notes.—Native to Madagascar; flowered in the Jardin Botanique of Marseille, from bulbs sent by Mr. Voyron.

119. C. RAUTANENIANUM, Schinz, Th. Durand et Hans Schinz, Conspectus Florae Africanae. Vol. V : 250, 1895.

Notes.—No description has apparently been given of this plant. Schinz records "Afr. autro-occ. : pays des Orambo, Shinz 822." This species is apparently related to *C. Lugardal,* N. E. Brown, from which it differs by its larger flowers and bulbs.

120. C. LUGARDAE, N. E. Brown, Gard. Chron. 34:49, 1903.

Description.—Bulbs ovoid, 4 to 5 cm. in diameter, neck well developed, about 5 to 7 cm. long; leaves linear, deep green, 45 to 75 cm. long 1.2 to 1.8 cm. wide, acute and concave, finely scabrous along the margins, not glacuous; scape erect, 10 to 30 cm. long, somewhat compressed, carrying two to six flowers; valve-bracts 3 to 7 cm. long, outer one 1.2 to 1.8 cm. long, oblong-lanceolate, acute, margins rolled inward; inner bract linear, to linear-filiform; pedicels almost wanting to about 1.2 cm. in length; ovary ellipsoid, 0.8 to 1.2 cm. in length; perianth tube slender, cylindric, 8 to 10 cm. long, and after Brown, "curved gradually, [or according to the drawing, curved abruptly] passing into the funnel-shaped limb, green"; segments lanceolate, 7 to 9 cm. long, 15 to 25 cm. wide, relovate at the apex, white with a light pink median stripe, point green.

Notes.—Native to the Kwebe Hills near Lake Ngami located in the dry interior part of South Africa. This *Crinum* is characterized by its small bulbs, whereas the leaves are conspicuously long and narrow. Mrs. E. J. Lugard discovered this species, and sent a bulb to the Royal Botanic Gardens, Kew. N. E. Brown based his description in part on a colored drawing of this species made by T. Bames at Koobies which is also in the neighbourhood of Lake Ngami. This species is apparently related to *C. Rautananianum,* Schinz., from which it differs by its smaller flowers and bulbs.

121. C. CRISPUM, Phillips, Flowering Plants of South Africa. 14 : Plate 532, 1934.

Description—Bulbs 5 to 6 cm. in diameter, Neck 5 to nearly 15 cm. long; leaves about 20, 8 to almost 22 cm. long, 4 to 5.5 cm. wide, linear, glabrous, margins undulate; scape 5.5 to 8 cm. long, 05 to 1.2 cm. thick, compressed; spathe valves ovate, acuminate to 6 cm. long; umbel 5 to 6 flowered, perianth tube 8 to 9 cm. long, cylindrical; segments 5 cm. long, sub-acuminate; Color of the flowers almost pure white to pink toward back of segments; ovary ellipsoid, becoming somewhat globose when older; filaments filiform, anthers curved; stigma obscurely trilobed.

Notes.—Native to Transvaal, Waterberg Distr., farm "Groote Vlei" near Naboomspruit, where it grows on low, brackish situations. Galpin nr. 11678. Pretoria Distr. Zee Kolgat, near Piernaar's River. Vogts in Nat. Herb. nr. 14509, farm "Roodeplaat", near Piernaar's River. Letty in Nat. Herb. nr. 15877 (type specimen). The plant is said to be abundant in above mentioned places. The species was first collected by E. E. Galpin in 1931, and was collected the following year near Pretoria by L. R. Vogts.

122. C. GIGAS, Nakai, Plantae Japonicae et Koreanae. Botanical Magazine (Tokyo) 44:515-516, 1930.

Description.—Bulb round, 15 to 30 cm. in length, neck 100 to 150 cm. high and 10 to 30 cm. wide; leaves falcate, bright green, 20 to 30 cm. wide, 150 to 200 cm. long, acute, margins undulate; scape 100 to 150 cm. long, robust, compressed, 2 to 3.5 cm. thick; bracts elongated, boat-shaped, greenish 10 to 12 cm. long, 4 to 5 cm. wide; bractioles 5 to 6.5 cm. long, 2 to 4 cm. wide; flowers sweet-scented, 30 to 40 per inflorescence; peduncle erect, 2.5 to 3 cm. long; ovary about 1.2 cm long, bright green; perigone white, tube about 8 to 9 cm. in length; limbs subulate, 6 to 10 cm. long; stamens erect; style reddish-purple, shorter than the stamens.

Notes.—Native to the forest of Koromodate near Kitamura on the islands of Hahajima and Mukozima.

123. C. ELEONORAE, Blaetter et McCann, Journ. Bombay Nat. Hist. Soc. 32: 733-734, 1928.

Description—Bulb ovoid to almost spherical, 15 by 13 cm.; neck narrow and stout, 8 cm. long, surrounded by old pale leaf-remnants; leaves appear after flowering; leaves ensiform, apex obtuse, 60 cm. long, 5 cm. wide, not very firm, relatively thin, glabrous, deep green, margins entire; scape appears laterally, 50 cm. long, 2.5 cm. in diameter, cylindric, somewhat compressed, green tinged here and there with purple; flowers nodding, strongly scented, white; about 20 flowers per inflorescence; spathe-valves broadly lanceolate, acute or obtuse 8 cm. long and 3 cm. wide, green, with some purple on outside; Bractioles linear, about 8 cm. long, of same color as spathe-valves; pedicels stout 0.6 to 1.2 cm. long, Perigone white, sometimes tinged with purple in center of back, funnel-shaped; tube 3 cm. long, cylindric toward base; segments to 7.5 cm. long, 2 cm. wide, lanceolate, those of inner cycle not seldom oblanceolate, reflexed, somewhat concave toward apex; filaments on the throat of perigone-tube, purple; style filiform, 5 cm. long, white below, red in upper part.

Notes.—This species has been reported from Lingmala near Mahableshwar, where it was found along the open-hills on both sides of the river above Yenna Falls, also half-way between Panchgami and Mahableshwar (McCann nrs. 7, 8, 9, 10 type).

124. C. GLAUCUM, A. Chevalier, Mem. Soc. Bot. Frabee. 2:212, 1911 (1912).

Description.—Bulbs 20 cm. long, 15 cm. in diameter, ovoid; leaves 12 to 15, erect, margins undulate, 90 to 100 cm. in length, and 10 to 12 cm. wide, lanceolate to linear, narrow caniculate in the upper part, glaucous; scape firm, compressed, 60 to 90 cm. long, 2.5 cm. wide, glaucous, erect; flowers 6 to 14 (usually 7 to 10) per umbel, with vanilla-like scent, white, sessile; Spathe 2 to 3 parted, ovate or lanceolate, obtuse imbricate, 10 to 12 cm. long; perianth tube green, somewhat curved at apex, 15 to 20 cm. long, 5 to 8 mm. in diameter; perianth lobes about 4 to 5 cm.; anthers curved, 20 to 25 mm. long; style almost as long as the stamens; fruits obovate, attenuate, about 12 to 15 cm. long.

Notes.—Reported from Lower-Dahomy, frequently in the region of Savé-Agouagon. Chevalier nr. 23581.

125. C. SCILLIFOLIUM, A. Chevalier, Mem. Soc. Bot. France. 2:211, 1911 (1912).

Description.—Plants stoloniferous; bulbs oblong, 10 cm. long; leaves many, linear, canaliculate, 50 cm. long, 12 to 15 cm. wide in the middle, margins not scabrous; scape compressed, 40 cm. high, 12 to 15 mm. thick, reddish green; flowers subsessile; umbel of three flowers; spathe-valves ovate, acuminate, 5 to 6 cm. long; perianth tube almost erect, subarcuate at top, greenish white, 15 to 17 cm. long; segments white, with reddish lines, 7 to almost 10 cm. long, nearly 4 cm. wide, ovate elliptic, acuminate; stamens shorter than the perianth; anthers arcuate, less than 1.2 cm. in length.

Notes.—Reported from the Ivory-Coast, along the banks of the Hana River near Fort Binger on periodically inundated lands. Aug. Chevalier nr. 19499. No relationship to other species is indicated.

126. C. TOXICARUM, A. Chevalier, Mem. Soc. Bot. France. 2:212, 1911 (1912).

Description.—Bulbs ovoid, 5 to 9 cm. in length; leaves 8 to 10, linear, firm, 40 to 60 cms. long, 3.5 to 4 cm. wide, subcaniculate, margins apparently scabrous; flowers two per umbel, sessile; spathe-valves lanceolate, 6.5 to 8 cm. long; perianth tube curved, 9 to 11 cm. long, 6 mm. wide, pale green; segments ovate-lanceolate, acuminate; perianth ovoid campanulate, whitish with red stripes, 18 cm. long, 3.5 to 4 cm. wide; filaments 0.6 cm. shorter than the perianth; anthers linear, less than 0.6 cm. long; style reddish-white.

Notes.—Native to Moyen-Chari near Neyalims village. Kom. nr. 8554. Has also been observed in Bongolo and Telé, in Kabas near Fort Archambault etc.

This species is considered poisonous by the natives, who use the plants sometimes in fetish-worship.

127. C. STUHLMANNI, Baker, Thiselton-Dyer, Flora of Tropical Africa. 7:378 London 1898.

Description.—Bulb and leaves have not been described; scape stout, 2 cm. in diameter; umbel dense, composed of many flowers; spathe valves large and thick; pedicels, 2.5 to 7 cm. in length; flowers erect; perianth tube slender, 7.5 cm. in length; limb 12 cm. long; segments oblanceolate, above 1.2 cm. wide; stamens as long as the segments.

Notes.—Native to the Mozambique Distr. East Africa; Dar-es-Salam. *Stuhlmann nr. 8536* in Berlin Herbarium. No relationship to other species is indicated.

128. C. MENYHARTHII, Baker, Thiselton-Dyer, Flora of Tropical Africa. 7:395-396, London 1898.

Description.—Bulb described as larger than a man's head; leaves unknown; scape 2 cm. in diameter, less than 30 cm. in length; many flowers per umbel; spathe valves 10 cm. in length; pedicels erect, 3 to 4 cm. long; perianth tube straight or somewhat curved, 10 to 11 cm. in length; segments linear, ascending many-nerved, considerably tinged with red, half as long as the tube; filaments red, equally as long as the perianth segments.

Notes.—Native to the Mozambique Distr. British Central Africa; reported from the Zambesi River. *Menyharth nr. 690.* No relationship to other species has been indicated.

129. C. TANGANYIKENSE, Baker, Thiselton-Dyer, Flora of Tropical Africa. 7:400 London, 1898.

Description.—Bulb unknown; leaves ensiform, 45 cm. in length, 3 cm wide, broad toward the base, relatively firm, margins not ciliate or scabrous; scape slender; 2 to 4 flowers per umbel, sessile; spathe valves ovate-cuspidate, 5 cm. in length; perianth tube erect, 10 cm. in length; perianth segments oblong, as long as the tube, 2.5 cm. wide, with broad red keel down back; stamens shorter than perianth; limb style as long as segments.

Notes.—Native to the Mozambique Distr. East Africa, Uzige northern part of Lake Tanganyika. *Scott Elliott nr. 8302.* No relationship to other species has been indicated.

130. C. ERYTHROPHYLLUM, Carey. Bot. Mag. 47, t. 2121, p. 7; Herbert, Amaryll. 1837, p. 258; Hayward, Herbertia 7:92, 94, 1940.

Description.—Bulb small, 6 to 7.5 cm. in diam.; leaves sprawling, not over 30 cm. long, 2.5 to 5 cm. wide, curling, and narrowing to a point, wine colored; scape slender, about the size of a pencil, under 30 cm. long; umbel 3 to 4 flowered; perigone white, tepals, 7.5 to 10 cm. long, linear-lanceolate, much like *Crinum pratense* Herb.

Habitat.—Rangoon, Burmah.

Notes.—Herbert observes that "Dr. Carey lost this remarkable plant without having seen its flower, and vainly attempted to obtain it and *Macrocarpon* again. There is no doubt of its being a distinct species, but I cannot tell what are its affinities. Leaves as red as those of a red cabbage."

Mr. Wyndham Hayward of Winter Park, Florida obtained more than 100 bulbs of this species with a shipment of mixed Crinum bulbs from Hla Maung Bros., Rangoon, Burmah, in 1934. The brief description above is from that of Hayward cited above.

CHECK-LIST OF AMARYLLID COLOURED PLATES

Chiefly latter part 18th. and 1st. half 19th. Centuries

Major Albert Pam, *O. B. E., F. L. S.*
Wormley Bury, Broxbourne, Herts., England

Amaryllids were great favourites in English Gardens during the latter part of the 18th and the first half of the 19th century. During my researches for this Article, I came across a catalogue issued by the firm of Loddiges who had extensive nurseries near Hackney (now a part of London, but then well in the country) issued in 1823. This catalogue offered for sale as stove plants 13 species of *Amaryllis* (syn. *Hippeastrum*), 2 of *Lycoris*, 1 of *Zephyranthes*, 22 of *Crinum* in addition to 2 which I cannot determine, 4 of *Crinum* hybrids, 1 of *Boophone*, 1 of *Griffinia*, 3 of *Haemanthus*, 13 of *Hymenocallis* in addition to 1 which I cannot determine, and 1 of *Eurycles*. Further, as greenhouse plants 2 species of *Agapanthus*, 4 of *Nerine*, 1 of *Callicore*, 1 of *Zephyranthes*, 1 of *Amaryllis*, 2 of *Crinum*, 1 of *Vallota* and 1 of *Sprekelia;* in all 77 species. This list does not of course include the hardy species, but only those which were at that time usually grown under glass. No horticultural firm in Europe or in America has recently offered nearly as many species. If further evidence of the popularity of this order were necessary, it would be found in the number of plates and descriptive matter to be found in the botanical publications issued during this period. Practically all the plates in colour which are listed in this Article were drawn from living plants, grown by a large number of amateurs, botanic gardens and nurseries. These publications were in most cases edited by leading botanists of that time, and the plates were carefully and faithfully executed. The skill of the various botanical artists employed naturally varied considerably, but a large percentage of the plates are most beautifully finished and are real works of art. The great interest taken in horticulture during the early 19th century can also be realised by the fact that in 1827 no less than 10 serial publications, illustrating in colour plants cultivated in English Gardens, were being issued. It was a wonderful period for gardening, especially under glass, for the introduction to this country of new plants, and for publications relating to them.

Among these publications pride of place must be given to the *Botanical Magazine* which was first issued in 1787 and is still the leading botanical serial in the world, with an unbroken record, to the present date, of 155 years uninterrupted issue. At the time of writing this Article 9,633 plates have been issued, of which 270 represent Amaryllids. Its editors, beginning with its founder, William Curtis, comprise some of the most learned botanists of each generation—Thomas Curtis, Dr. John Sims, Sir William J. Hooker, Sir Joseph Hooker, Sir William Thiselton-Dyer, Sir David Prain, Dr. O. Stapf and Sir Arthur Hill, who died quite recently. The botanical artists, who were responsible for the plates, include such famous names as J. Sowerby, Sydenham Edwards, Rev. William Herbert (Dean Herbert), Sir W. J. Hooker,

W. H. Fitch, Miss M. Smith, and the present chief artist, Miss L. Snelling, whose work, in my opinion, compares most favourably with the best of the past periods.

At first the plates showed only the plant without any botanical detail, but some was given in vol. 46 (1819), and from then onwards an increasing amount of purely botanical information was included in the plates. Of late years this detail forms part of the text in order to allow the plants to be pictured alone and undisturbed by other drawings. An important "*Preliminary Treatise*" on the Amaryllidaceae by Dean Herbert consisting of 50 pages of text and 2 beautifully drawn and coloured plates, forms the beginning of Vol. 49 (1822). The Dean contributed very many descriptions and plates over a long period, mainly of Amaryllids and other bulbous plants, and his plates are among the finest of that period.

The first Amaryllid, described and pictured is *Narcissus Minor* in tab. 6 of the first volume, followed by tab. 46 of *Leucojum vernum,* and tab. 47 of *Sprekelia formosissima.* In the 16th volume two-thirds of the plates represent bulbous plants and half of the 17th to 26th volume is devoted to these subjects, which shows their popularity at that time. Later on their place was taken by orchids and the 65th volume (1839), although dedicated to Dean Herbert, contained only 1 Amaryllid!

The work issued in Nuremberg in 1750-1773, and of which the descriptions were written by Christopher Joseph Trew, is chronologically the first in the check-list which follows. This book, entitled *Plantae Selectae* is a folio with 100 plates, of which a few are of species of the Amaryllidaceae. The artist was George Dionysius Ehret, many of whose plates are particularly fine and who later came to England and worked there as a botanical artist.

Next in order of time came The *Botanist's Repository* issued in London by Henry Andrews from 1797 to 1814: this serial specialised in new and rare plants, and contains 664 plates, Andrews being responsible for both description and the illustrations. The size is quarto, and 10 volumes were issued. The author-artist had at least 4 other serials being issued contemporaneously, and is said to have been responsible altogether for over 1,500 plates on botanical subjects, beside the descriptions of the plants figured. It is therefore not surprising that the quality of the illustrations is not uniform.

Then followed what, to my mind, is the finest botanical publication ever issued—*Les Liliacées* by Pierre Joseph Redouté, Paris 1802-1816 in 8 volumes, 21½″x14″, containing 486 magnificent plates, a great number of which are of Amaryllids. The edition was limited and all the illustrations were by Redouté, while the descriptions of the plants in the first 4 volumes were by A. P. de Candolle, in the 5th and 6th volumes by F. de la Roche, and in the 7th and 8th volumes by A. Raffeneau-Delile. The plants illustrated seem to stand out of the plate —the perspective is in my opinion better than that of the work of any other botanical artist—there are very few plates of Amaryllids which are not superlative in quality.

From 1806 to 1840 there appeared in London John Sibthorpe's famous and rare work *Florae Graeca* in 10 volumes folio with 966 plates, but this need not detain us, as only very few Amaryllids grow in Greece.

Leaving out a number of other serials in which Amaryllids are not pictured, we come to the *Botanical Register,* which from the point of view of this article, is next in importance to the *Botanical Magazine.* This serial comprises 33 volumes with 2,702 plates, of which 123 are of Amaryllids, and was issued in London from 1815 to 1847. The chief artists were Sydenham Edwards, Dr. John Lindley, and from 1831 onwards Miss Drake; the illustrations of the Amaryllidaceae reached a high degree of excellence and the plants described were mostly of recent introduction. One troublesome feature of this publication is that although the plates are numbered consecutively in the first series from the 1st to the 23rd volumes, the plates in the second series (24th to the 33rd volumes) are numbered separately in each volume—all references to the second series must therefore indicate both the year of publication and the number of the plate.

The first Editor was John Bellanden Ker, previously known as J. B. Gawler. It is under this first name (abbreviated as "Gawl.") that references to him will be found in the check-list which follows.

Although Dr. Lindley only assumed the Editorship of this serial in 1829, his initials, J. L., first appear at the foot of descriptions in vol. 9 (1823), and from then onwards he made himself responsible for most of the descriptive matter relating to the Amaryllidaceae, and later on for a number of beautifully executed plates.

While Sydenham Edwards was the chief artist of the *Botanical Magazine,* and before he left that publication to found and edit the *Botanical Register,* he was the artist of a *Dictionary of Gardening* and the Editor and artist of "*The New Botanic Garden*" also published under the title of "*The New Flora Britannica.*" This was issued in 2 volumes Quarto in London in 1812 with 60 plates, but only 2 of these are of Amaryllids.

The next publication was Loddiges' *Botanical Cabinet* issued in London between 1818 and 1833, in 20 volumes with 2,000 plates; these are small in size but well executed, by various artists. A number of the Amaryllidaceae are represented, but there is no botanical detail and the descriptions are meagre. All the plants illustrated in this serial were grown and flowered in the nurseries of Messrs. Loddiges, and to that extent this is a unique publication: it was a great advertisement for the firm of Loddiges as well as a useful contribution to horticulture.

In the year 1819 there was published in Vienna Leopold Trattinick's *Thesaurus Botanicus,* a folio volume of 80 beautiful plates, the chief artist being Strenzel, who was responsible for 10 superb pictures of Amaryllids.

This was followed by the issue in London of *The British Flower Garden* by Robert Sweet, comprising 3 volumes of the 1st series and 4 volumes of the 2nd series, the whole containing 712 good plates by E. D. Smith. This work was issued between 1823 and 1838, and at the same time Sweet was issuing 4 other serials in which the Amaryllidaceae

were not dealt with; most of the plants illustrated by Sweet were grown in the nurseries by Messrs. Colvill of Chelsea, of which Sweet was for many years the Manager.

Then came one of the most beautiful plant books ever issued—Mrs. Bury's *A Selection of Hexandrian Plants,* a very large folio (24½″x18″) of 51 plates, of which 45 represent Amaryllids, drawn by Mrs. Bury and engraved by R. Havell. This was published in London from 1831 to 1834 and is extremely rare. It is a magnificent work, and the plates are exquisitely drawn and coloured—the only publication apart from Herbert's *Amaryllidaceae* which deals almost entirely with plants of this order. Mrs. Bury lived in or near Liverpool and all her pictures are drawn from living plants.

Finally, in chronological order but ranking highly in merit and in botanical interest for readers of HERBERTIA, came *Amaryllidaceae* by the Hon. and Rev. William Herbert. This was issued in 1837 and contains 48 plates, small but extremely exact with much botanical detail, drawn by the author with meticulous care. This will always remain the classical text book of the student of this order of plants, even if many changes in nomenclature have been made in the century since it was published. Dean Herbert's skill as an artist is shown in the many plates he prepared for various botanical works, and his wide knowledge as a botanist is proved by the numerous new plants he described for the first time and named.

No plants illustrated in any other of any later work have been included in my list, but all plates of Amaryllidaceae in the *Botanical Magazine* up to and including vol. 162 (April 1940) have been mentioned.

In the check list which follows, I have adopted the classification and key of Dr. J. Hutchinson in the second volume of his *Families of Flowering Plants* (1934) with the changes in nomenclature since proposed by Traub (Herbertia 5:112-113, 1938) and by Traub and Uphof, Sealy and others. I have, however, not dealt with plants classified under the tribes "Alliaceae" and "Gilliesieae" as inclusion of the former would have made my list unduly long, while of the latter only a very small number of species were illustrated in the publications mentioned. The numbers represent the plates in the various works, and I have italicised those which appear to me to be of special merit; where a note of interrogation appears after a number it signifies a form or a variety, or a case in which the illustration has not been definitely determined, but is evidently very near the species under which it is placed.

The following abbreviations are used for the works referred to:

1	B M	Botanical Magazine
6	B R	Botanical Register
3	A B R	Andrews' Botanical Repository
8	B C	Loddiges' Botanical Cabinet
10	B F G	Sweet's British Flower Garden
5	F Gr	Sibthorpe's Florae Graeca

4	Red	Redouté's Les Liliacées
11	Bury	Mrs. Bury's Hexandrian Plants
9	Tratt	Leopold Trattinick's Thesaurus Botanicus
7	N B G	Sydenham Edwards' New Botanic Garden
2	P S	C. J. Trew's Plantae Selectae
12	Herb	The Hon. & Rev. William Herbert's Amaryllidaceae

TRIBE AGAPANTHEAE

Genus AGAPANTHUS L'Herit.

A. africanus Beauv. BM 500; BR 699; BC 42
orientalis Leighton? BR 1843 t. 7; Red *6* & *403;* NBG *3*

Genus TULBAGHIA Linn.

T. capensis Baker BM 806
alliacea Sims
var. *Ludwigiana* Harv. BM 3547
violacea Harv.? BM 3555

TRIBE IXIOLIRIEAE

Genus IXIOLIRION Fisch.

I. montanum Herb. BR 1844 t. 66; Red *241;* Herb. t. 20 f. 2
var. *tataricum* Herb. t. 19 & t. 20 f. 1

TRIBE GALANTHEAE

Genus GALANTHUS Linn.

G. Elwesii Hook. fil BM 6166
nivalis Linn. Red *200*
plicatus MB BM 2162; BR *545;* BC 1823
Ikariae Baker BM 9474

Genus LEUCOJUM Linn.

L. aestivum Linn. BM 1210; Red *135*
pulchellum Salisb. BC 1478
vernum Linn. BM 46 & 1993;
trichophyllum Schousboe BM 9585; BR 544; Red *217;* Herb t. 30 f. 4
autumnale Linn. BM 960; BC 812; Red *150* f. 2
roseum Martin Red *150* f. 1
hyemale DC BM 6711

Tribe CALLICOREAE Traub

Genus CRINUM Linn.

C. asiaticum Linn. BM 1073; BC 669; Red *348*
var. *declinatum* Herb. BM *2231; Bury 43*
var. *procerum* Carey BM 2684
var. *anomalum* Herb. BM 2908
sumatranum Roxb. BR 1049
amabile Donn. BM 1605
defixum Gawl. BM *2208;* BC 362
var. *ensifolium* Roxb. BM *2301;*
pusillum Herb. Herb. t. 32 f. 3
pedunculatum R. Br. BR 52; Red *408;* Bury *11*
bracteatum Willd. BR 179
mauritianum Lodd. BC 650

leucophyllum Baker BM 6783
cruentum Gawl. BR *171;* BC 346; Bury *22*
humile Herb. BM 2636
Balfourii Baker BM 6570
pratense var elegans Carey BM 2592
angustifolium Roxb. BM 2355
var. *confertum* Herb. BM 2522
var. *Blandum* Roem. BM 2531
purpurascens Herb. BM 6525
Hildebrandtii Vatke BM 6709
augustum Roxb. BM *2397;* BR 679; Bury *4*
erubescens Ait. BM *1232;* BC 31; Red *27;* Bury *34* ?
americanum Linn. BM 1034; Red *332* ?
Commelyni Jacq. Red *322* ?
strictum Herb. BM 2635
zeylanicum Linn. BM *1171;* Bury 29 ?; PS 13 ?
latifolium Linn. BR 1297; ABR 478?; BM *2217* ?; BM 2292?; BR 579?
brachynema Herb. BM 5937
flaccidum Herb. BM 2133; BR 426
Careyanum Herb. BM 2466
distichum Herb. BM 1253; Tratt. 39 ?
yuccaeflorum Salisb. BM *2121;* ABR 390; BC 688; Red *62;* Bury 21
Sanderianum Baker Bury *18*
scabrum Herb. BM *2180;* BC 529 ?; Bury 32
Kirkii Baker BM 6512;
podophyllum Baker BM 6483
giganteum Andr. BM 923; BM 5205 ?; ABR 169; Red *181;* Bury *17*
lineare Linn. fil. BM 915; BR 623
variabile Herb. BR 615; BR 1844 t. 9; BM 1178 ?
campanulatum Herb. BM 2352;
Moorei Hook. fil. BM 6113
Forbesianum Herb. BM *6545*
bulbispermum (Burm.) Milne-Redhead et Schweickerdt BM 661; BR 546 ?; Red *347;* Bury *42* ?;
var. *riparium* Herb. BM 2688
Macowani Baker BM *6381*
submersum Herb. BM *2463*
longiflorum Herb. BR *303*
rhodanthum Baker BM 7777/8
Schimperi Baker BM 7417
Woodrowi Baker BM 7597
Johnstoni Baker BM 7812
natans Hook fil. BM 7862

HYBRIDS

Crinodonna Corsii Ragioneri BM 9162
erubescens X *capensis* BM 2336
pedunculatum X *zeylanicum* Bury *30*

Genus AMMOCHARIS Herb.

A. falcata Herb. [=*Cybistetes longifolia* (Linn.) Milne-Redhead et Schweickerdt] BM 1443 (not fruit); BR 139;
var. *pallida* BR 1219; BC 745 ?

Genus CALLICORE Link.

C. rosea Link. (*A. Belladonna* (Linn.) Ait) BM 733; Red *180;* Bury *45;* Tratt 40
var. *pallida* BR 714; Red *479*
var. *blanda* Gawl. BM 1450

Genus BRUNSVIGIA Heist.

B. Josephinae Gawl. BM 2578 ?; BR 192/3; Red 370/2
grandiflora Lindl. BR 1335;
Slateriana Benth. BR 1842 t. 11; Herb. t. 32 f. 2
minor Lindl. BR 954; Herb. t. 32 f. 1
gigantea Heist. BM 1619
radulosa Herb. Herb. t. 22 f. 2

Genus NERINE Herb.

N. sarniensis Herb. BM 294; Red *33;* Tratt *46*
var. *venusta* Herb. BM *1090*
var. *rosea* Herb. BM 2124
var. *corusca* Herb. 1089 BM
curvifolia Herb. BM 725; Red *274*
var. *Fothergilli* Roem. ABR 163; Tratt *47*
flexuosa Herb. BR 172
var. *pulchella* Herb. BM *2407*
pudica Hook. fil. BM 5901
filifolia Baker BM 6547
humilis Herb. BM 726; BC 1674?; Red *450*
undulata Herb. BM 369; BC 1669?; Red *115*
var. *major* Tratt. Tratt 45
lucida Herb. BR 497
Bowdeni W. Watson BM 8117

HYBRID

N. Mitchamiae Herb. (*N. undulata* X *curvifolia*) BM vol. 49 p. 51; Herb. t. 45

TRIBE CYRTANTHEAE (Herb.) Traub

Genus CHLIDANTHUS Herb.

C. fragrans Herb. BR 640; Herb t. 27 f. 2

Genus ANOIGANTHUS Baker

A. breviflorus Baker BM 7072

Genus CYRTANTHUS Ait.

C. obliquus Ait. BM 1133; ABR 265; BC 947; Red *381*
carneus Lindl. BR 1462
spiralis Burchell BR 167
collinus Burchell BR *162*
pallidus Sims BM 2471; BC 1808 ?
odorus Gawl. BR 503
angustifolius Ait. BM 271; BC 368; Red *388*
striatus Herb. BM 2534; BC 1945 ?
ochroleucus (Herb) Burch. Herb. t. 33 f. 14
Mackenii var. Cooperi Hook. BM 5374
clavatus (L'Herit.) Dyer BM 2291; BR 168
vittatus Desf. Red 182 ?
sanguineus Hook. BM 5218
Huttoni Baker BM 7488
parviflorus Baker BM 7653
rhododactylus Stapf BM 9175
epiphyticus J. M. Wood BM 9252

Genus VALLOTA Herb.

V. purpurea Herb. BM 1430; Bury 39
var. *minor* Gawl. BR 552

TRIBE HAEMANTHEAE

Genus HESSEA Herb.

H. crispa Kunth. BM 1363
filifolia Benth. BR 440
gemmata Benth. BM 1620; Herb t. 29 f. 5

Genus CARPOLYZA Salisb.

C. spiralis Salisb. BM 1383; ABR 92; Herb. t. 29 f. 9

Genus BUPHANE Herb.

B. disticha Herb. BM 1217; BR 567

ciliaris Herb. BR 1153;
var. *guttata* Herb. Herb. t. 22 f. 1

Genus GRIFFINIA Gawl.

G. dryades Roem. BM 5786
ornata Moore BM 6367
hyacinthina Herb. BR 163; Bury *14*
intermedia Lindl. BR 990
parviflora Gawl. BR 511

Genus CLIVIA Lindl.

C. nobilis Lindl. BM *2856;* BR 1182; BC 1906
Gardneri Hook. BM 4895
miniata Regel BM 4783

Genus HAEMANTHUS Linn.

H. multiflorus Martyn BM 961 & 1995; ABR 318; BC 912; Red *204* BM *3870* & 5881?
Mannii Baker BM 6364
Katherinae Baker BM 6778
cinnabarinus Decaisne BM 5314
puniceus Linn. BM 1315; BC 1948; Red *320;* PS 44
magnificus Herb.
var. *insignis* Hook BM *4745*
natalensis Pappe BM *5378*
carneus Gawl. BM 3373; BR 509; Herb t. 30 f. 3
var. *strigosus* Herb. Herb t. 30 f. 2
albiflos Jacq. BM 1239; BR 984; BC 602; Red *398*
var. *pubescens* Herb. BR 382; BC 702
Baurii Baker BM 6875
deformis Hook. fil. BM 5903
rotundifolius Gawl. BM 1618
incarnatus Burch. BM 5532; Herb t. 31 f. 1
undulatus Herb. Herb t. 30 f. 1
concolor Burch. Herb t. 31 f. 2
coccineus Linn. BM 1075; BC 240; Red *39*
var. *coarctatus* Jacq. BR 181; Herb t. 31 f. 6
crassipes Jacq. Herb t. 31 f. 10
tigrinus Jacq. BM 1705
pubescens Linn. fil. BM 1523
Lynesii Stapf BM 8975
Nelsonii Baker BM 9293

Genus CHOANANTHUS Rendle

C. cyrtanthiflorus Rendle BM *9385*

TRIBE ZEPHYRANTHEAE Herb.

Genus ZEPHYRANTHES Herb.

Z. atamasco Herb. BM 239; BC 1899; Red *31;* Tratt *37;*
grandiflora Herb. BM 2594; BR 902; Bury *13;* BFG ser 2 t. 4
tubispatha Herb. BM 1586; Bury 25
mesochloa Herb. BR 1361
rosea Lindl. BM 2537; BR 821; Bury *13*
Commersoniana Herb. Red 454; Herb t. 29 f. 3
Lindleyana Herb. Herb. t. 35 f. 5 (flower only)
gracilis Herb. Herb. t. 29 f. 1
minima Herb. Herb t. 24 f. 3
verecunda Herb. BM 2583 & 2593; Herb t. 29 f. 2
candida Herb. BM 2607; BR 724; BC 1419; Bury 25
citrina Baker BM 6605
concolor Lindl. BR 1845 t. 54

HYBRID: Z. tubispatha X grandiflora

Z. Spofforthiana Herb BR 1746

Genus PYROLIRION Herb. (Sealy)

P. aureum (R. & P) Herb. Herb t. 23 f. 2 & t. 29 f. 4
flavum Herb. BR 1724 ? (may also be P. aureum)

Genus COOPERIA Herb.

C. Drummondii Herb. BR 1835; Herb t. 24 f. 5
var. *chlorosolen* Herb. BM 3482
pedunculata Herb. BM 3727; Herb t. 42 f. 3; BFG ser 2 t. 328

Genus HAYLOCKIA Herb.

H. pusilla Herb. BM 7693; BR 1371

Genus STERBERGIA W. & K.

S. colchiciflora W. & K. BR 2008; F Gr 311;
lutea Roem. & Schult. BM 290; Red *148;* F Gr 310
Fischeriana Roem. BM 7441; Herb t. 47 f. 3
macrantha J. Gay BM 7459

Genus GETHYLLIS Linn.

G. spiralis Linn. fil BM 1088
afra Linn. BR 1016
undulata Herb. Herb 25 f. 5

TRIBE AMARYLLISEAE Traub

Genus AMARYLLIS (Linn. ex parte) Uphof Syn. *Hippeastrum*

A. Bagnoldii (Herb) T. & U. BR 1396;
var. *Gillesiana* (Herb) Herb. t. 23 f. 1
bifida (Herb) T. & U. BM 2597; BR 1638?; BR 1148?; BM 2639?
advena Gawl. BM 1125; BR 849; BC 779?; BFG ser 2 t. 213?
pulchra (Herb) T. & U. Herb. t. 26 f. 1
rosea (Herb) T. & U. BC 1771; BFG ser 2 t. 107
chilensis R. & P. BC 1760?
pratensis (Herb) T. & U. BR 1842 t. 35; BM 3961?
Herbertiana (Lindl). T. & U. BR 1341
Elwesii (C. W. Wright) T. & U. BM 8614
fulgens (Hook. fil) T. & U. BM 5563

bicolor R. & P. BM 2399; BR *809;* BR 1943; BC 1769?; BFG ser 2 t. 121?; Herb. t. 24 f. 12 & 15; Herb. t. 25 f. 1?
var. *glauca* (Herb) BM 2687; BC 1746
phycelloides (Herb) T. & U. BR *1417;*
solandriflora (Herb) T. & U. BM *2573* & 3771; BC 1200; Bury 7 ?
candida (Stapf) T. & U. BM 9184
breviflora (Herb) T. & U. BM *3549*
vittata Ait. BM 129; Red *10;* Bury 40; Tratt 38
Harrisonii Lindl. BM 7737; BR 988?; Bury 27
rutila Gawl. BR *23;* ABR 358?; BC 1449;
var. *fulgida* (Herb) BM 1943 & 2475; BR 226; Bury *26* & 35
var. *crocata* (Herb) BR 38; BC 1082 ?; Bury *16*
var. *acuminata* (Roem) BM 2273; BR 534 & 1188; BC 484; Bury *44*
Blumenavia (Koch et Bouche) (Sealy) T. & U. BM 5666 & 9504
reticulata L'Herit. BM 657; ABR 179; Red *424;* Tratt 41
var. *striatifolia* (Herb) BM 2113; BR *352;* Bury *48*
procera Duchartre BM 5883;
belladonna Linn. BM 305 & 2315; Red *32;* BR 234; Bury *41*
reginae Linn. BM 453; Red *9;* Bury *24;* Tratt 42
stylosa Bury BM *2278;* BR 719; Bury 33
miniata R. & P. Herb. t. 47 f. 7
calyptrata Gawl. BR *164;* BC 864
psittacina Gawl. BR *199;* BC 1204; Bury 23
organensis (Hook) T. & U. BM 2983; Bury *9* & 15?
aulica Gawl. BM 3311; BR *444* & 1038; Bury *19*
pardina Hook fil. BM *5645;*
cybister (Herb) T. & U. BM *3872;* BR 1840 t. 33 (? Bentham)

HYBRIDS

X *Johnsoni* Bury *1*
X *braziliensis* Red. *469*
X *spectabile* BC 159
X *superba* (Vittata) Bury 31
X *psittacina* BM 3528
X *picta* BR *876;* Bury *5*
X *Johnsoni* & *solandriflora* Bury 46
X *Splendens (rutila-belladonna-vittata)* Herb. BM page 52 vol. 49
X *ambigua (solandriflora* X *vittata)* Herb. BM 3542

Genus PLACEA Miers

P. ornata Miers BR 1841 t. 50

Genus SPREKELIA Heist.

S. formosissima Herb. BM 47; BFG ser 2 t. 144; Red *5;* Bury *6;* Tratt *44*
var. *glauca* Lindl. BR 1841 t. 16

Genus LYCORIS Herb

L. aurea Herb BM 409; BR 611; BC 847?; Red *61;* Bury *3*
squamigera Mamix. BM 7547
radiata Herb BR 596; ABR 95; Tratt 48

Genus HABRANTHUS Herb (Sealy)

H. Andersoni Herb ex Lindl BR 1345; BC 1677; BFG ser 2 t. 70;
texana (Herb) BM 3596; Herb. pl 24 f. 4
brachyandrus (Baker) Sealy BM 7344
cardinalis (C. H. Wright) Sealy BM 8553
gracilifolius Herb. BM 2464
var. *Boothianus* Herb. BR 1967

robustus Herb. BM 9126; BC 1761; BFG ser 2 t. 14
versicolor Herb. BM 2485

Genus VAGARIA Herb.

V. parviflora Herb. BM 9406; Red *471;*

TRIBE NARCISSEAE

Genus NARCISSUS Linn.

TRUMPET SPECIES

N. hispanicus Gouan
var. *maximum* Pugsley BM 51
moschatus Linn. BM 1300; Red 188; BFG ser 2 t. 101
pseudo-narcissus Linn. Red 158; Herb t. 43 f. 3
bicolor Linn. BM 1187
pumilus Salisb. BM 6; BFG ser 2 t. 143
minor Linn. Red 480; Herb t. 41 f. 28
asturiensis Jord. BM 9495; Herb t. 43 f. 4/5

TRUMPET HYBRIDS & GARDEN FORMS

N. "Henry Irving" BFG ser 2 t. 286
propinquus Salisb. BM 1301 upper
obvallaris Salisb. BM 1301 lower
albescens Pugsley BFG ser 2 t. 145
tortuosus Haw. BM 924
incomparabilis Miller BM 121; Red 220
Macleayi Lindl. BM 2588; BR 987
Sabinii Lindl. BR 762

N. triandrus Linn. BM 48 & 6473a
var. *pulchellus* BM 1262; BFG ser 2 t. 99
calathinus DC Red 177 & 410

TRIANDRUS HYBRID

N. Johnstonii Baker BM 7012

N. cyclamineus DC BM 6950

JONQUIL GROUP

N. Watieri Maire BM 9443
juncifolius Requien BR 1847 t. 22 f. 1; Herb t. 43 f. 1
rupicola Dufour BM 6473 c
minutiflorus Willk. Herb. t. 39 f. 22 & t. 43 f. 2
Jonquilla Linn. BM 15; Red 159
odorus Linn. BM 934; Red *157*
var. *minor* BM 78; Red 428

JONQUIL HYBRIDS & GARDEN FORMS

N. trilobus Gawl. BM 945
bifrons Gawl. BM 1186 & 1299; Red 459
laetus Salisb. Red 427—2nd plate (see footnote)
gracilis Sabine BR 816; Red 427; BFG ser 2 t. 136
tenuior Curtis BM379

Note:—My copy of Les Liliacées (Redouté) contains two plates numbered 427, as far as I know this is very rare. The second plate shows a fine hybrid under the name of *"N. laetus,"* somewhat similar to t. 1299 in BM of *N. bifrons.* It is a cross between *N. Jonquilla* and an unknown large flowering species and is not represented in cultivation now.

TAZETTA GROUP

N. Tazetta Linn. FGr 358
corcyrensis Herb. t. 37 f. 1
papyraceus Gawl.
var. *grandiflorus* BM 947
Broussonetii Lagasca BM 7016
pachybolbus Durieu BM 6825
dubius Gouan Red 429 & 409?
italicus Gawl. BM 1188

TAZETTA HYBRIDS & GARDEN FORMS

N. Trewianus Gawl. BM 940; BFG ser t. 118 & 179
Cypri Haw. BFG ser 2 t. 92
cupularis Salisb. (Soleil d'or) BM 925; Red 17; BFG ser 2 t. 191
orientalis Gawl. BM 946, 948, 1298
var. *flore pleno* BM 1011
multiflora Haw. BM 1026
biflorus Curtis BM 197; Red 405

N. poeticus Linn.
var. *recurvus* BFG ser 2 t. 188; Herb t. 40 f. 1
var. *radiiflorus* Salisb. BM 193; Herb. t. 37 f. 2 & t. 40 f. 2
var. *stellaris* Haw. BFG ser 2 t. 132
var. *exertus* Pugsley Red 160

N. viridiflorus Schousboe BM 1687
serotinus Linn
var. *deficiens* Herb. BR 1847 t. 22 f. 1
elegans Spach
var. *obsoleta* Haw. BR 1847 t. 22 f. 2
bulbocodium Linn.
var. *serotinus* Haw. BM 88; BFG ser 2 t. 164
var. *conspicuus* Haw. Red 24; BFG ser 2 t. 326
var. *tenuifolius* Salisb. Red 486; BFG ser 1 t. 114
var. *citrinus* Baker BM 6473 b
var. *monophyllus* Durieu BM 5831

(I am greatly indebted to my friend Mr. E. A. Bowles FLS, author of "A Handbook of Narcissus" the most recent and authoritative description of the Genus, for his help and advice in the compilation of the above list.)

Genus TAPEINANTHUS Herb.

T. humilis Herb. BR 1847 t. 22 f. 4

TRIBE EUSTEPHIEAE

Genus URCEOLINA Reich.

U. pendula Herb. BM 5464
var. fulva Herb. Herb t. 26 f. 5
latifolia Benth. BM 4952
miniata Benth. BR 1839 t. 68

Genus EUSTEPHIA Cav.

E. pamiana Stapf BM 9164

Genus CALLIPSYCHE Herb.

C. eucrosioides Herb. BR 1845 t. 45
aurantiaca Baker BM 6841

Genus EUCROSIA Gawl.

E. bicolor Gawl. BR 207; BM 2490

Genus PHAEDRANASSA Herb.

P. chloracea Herb. BM 5361?; BR 1845 t. *17*
Carmioli Baker BM 8356? (does not represent the true plant which will shortly be figured in BM.)

Bi-generic hybrid

Urceocharis edentata BM 8359—hybrid between *Urceolina pendula* & *Eucharis grandiflora.*

TRIBE EUCHARIDEAE

Genus STENOMESSON Herb.

S. aurantiacum Herb. BR 1844 t. 42
croceum Herb. BM 3615 ?; Red 187; Herb t. 28 f. 4
flavum Herb. BM 2641; BR 778; Herb t. 28 f. 1
var. *latifolium* Herb. BM *3803;* BR 1843 t. 2
var. *curvidentatum* Herb. BM 2640; Herb t. 28 f. 2/3
humile Baker BR 1842 t. 46
coccineum Herb. BM 3865; Herb t. 28 f. 5/6
var. *breviflorum* Herb. Herb t. 28 f. 7
incarnatum Baker BM 3221 ? & 3867 ? & *5686* ?; BR 1497 & 1842 t. 66 ? BFG ser 2 t. 17
luteoviride Baker BM 6508;
viridiflorum Benth. BM *3866a*
var. *angustifolium* Herb. BM 3866b;

Genus PANCRATIUM Linn.

P. illyricum Linn. BM 718; Red *153*
zeylanicum Linn. BM 2538; BR 479;
maritimum Linn. BR 161 & 927 ?; F Gr 309; Red *8;* NBG 41
canariense Gawl. BR 174
verecundum Ait. BR 413
longiflorum Roxb. Herb t. 42 f. 1/2

Genus HYMENOCALLIS Salisb.

H. tubiflora Salisb. BR 265;
speciosa Salisb. BM 1453; Red 156 ? & *412;* Bury *47*
ovata Roem. BM 1467; BR 43; BC 510 ? & 834 ?; Red 413 ?; Bury 28 ?
var. *glauca* Herb t. 35 f. 1
littoralis Salisb. BM 825?; 1879 ?; & 2621 ?; BR 940?; Red *154*?; PS 27
pedalis Herb. BR 1641; BC 809
Harrisiana Herb. BM 6562;
Caribaea Herb. BM 826; BR 221?; BC 558 & 286?; Red 358? & *414;* ABR 556
expansa Herb. BM 1941
macrostephana Baker BM 6436
lacera Salisb. BM 827; BC 19
var. *paludosa* Salisb. BM 1082?; BC 274?; Red *155*
nutans Baker BM 1561
Macleana Nichols. BM 3675; BR 1841 t. 12; Herb t. 35 f. 2 ?
calathina Nichols. BM *2685;* BR 215; Red 353; Bury *10*
Amancaes Nichols. BM *1224;* BR *600;* BC 1266; Bury *37*
schizostephana Worsley BM 7762

HYBRID

H. X *Amancaes* & *calathina* BR 1665

Note: This genus is much confused, and needs complete revision.

Genus PAMIANTHE Stapf.

P. peruviana Stapf BM *9315*

Genus LEPTOCHITON Sealy

L. quitoensis (Herb) Sealy BM 6397; & *9491*

Genus ELISENA Herb.

E. longipetala Herb. BM 3873

Genus CALLIPHRURIA Herb.

C. Hartwegiana Herb. BM 6259

Genus EUCHARIS Planch.

E. grandiflora Planch. BM 4971
Mastersii Baker BM 6831
Sanderi Baker BM 6676
subedentata Benth. BM 6289
Bakeriana N. E. Br. BM 7144

Genus EURYCLES Salisb.

E. sylvestris Salisb. BM 1419; BR 715; Red *384;* Bury 20; PS 28
Cunninghami Ait. BM 3399; BR 1506

Genus CALOSTEMMA R. Br.

C. purpureum R. Br. BM 2100; BR 422;
var. *carneum* Lindl. BR *1840t. 26*
luteum Sims BM 2101; BR 421 & 1840 t. 19

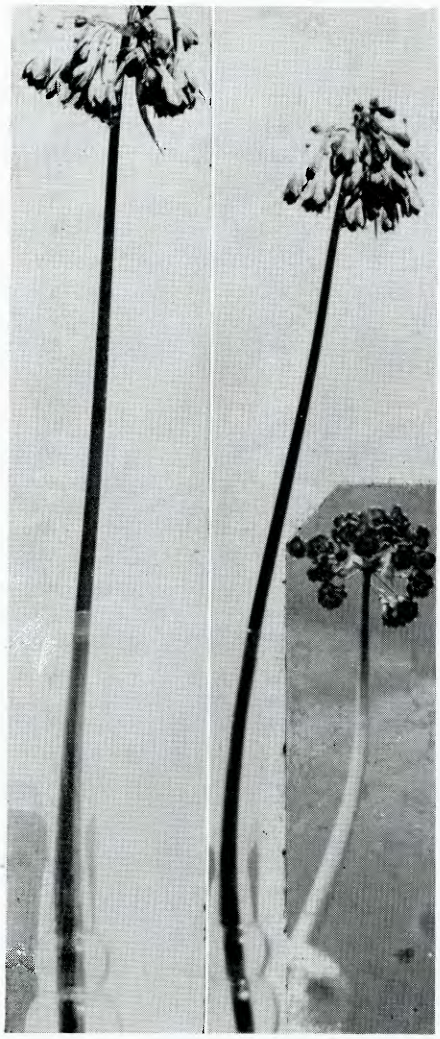


Fig. 73. Calostemma purpurea. Photo by Mildred Orpet

CALOSTEMMA PURPUREA

MILDRED ORPET, *California*

Seeds of *Calostemma purpurea* were received from Mrs. James T. Gray, Orroroo, South Australia and planted in July 1936. The first flowers were produced in August 1942 as shown in Figure 73. The first one that flowered was sort of mauve in color, and a second a pale pink. They seem to flower with the new foliage coming—that is a thin, long leaf; the flower stem or peduncle is quite long, out of all proportion to the size of the flower.

The illustrations in Figure 73 show, *left*, photo taken head on, and *center*, taken with camera flat on its back looking up into the flower tubes to get the detail.

The cut flower was kept in water for ten days; the stem split at the base like dandelions when children split them for "curls". The flowers dried and hung on while the seed pods developed—four large seed pods are shown at right in the Figure, and a number of incipient ones apparently will not develop.

From the standpoint of floriculture this may not be an outstanding subject, but from the viewpoint of science it is as important as any other amaryllid for it represents one of the few amaryllid species native to the Islands off the southwest coast of Asia and to Australia.

ABSTRACT: ARTICLE ON CALLICORE-BRUNSVIGIA HYBRIDS

L. S. Hannibal, *Concord, California*

The writer of an article in Gardeners Chronicle [Amaryllis Blanda And Its Allied Varieties And Hybrids, Brunsdonna Ex Parte. Gardeners Chronicle: Vol. 84, P. 349. (1928) With Fig of *Rubra Maj.*], who chose to remain anonymous, stated that Dean Herbert considered the genus which we now know as *Callicore** as not monotypic, and that it included some species of *Brunsvigia* such as *B. Josephinae.* His opinion receives support from the fact that five or more hybridists have succeeded in crossing *Callicore* with *Brunsvigia spp.* (R. H. S. 1926, P. 65) and as these garden hybrid "Brunsdonnas" occur with such ease it is only logical that wild crosses have occurred in the natural habitat of these plants. It is apparent that collectors at times have gathered these hybrids, along with back crosses of these hybrids, both of which often resemble the original *Callicore blanda* (syn. *A. blanda,* Bot. Mag., t. 1450, 1812).

Blanda, being tender, disappeared during Herbert's time, but it often reappeared later as seedling segregates from several possible sources, one being mentioned in Paxton's Mag. 1882. A similar clone, *pseudo-blanda,* which received a R. H. S. Award of Merit September 11, 1928, can be traced to an original *Parkeri* hybrid distributed by Mrs. Arbuckle in 1889 (R. H. S. Journal (1926), P. 67). Various other forms of *Blanda* have been noted among bulbs imported from the Cape. In general the *Blanda* forms, as distinguished from the type of the Cape Belladonna, have wider, more substantial leaves and late flowering, tubular-shaped blossoms of very pale self color when they first expand, but on the third or fourth day the perianths become entirely pink.

An allied form, *Callicore rosea* var. *rubra,* (syn. *A. rubra major,* of J. E. Elwes, see plate in article cited above) was considered to be a similar hybrid by Wm. Watson. It is only partly deciduous and bears a pronounced pseudo-leaf-stem 6″ to 8″ long. Fortunately it is very free flowering and quite hardy. The blossoms, which are crimson with a yellow base, are long lasting, and recurved only slightly. A typical *Brunsvigia* characteristic is the elongation of the pedicels to 7″ or 8″ as the fruits set, which is not quite so characteristic of *Blanda.* Many of the seedling crosses resulting from either of these original hybrid forms are of unusual merit, being very large, robust plants that flower quite freely with umbels far superior to the type of the Cape Belladonna; however, a number of seedlings revert to the original type and can be considered of no special value.

* The nomenclature adopted by the American Amaryllis Society, and by Standardized Plant Names, 1941, is used in this article with synonyms given in parentheses. However, it should be noted that, as indicated in the following article, **Callicore rosea** Link may shortly be superceded by transferring it to the genus **Brunsvigia** where it apparently rightly belongs. As will be recalled **A. belladonna** Linn., was proven to be the former **Hippeastrum equestre** Aiton (Herbertia 5. P. 100, 1938). Apparently Linnaeus never saw the "Cape Belladonna Lily", although it was well known in Spain and Italy as "Lilio Vulgaris", etc. The superficial resemblance of the circular "Blanda" umbel to that of the "Equestrian Lily" could have been the vector that misled Linn., 2nd, and Herbert in adopting the wrong name for this Cape bulb.—**L. S. H.**

In reviewing this article two things are apparent: first the writer implies that he does not regard *Brunsdonna* hybrids as bigeneric without definitely stating it, and secondly, no mention is made of hybrid progeny reverting to the *Brunsvigia* type. From some personal experience with *Blanda* forms it is apparent that Cape Belladonna genes are dominant in many of their characteristics, and that typical *Brunsvigia* forms seldom occur. "Brunsdonnas" can usually be recognized by one or more of the following characteristics: tenderness to frost, pseudo-neck to bulb, lingulate leaves, tubular flowers, circular umbel, strong orange to yellow base or eye in the blossom's trumpet, or marked elongation of the pedicels as the fruit matures.

CALLICORE AND BRUNSVIGIA

L. S. Hannibal, *California*

Callicore rosea Link *(syn. Amaryllis belladonna* Herbert non Linn.) may prove to be a *Brunsvigia.* Apparently 95% of the hybrids (Brunsdonnas) with *B. Josephinae* Redoute *(B. Gigantea* Van Marum), or *B. gigantea* Heist *(B. orientalis* Linn. or *B. multiflora* Aiton) readily set seeds. Normally we would expect sterile bigeneric hybrids, such as the *Crinnodonna* F-1 crosses, but as the plants in question are not sterile it appears that they may belong to the same genus. If a new name is given it should apparently be *Brunsvigia rosea* (Lamarck) since Lamarck's description of *Amaryllis rosea* in the Dict. Enc. dr. Bot. of 1789 long predates Link's *Callicore rosea,* which is the same plant.

The work of Cowlishaw (Herbertia, Vol. 2, P. 46) on his *multiflora* hybrids and the interesting observations (See Abstract above) on *Parkeri* and *Blanda* forms (Gard. Chron. *84.* 1928. P. 349) only tend to substantiate these views. Chromosome studies should help to clear up this problem if any doubt exists.

The present major distinction between *Callicore* and *Brunsvigia* is that the seeds in the case of the former are practically sessile, while in *Brunsvigia* they are stalked. However, in *Brunsvigia* X *Callicore* hybrids, as might be expected, quite a variation in length of placentae can be observed, even in a single ovary. Stalks up to 5 mm. in length are not unusual. In general, depending on the clones examined, those having the longer pedicles when the fruits ripen show less tendency for the seeds to be sessile, which suggests possibly that elongated placentae in *Brunsvigia* are associated with pronounced length of the pedicels. However, there are other factors involved. In hybrids between several *Callicore* strains, where no *Brunsvigia* genes are known to exist, the fruits develop as acutely triquetrus, turbinate capsules on long pedicles*, and the seeds instead of being few in number, are densely packed almost like Pomegranate seeds, with 75 or more to a capsule, and surprisingly enough some of the seeds in this crowded aggregation were definitely stalked. Also the length of the pedicel was distinctly correlated with

* The longer pedicels always appear on the red scape forms. Those on green scape forms are seldom more than 5 or 6" long.

the number of seeds in the capsule—few seeds, a short pedicel; many seeds, a pedicel 7″ or 8″ long with up to 20% of the seeds in some capsules being stalked as in *Brunsvigia.*

This observation may not prove that *Callicore* is a Brunsvigia, but it does indicate that previous classifications may be at fault. Incidentally it does clear up a puzzling problem for breeders. A few years back the U. S. D. A. carried out some long period corn inbreeding experiments. The ears finally obtained had few grains of no apparent value, but if two weak inbred strains of corn were crossed, the resulting hybrids were some of the most productive ever obtained. This applies

Fig 74. Flowers of Hemerocallis altissima sp. nov. Photo taken early forenoon Aug. 28, 1934; petals were fading and melting; note elongated perianth tube, trumpet-shaped flowers and slender branched bostryxes.

[CALLICORE-BRUNSVIGIA—*Continued on page 146.*]

HEMEROCALLIS ALTISSIMA STOUT, SP. NOV.

The Tsu-kin-shan Daylily

A. B. Stout

The designation of this new species is based on 104 individual plants that have been grown to maturity at the New York Botanical Garden. Nine of these were wild plants transplanted from Purple Mountain, near Nanking, China, and 40 were grown from seeds of wild plants that

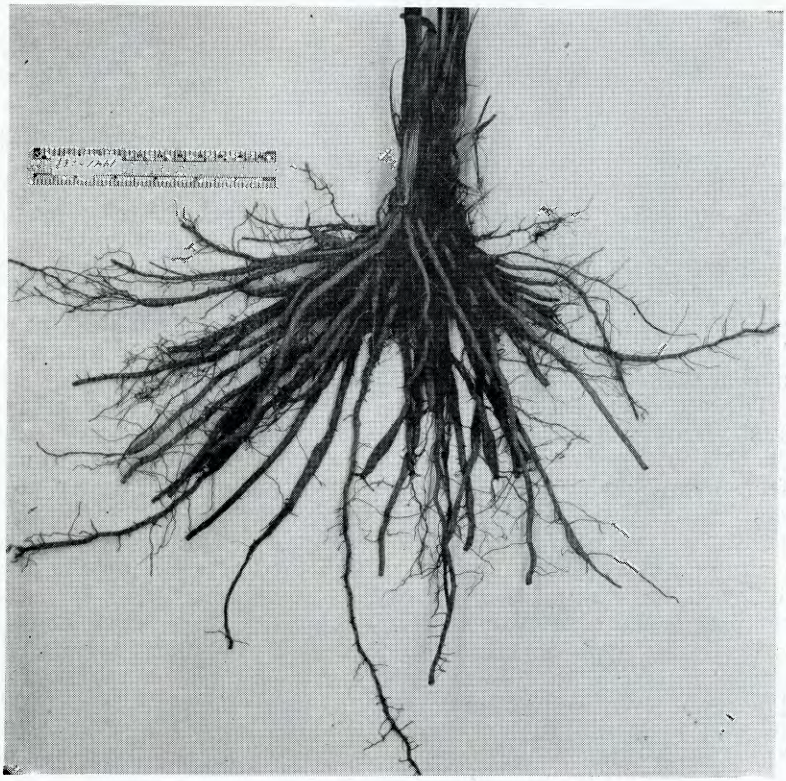


Fig 75. Roots, crown and base of leaves of Hemerocallis altissima sp. nov. Photo taken in November at end of growing season; most main roots are coarse cylindrical; some of enlarged roots are spindle-shaped and some have terminal enlargements.

grew on this mountain or near Chunchow about 50 miles from Nanking. These collections were made by Dr. Albert N. Steward. From seeds of controlled cross-pollinations involving two of the first plants from Purple Mountain, fifty-five seedlings have been grown to maturity. Of collections more recently made by Dr. Steward of seeds from "yellow-flowered daylilies that grew wild in the hills to the south and east of

Nanking'' a total of 189 plants are now being grown at The New York Botanical Garden and of these some have already flowered. All of these plants are very similar and sufficiently distinct from all other types of *Hemerocallis* known to the writer to warrant description as a new species.

A photograph of one of the first plants grown from seed that came from Purple Mountain is shown in plate 26 in the volume ''Daylilies''[1]. It may be considered that this plant is the type for the species *Hemerocallis altissima*[2] and that the others mentioned above are co-type plants. Herbarium specimens together with a series of photographs of the type and co-type plants are deposited in the herbarium of The New York Botanical Garden.

This species is herbaceous and perennial. Growth is discontinuous in autumn and plants are fully dormant during winter. The main roots are coarsely fibrous, and some of them are somewhat spindle-enlarged and occasionally abruptly so. Young roots are white, later they become yellowish, then noticeably orange in color, and when old they are brown-gray. The crown branches are short, rather erect and crowded, and without spreading rhizomes (See Fig. 75.). The foliage is medium-coarse in comparison to the other species of the genus; individual leaves are as much as 1.5 m. in length and usually no more than 3 cm. in width. The mound of foliage is ascending-spreading and it reaches a height of from 60 to 90 cm. (See Fig. 76.). In autumn the foliage becomes wiry and rich brown in color and remains in a conspicuous mound over winter. In spring the old foliage breaks in the crown leaving considerable fiber.

The scapes of well-grown plants rise to a height of from 1.8 m. to at least 2.2 m., and are the tallest for any species of *Hemerocallis* known to the writer. They are relatively slender and well-branched with usually from 5 to 7 nodes and with branches in the axils of nearly all the bracts (See Figs. 76 & 74.). No more than three bostryxes have been observed in a primary inflorescence and these have slender axes and as many as seven flowers to a bostryx. In the laterals below the primary inflorescence vegetative dichotamy is frequent; but also for certain of the plants many laterals have but one bostryx, a feature seldom seen thus far in any other species. The flowers (See Fig. 74.) are strictly nocturnal in opening. According to observations over a period of several years the flowers started to open at hours ranging from 3:00 to 5:00 P. M. and became fully open at hours ranging from 5:00 to 9:00 P. M. On many days a set of flowers of the previous night was fully closed at 5:00 A. M., but frequently in cool weather the flowers did not fully close until as late as 8:00 A. M. and occasionally the closing was still later in the forenoon. The flowers are fragrant, pale yellow in color, and trumpet-shaped with the perianth tube frequently as much as 4 cm. in length. The widely open flowers may have a spread of at least 10 cm. At The New York Botanical Garden the periods of flowering for the group of plants of this species during several years of observation have extended from the middle of July until late in October.

1 Daylilies, 1-119 pages, by A. B. Stout. 1934. The Macmillan Co., N. Y.
2 Brief reference to this species was made by Dr. Stout, **without Latin diagnosis,** in Jour. N. Y. Bot. Gard. 43:240. 1942.

There is considerable variation in the size and shape of the capsules borne by different plants. Well-developed capsules characteristic of different plants have ranged from one inch to one and one-half inches in length, and for some plants the shape is oval with a rounded apex while for others the apex is truncated. The seeds are black, smooth, and rounded or somewhat angled. In size they are intermediate between the large-sized seeds of *H. flava* and the small-sized seeds of *H. minor*. Counts of chromosomes have been made for two of the original plants from Purple Mountain and five of their seedlings, and for all of these the diploid number of chromosomes is twenty-two (2n = 22) which is the normal number for all known species of *Hemerocallis;* but there are, however, several triploid (3n = 33) clones of *H. fulva* in cultivation.

Fig. 76. Typical plant of Hemerocallis altissima sp. nov. Photo taken Aug. 5, 1941; rule is 5 feet tall.

Of the known species of *Hemerocallis* the *H. altissima* is similar to *H. Thunbergii* in habit of growth, color of foliage in autumn, and color of flowers. But the plants are much taller, the flowers are larger and have a longer tube, the season of bloom is later, and the flowers are more strictly nocturnal in opening. A type in cultivation in Japan (possibly a clone) described under the name *H. sulphurea* Nakai appears to be more like *H. Thunbergii;* at least the flowers are described as having perianth tubes only 2.8 cm. in length and the scapes are described as more than 60 cm. tall.

The type locality for wild plants of *Hemerocallis altissima* is Purple Mountain, Nanking, China; but the plants of this description are now growing at The New York Botanical Garden. The common or vernacular name here given to this species is an anglicized spelling and pronunciation provided by Dr. Roberta Ma from the Chinese name for Purple Mountain which in its entirety signifies Purple Enshrouded Mountain.

Herba perennis hieme dormiens, intermittenter augens. Radices crasse fibrosae vel satis fusiforme vel interdum abrupte dilatatae. Caudicis rami compacti; rhizomata nulla. Scapi ramosi usque 2.2 m. alti. Bostrychum axes graciles elongati, usque 7-flori. Flores pallide flavi suaveolentes nocturni infundibuliformes, in viciniis urbis Novae Eboracensis florentes ab medio mensis Julii usque finem Octobri. Capsulae magnitudine formaque variabiles, saepissime ovatae vel obovatae, 2-4 cm. longae. [Figs. 74, 75, & 76]

The New York Botanical Garden,
August 15, 1942.

AMARYLLIDS OF CEYLON[1]

T. H. Parsons, *Curator,*

Royal Botanic Garden, Paradeniya, Ceylon

The following species of amaryllids seem to be native to Ceylon although they may be found in India as well:

Crinum asiaticum, Linn.; It is commonly known as "Tolabo" in Sinhaleae and as "Vichamunkil" in Tamil. It is very common along the sandy sea coast chiefly in moist regions and it flowers in February-May producing white, sweet-scented flowers.

Crinum defixum, Ker. It is known as "Hin-tolabo" in Sinhaleae. This species differs from *Crinum asiaticum* in the possession of larger bulbs, leaves smaller and very much narrower. The flowering umbel produces about 6-15 flowers while in *Crinum asiaticum* 10-30. It flowers between March-July. The filaments are white, and the style is purple.

Crinum latifolium, Linn. This has a larger bulb than any of the other Ceylon crinums. The leaves are smaller than in *Crinum asiaticum* but larger than in *Crinum defixum.* The style is longer than the stamens.

---

1 A similar report by Mr. Parsons (Herbertia 3:79. 1936) was published in a former issue, but the present article includes additional species, and in most cases the descriptions are more detailed. We are grateful to Mr. Parsons for remembering us in these troublous times.—**Ed.**

Crinum zeylanicum, Linn. It is found in damp places in the low country. It is very common, but seems to show great variations. The bulb is 6-8 inches in diameter; leaves few, short and undulate; flowers white with pink or purplish stains down the center.

Pancratium zeylanicum, Linn. It is known as "Wal-lunu" in Sinhaleae. The bulbs are very small, 1½ to 2 inches in diameter, leaves linear-lanceolate, 5 to 11 inches in length, acuminate. It flowers in January; flowers white, fragrant. It is also found in other parts of tropical Asia.

Pancratium verecundum, Ait.

Pancratium triflorum, Roxb. *(Hymenocallis tenuiflora,* Herbert.)

INTRODUCTION OF HEMEROCALLIS SPECIES TO BRITISH GARDENS

FRED. J. CHITTENDEN, *England*

There is always interest and often difficulty in trying to discover when and how plants came from their native homes to our gardens, and it is sometimes not easy to discover where their native home was. The universally loved Madonna Lily and the Blue Flag Iris are good examples of this, and so also is Hemerocallis. Linnaeus knew two forms of Hemerocallis which he distinguished in the 2nd edition of his Species Plantarum in 1762 as *H. flava* and *H. fulva;* but at first he had treated them as varieties of one species under the names *H. Lilio Asphodelus (a)flavus* and *H. Lilio Asphodelus (B)fulvus*—that was in 1753. The name Hemerocallis existed long before this, however, for it is found in the writings of Dioscorides and Pliny who used it at the very dawn of the serious study of plants. Dioscorides gave the name to a yellow-flowered Lily, and as it fits so well the fleeting nature of the flower, his plant may well be our *Hemerocallis flava.* Did he then know it as a wild plant or had it even then been introduced from some remote region into cultivation? *H. flava* and *fulva* have been recorded as growing wild and sometimes fully naturalized in large masses in various parts of Central Europe: *H. flava* as wild in S. France, Italy, Caucasus, W. Siberia and Japan: *H. fulva* as wild in S. France, Italy, Mid and S. Russia, and Transcaucasus, but there has always been a feeling that their true home lay in the far east—in China perhaps—for it is there or thereabouts that the other species of the genus have been found.

There is nothing innately impossible in the idea that they may be wild in Europe though their nearest relatives have their home thousands of miles to the east. There are examples among other plants. Forsythias

belong to China and Korea, but *F. europaea* is a native of Albania; Philadelphus belongs to E. Asia and N. America, but *P. coronarius* is a native of S. E. Europe; Spiraea too belong in the main to E. Asia and N. America, but some species are native of S. and S. E. Europe, though there are here connecting species across the continent of Asia.

Does such evidence as we have point to their indubitable wildness in Europe? Vernacular names sometimes help to clear up the matter where common or conspicuous plants are concerned, and these are certainly conspicuous. Yet the vernacular names seem to be such as are imposed, not such as arise spontaneously among the bulk of the people, like our Daisy and Buttercup, or the American Mayflower and Black-eyed Susan. The names in Germany are *Taglilie* and *Tagschöne;* in Holland, *Daglilie;* in Italy, *Giglio turco;* in Roumania, *Crini-galbeni;* Czecho-Slovakia, Denivka; in Croatia, *Ljiljanka;* translations or near translations of Hemerocallis as is our own name, Day-Lily. There is no confirmation of European nativity here, and there is direct negative in the fact that, as Focke pointed out in 1888, *H. fulva* never sets seed. It is no uncommon thing for a plant to be infertile to its own pollen. The common field poppy is, yet if pollen of another seedling field poppy finds its way to the stigma seed is set abundantly. But no two plants of *H. fulva* have been found to fertilize one another, and in fact all the plants are but pieces of one carried from place to place by one means or another and establishing themselves so well as to become quite at home. *H. flava* sets seed with its own pollen but seldom and, again as Focke reported, the seedlings are often without chlorophyll and unable to maintain themselves; but foreign pollen, i.e. pollen from another seedling of *H. flava,* results in full fertility.

H. fulva does not seem to have been found truly wild anywhere yet, but closely allied forms have come to our gardens from Japan. A double-flowered form *(flore-pleno* with a synonym *H. disticha fl. pl.)* came to this country in 1860, and 4 years later a double flowered variegated form called *Kwanso* fl. pl. also came from Japan, but the flowers are less double than in *flore-pleno.* There is also a variety with flowers similar to *Kwanso fl. pl.* but with green leaves, while var. *Cypriana,* with bright glossy green leaves and a larger number of flowers in the inflorescence than in the type, came to us from China in 1906, its flowers being brownish outside. Whether this is the origin of our old *H. fulva* to which Dr. Stout has given the name "Europa" or not remains to be seen. Another variety, *maculata,* which has slightly paler flowers with a darker median band came also from China in 1897.

The evidence we have then points, not to Europe as the native home of *Hemerocallis fulva,* but to eastern Asia and Mr. G. P. Baker in the Journal of the Royal Horticultural Society, 1937, finds no difficulty in supposing that it came thence quite early in the Christian era or before, by the trade routes along which so many Chinese commodities found their way to Antioch and the civilization of southern Europe. Whether it was the beauty of the flower or some real or assumed medicinal virtue that led to its introduction is not clear. It had both, but it was usually the latter that in early days most recommended a plant to cultivators.

Be that as it may both *H. flava* and *H. fulva* arrived in England sometime before the end of the sixteenth century and had become well known when John Gerard wrote his Herbal, published in 1597. Apparently John Gerard did not like *H. fulva* very much for the following is the bulk of his remarks: "This plant bringeth forth in the morning his bud, which at noone is full blowne, or spread abroad, and the same day in the evening it shuts itself, and in a short time after becomes as rotten and stinking as if it had been trodden in a dunghill a moneth together, in foule and rainie weather; which is the cause that the seed seldome followes, as in the other of his kinde, not bringing forth any at all that I could ever observe; according to the old proverb, Soone ripe, soone rotten". Perhaps they had been brought here by the Crusaders but there seems no clear indication as to when they actually reached our shores.

There appear to have been no new forms introduced until the impetus given to botanical discovery by the enthusiasm imparted to his students by Linnaeus, and all subsequent immigrants came from eastern Asia. First came *H. minor* in or about 1768 which Philip Miller, the great head of the Chelsea Physic Garden briefly describes in the 8th Edition of his Dictionary; then about the end of the eighteenth century, came a form of *H. fulva,* published as *H. disticha* in 1798 and figured by Robert Sweet in his British Flower Garden in 1823: it was distinct from the original of *H. fulva* but so much like it that it is clearly conspecific.

In the first half of the nineteenth century there began a closer connection between China and even Japan and the western world, and an opportunity occurred for a greater influx to our gardens of the plants of those lands so rich in the gifts of Flora. It was Philipp Franz von Siebold who found favour with the Emperor of Japan and whose enterprise led to many a good garden plant reaching us. Among them was the dwarf *H. Dumortieri* which reached Europe in 1832, and before long it came to our shores and was grown also as *H. rutilans* and *H. Sieboldii.* Then in the second half of the century about 1860 from Japan there came *H. disticha fl. pl.* and in 1862 *Kwanso fl. pl.* both double forms of *H. fulva.* Messrs. Veitch the great nurserymen of Chelsea grew and showed them, and later first *H. Middendorffii* in 1887, then *H. aurantiaca* about 1890 and the form of the latter so well known as *H. aurantiaca major* about 1895. The dates given are for the most part those in which the plants in question were shown before the Royal Horticultural Society in London and thus are a little later than the actual year of introduction. Some of them came to us direct from Japan, but others via various botanical gardens on the Continent, for there has always been exchange of plants between these gardens.

The introductions from China during the present century, especially through the great collectors E. H. Wilson and G. Forrest have added a few charming plants to our gardens, such as *H. Forrestii, H. nana* and *H. plicata;* others have come via America where Dr. Stout's enthusiasm for the genus has resulted in the attainment of still other species, but none of them has so far gained a really sure foothold in English gardens

generally and possibly they will not; for a host of beautiful garden-raised hybrid seedlings now competes with them for favour, and many of that host—of which others will tell—of both English and American birth are likely to claim preference.

DAYLILY ADAPTATION

Hamilton P. Traub

Since reporting on daylily clones originated by the writer in Florida in 1940 Herbertia, the opportunity was afforded to test these clones farther north at Beltsville, Maryland, near Washington, D. C. All of these were grown from the summer of 1940 to the summer of 1942 in gravelly clay loam on a knoll—a very severe test—and some also in a silty clay loam on a lower site. On the exposed knoll no plants were lost from winter killing but on the lower location some plants did not sprout in the spring. The whole question of winter hardiness of daylily clones needs to be thoroughly investigated to clear up the reports of winter killing in Illinois, Massachusetts and other regions.

During the flowering season notes were taken on the effect of sunshine on the condition of the flowers, and this information is summarized in Table 1. The flower condition at 6 p. m. is indicated on the scale,—*Excellent*, as good as or better than on first opening; *Good*, slightly less presentable on hot days; *Fair*, markedly off grade by the afternoon; *Poor*, flower fades in the morning and is not presentable in the afternoon on hot days.

In Table 1, the ratings under Florida conditions are contrasted with those under the less hospitable environment in the vicinity of Washington, D. C., at Beltsville, Md. Under these conditions, a number of clones received a lower rating and should be discarded for that region. Surprisingly some clones did better than in Florida. Plant habit and flower size could not be scored finally in all cases since some plants were small, and all were not grown under optimum conditions but rather under hardly average good culture. However, preliminary ratings have been made. The perigone segments of *Theodore Mead* and *Indian Chief*, for instance, were much shorter than under Central Florida culture.

It is the writer's opinion that all clones rating *Fair* or *Poor* in flower condition should be discarded without delay, and those rating *Good* should be kept until superceded by similar better clones. Those rating *Excellent* have permanent value.

(1) Clones rating *Excellent* will only be displaced, if at all, as a result of keen competition as daylily breeding progresses. In this class are *Carnival, Corinne Robinson, Dr. Stout, Duchess of Windsor, Emberglow, Fire Red, General MacArthur. Georae Kelso. Golden Glow, Granada, Helen Wheeler, Indian Chief, John Blaser, Lidice, Mildred Orpet, Theodore Mead, Victory Taierhchwang* and *Wekiwa.*

(2) Clones rating *Good* are distinct and valuable in themselves and for further breeding work, some representing distinctly new departures, but should yield their place to similar better clones when they appear.

This class includes *Dr. Hughes, Happiness, Elaine, Fred Howard, La Tulipe, Mayor Starzynski, Cecil Houdyshel, Peony Red, Queen Wilhelmina, Reba Cooper, Rouge Vermilion, Russell Wolfe, San Juan, St. Joan,* and *Victory Montevideo.*

(3) Clones rating *Fair* and *Poor,* and also some rating *Good* for flower condition, have been marked for discard. Some not so marked apparently have been superceded and should also be discontinued. Plants

TABLE 1

Comparative rating of daylily clones in Florida (1940) and Maryland (1942).

Clone	Flower condition at end of day:1				Ratings:	
	Excellent	Good	Fair	Poor	Florida 1940	Maryland 1942
Audrey Blaser			*		7.8	Discard
Carnival	*				9.6	9.8
Cecil Houdyshel		*			8.0	8.5
Charlotte Traub		*			8.5	Discard
Corinne Robinson	*				9.0	9.0
Dr. Hughes		*			9.0	8.5
Dr. Stout	*				9.8	9.8
Duchess of Windsor	*				9.8	9.8
Elaine		*			9.0	8.7
Emberglow	*				9.0	9.0
Estelle Friend			*		8.0	Discard
Fire red	*				8.8	9.0
Fred Howard2		*			9.5	8.8
General MacArthur	*				9.9	9.9
George Kelso	*				9.6	9.7
Gloriosa		*			7.6	Discard
Golden Glow	*				8.6	9.6
Granada	*				9.0	9.5
Happiness		*			8.5	8.6
Helen Wheeler	*				8.5	9.0
Indian Chief	*				9.6	9.2
John Blaser	*				8.8	9.6
La Tulipe2		*			9.6	8.8
Lena Hughes		*			8.0	Discard
Lidice3	*				8.8	9.8
Mauve Rose				*	7.5	Discard
Mayor Starzynski		*			9.5	9.0
Mildred Orpet	*				9.8	9.8
Peony Red		*			9.0	9.0
Queen Wilhelmina		*			8.6	8.6
Reba Cooper		*			8.5	8.6
Rouge Vermilion		*			8.6	8.9
Russell Wolfe		*			8.5	8.7
San Juan		*			9.1	9.0
St. Joan		*			9.0	8.5
Theodore Mead	*				9.8	9.8
Victory Montevideo2		*			8.5	8.8
Victory Taierhchwang	*				8.5	9.2
Wekiwa	*				8.5	9.2

1 **Excellent**=as good or better at end of day; **Good**=still quite presentable; **Fair**=markedly affected; **Poor**=flower not presentable.

2 Clone especially valuable for further breeding work.

3 The original name, **Victory Suomussalmi** was so often misspelled that it was necessary to replace it with the more simple name. It seems fitting and proper to name it in honor of the martyrized City of Lidice.

of all of these have been donated to others for trial, but in the light of these tests should not be listed in commercial catalogs,—*Audrey Blaser, Charlotte Traub, Estelle Friend, Gloriosa, Lena Hughes, Mauve Rose.*

Visitors who saw these clones in Maryland were uniformly charmed by practically all of these 39 clones, representing great variation in flower shape, size, flower color and pattern, and substance. Most daylily enthusiasts are discarding the idea that they want all the flowers to

be of bright obvious colors and of one shape—large, full flower form. They realize that we must have infinite variety in order to make any plant permanently interesting. And pastel shades are much more soothing and pleasing than obvious colors. *Peony Red* was described, for instance, from the Maerz and Paul Color Dictionary and represents Peony species red. However, one visitor was disappointed that it was not a different red. *Lidice,* which blooms over a very long period, was a universal favorite. The ladies particularly liked *Carnival,* a very unusual color pattern of gay abandon, but one or two men did not like it apparently because they could not classify it.

These clones will now be tested in coastal California under conditions where *Fulva Europa* flowers from spring to early winter—in the fall its flowers are an excellent rosy pastel and they last from two to three days. Most likely it will be necessary to breed an entirely new race of clones that are adapted to the conditions of this coastal valley.

THE PROBLEM OF EVALUATING HEMEROCALLIS CLONES

L. H. MacDaniels, *Cornell University*

As a newcomer in the American Amaryllis Society perhaps the appropriate thing to do would be to keep still at least until there was adequate opportunity to become better acquainted with society policies and its members. However, I find myself placed on two of the Society's Committees and have been encouraged to state an opinion as to what might be done by these. This I am pleased to do though it is with the realization that better acquaintance with the Society and its problems may change present opinions. There is some merit in the idea that a newcomer who is sympathetic with the aims of the Society might possibly have a better perspective regarding some matters than some of those who have been associated with the Society from the first.

Some ten years ago while casting about for a group of plants with which to work as a hobby, the advice of Dr. L. H. Bailey was sought. He suggested the Amaryllidaceae as a group with wide diversity of form and color and comparatively little known and used by gardeners. At the time some effort was spent in examining the literature and it was decided that because of the lack of hardiness of many of the genera and difficulties of handling with the facilities available, it was inexpedient to try it. The Liliums were chosen instead and through the years have afforded ample interest and opportunity for work. The recent change to Floriculture as a profession instead of a hobby makes it possible to extend my interest to include this closely allied group of plants.

Obviously one does not become familiar with so varied and widespread a group as the Amaryllids overnight and a glance through the volumes of HERBERTIA makes it clear that there is much to learn. Early this summer I was fortunate enough to visit Beltsville, Maryland, and to be introduced by Dr. Traub to some of his selections in a garden and the large number of seedlings growing in the Station grounds. Some time was spent going around with Dr. Traub and Dr. Cooley as they

made selections from the many seedlings which were blooming for the first time. There were so many of great beauty and good substance that it was difficult to know what to discard. Flowers that did not stand up under the trying summer sun were rigorously eliminated—No matter how beautiful earlier in the day.

In Dr. Traub's garden, many of his own originations were growing. The plants were just getting established and the soil was none too favorable. Nevertheless many of the plants were blooming well and showed a surprising range of form and color from delicate pastels to the clear orange and yellow "selfs", and the more somber browns and reds. In the garden of Dr. Cooley, many of the older standard sorts were growing in the perennial border. The plants were in well established clumps and blooming profusely. Hundreds of seedlings were also growing luxuriantly in the back garden where cultural conditions made blooms of exceptional size and substance.

Observing these gardens and recalling the large plantings of Dr. Stout at the New York Botanical Garden brings home to me the large number of clones that are being selected, named and introduced. It is obvious that the Hemerocallis breeders are going through the same sort of cycle that has been followed by the breeders of Dahlias, Iris, and Gladiolus. At first in such a cycle, all varieties that have any merit are named and introduced. Later as progress in breeding is made, the number of breeders and their enthusiasm increases and new clones are introduced in quantity. At this time the need for some control is recognized and scoring schedules and rating committees are organized. On the basis of experience gained, satisfactory standards are established. All varieties are judged according to these standards and many discarded from the lists and from the trade. Finally, a sort of equilibrium is reached in which new varieties are thoroughly tested before naming and only clones of exceptional merit are introduced.

To me it appears that the Hemerocallis breeding of the Society is about midway in the cycle. Certainly the increase in the named clones has been phenomenal and continues so. Judging schedules have been set up and ratings given at least to the clones growing in the Florida gardens by J. V. Watkins and H. P. Traub and W. Hayward (HERBERTIA 1941). It remains now for a judging committee or committees to evaluate the different clones as they are grown in different parts of the country. In this process it may be expedient to modify the judging schedule which has been formulated as it is only by experience that such schedules are finally put into satisfactory shape. The committees for evaluating clones have already been set up and it is my intention to work with these in an attempt to have the evaluating done as soon as may be expedient. The present war situation puts restrictions on travel and will of course, impede this program. However, it is something which all members should keep in mind.

In order to facilitate the evaluation of clones grown in different parts of the country, it is highly desirable to establish test gardens in as many localities as possible. It has already been pointed out by Mr. Shull that this is a difficult and expensive thing to do. In some places

test gardens may be set up at universities and experiment stations where facilities for maintaining test gardens are already in operation. The test planting at Cornell University already has a good start through the efforts of Prof. Watkins of Florida and Dr. Traub. Dr. R. C. Allen has immediate supervision of the planting. Similar official Society test gardens* have been established at the University of Florida, the Southwestern Louisiana Institute, the Texas Agricultural Experiment Station, and by the Park Boards of Milwaukee, Wisc., and Des Moines, Iowa. Others will be authorized as the program develops. A summary of their accomplishments will be included in 1943 HERBERTIA. But we must rely in considerable part on amateurs who have the evaluation of varieties at heart and who will cooperate in getting together collections of clones for the scrutiny and scoring of the judges.

These test plantings can not be carried on indefinitely even at the experiment stations because of their expense. As I see the problem, collections should be assembled in different localities and different clones given a rating and discards made. Eventually the problem will boil down to maintaining a collection of the best clones for demonstration and observation with a relatively small area given over to testing of new introductions.

The whole matter of varieties is one with which all branches of Horticulture have to contend. With fruit varieties the problem is simplified somewhat in that a new sort to be worthy of trial at all must show real promise. The success or failure of a fruit variety depends on its capacity to make money for the grower. No grower except the amateur will attempt to grow a new variety until it has been tested rather thoroughly. With ornamentals such as the daylily, there is no such economic consideration and there is the tendency to introduce far too many new clones even though they can not be recommended as superior to the established older sorts. Introduction of a large number of new clones becomes a real detriment to the progress of the Society because buyers are disappointed in the performance of the new varieties in comparison with the old. Just because a clone is new is no real recommendation.

It appears to me that any system of scoring and evaluation by a committee of society members is almost sure to fail unless the hybridizers themselves use great self restraint in making their selections and introductions. As soon as the Society sets up a board that has to be too arbitrary, there are likely to be antagonisms aroused which are unfortunate for the Society. I have sometimes thought that the variety situation might be likened to a procession or parade passing in review. In the parade at any one time, are old varieties which because of merit have withstood the test of time and are still going strong, and also those which are beginning to fall behind. Along with them are the new introductions which have recently joined and which show promise. As time goes on, stragglers fall out and remain as names only. New sorts may forge ahead in the line or if they lack merit, they too are left behind. Certainly the variety parade is in a continuous state of flux.

* Complete addresses are given under Roster of Officers and Committees.—**Ed.**

With many flowers and fruits the clones that were once important have fallen by the wayside and their places taken by newcomers of greater merit. Carrying this idea further, it is the duty of the evaluation committee to see that really promising newcomers get a place in the line, but also that many that are unworthy never join it at all and also that the older mediocre sorts are left behind and forgotten. Varieties of doubtful merit may well be tested at the test gardens, but they should not be placed in the trade. This testing and rating of clones should be a family affair and kept mostly within the Society. That this is a difficult task has already been pointed out by Mr. Shull in the 1941 HERBERTIA.

An aid in the evaluation of new varieties will be a check list of all introductions. This should be compiled by the evaluation committee and might well be prepared for the 1943 yearbook. Such a list would be a starting point for the evaluation committee's use in the future.

At the present time, I am not sufficiently familiar with research needs in the Amaryllidaceae to give a valid opinion as to what is most desirable. An examination of the yearbooks of the Society indicates that much valuable work has already been done and that it will take careful consideration to determine where emphasis may best be placed. In any case in a Society of this sort, research certainly should be encouraged on the part of the amateurs who have interest in special problems.

In conclusion let me say I am well aware that at the present time my knowledge of Hemerocallis varieties is entirely inadequate to be a competent judge. It is however, possible to be of service to the Society in organizing the evaluation program and this I expect to do with the help of those in the Society who are interested in this group of plants. Because of the war situation, undoubtedly our program will be delayed. We can, however, all work along with it in so far as may be expedient. With each of us, working with plants is, I am sure, a source of recreation and as such many will be kept going during this time of stress.

UNIVERSITY OF FLORIDA DAYLILY TRIAL GARDEN

More than 250 plants representing 50 standard clones were sent to the Regional Test Gardens by the University of Florida in July 1942. Under the direction of John V. Watkins, the Daylily Display Garden on the Campus of the University of Florida has become well known to gardeners in the Lower South during the past decade. The exchange plants were divided from the large clumps that are growing "in threes" in the permanent beds of this experimental planting. As new introductions become sufficiently large, divisions will be offered each season to the directors of the gardens that are cooperating in the regional testing of *Hemerocallis*. —*Ed.*

EVALUATION OF DAYLILIES FOR NORTHERN FLORIDA

JOHN V. WATKINS
Assistant Professor, Horticulture
University of Florida

These notes follow an original article by the same title that was published in HERBERTIA, volume 8. The evaluations are based on observations and data taken in the garden at the home of the writer. The clones were acquired, for the most part, in the summer of 1941 and were planted in their present locations in September 1941. The official score card for rating Daylily clones on page 126, 1940 HERBERTIA, was used in arriving at the numerical values.

3. CLONES IN COMMERCE LESS THAN THREE YEARS.

Clone		*Rating*	*Clone*		*Rating*
Afterglow	(Stout)	9.4	*Port*	(Stout)	9.1
B. H. Farr	(Stout)	9.6	*Queen Bess*	(McDade)	8.1
Bicolor	(Stout)	9.5	*Red Bird*	(Stout)	9.5
Charmaine	(Stout)	8.9	*Takoma*	(Norton)	9.0
Dominion	(Stout)	8.7	*Taruga*	(Stout)	9.7
Mermaid	(McDade)	8.1	*Wolof*	(Stout)	9.4
			Welaka	(Watkins)	9.5

SUMMARY OF CLONES IN COMMERCE FOR LESS THAN THREE YEARS.

Numerical Ratings:	*Number of Clones:*	*Percentage:*
9.6 - 100 Excellent	2	16.0
9.1 - 9.5 Very good	6	50.0
8.6 - 9.0 Good	3	25.0
8.1 - 8.5 Fair	1	9.0
		100.0

AMARYLLID GENERA AND SPECIES

In this department the descriptions of amaryllid genera and species translated from foreign languages will be published from time to time so that these will be available to American and British readers.

Ixiolirion karateginum, Lipsky, acta horti petropol. 18:108-110. 1901.

Plant 2 inches to half a foot or almost a foot high. Bulb ovate, the segments oblong-ovate, gray-brown. Stem mostly with the greater part sunk in humus, the free part straight, much exceeded by the leaves. Leaves 3 or 4, linear, plicate, long-attenuate toward apex. Flowers 2 to 7, small (sometimes very small, not larger than those of *Gagea),* pale lilac or almost white, subumbellate, subtended by scarious-margined bracts. Corolla (living) rotate, the tube short, the limb spreading, 4 times longer, the inner segments obovate, the outer linear-elliptic, all green-mucronate-apiculate at apex and attenuate at base, forming a tube. Anthers subglobose or a little longer than wide, sulphur-yellow, the filaments white.

In habit, method of growth and flower color near *I. Kolpakowskianum* Regel, but differing however in much smaller flowers, in the proportions of the perigonium, the segments broader and of different shape, the tube proportionately shorter, the anthers punctiform, the filaments conform, not unequal.

Habitat.—Buchara, Prov. Karateginjugum

Boophone disticha (L. f.) Herb. var. *Ernesti-Ruschii* Dtr. & G. M. Schulze, Bot. Jahrb. Engl. 71:520-521. 1941.

Differs from B. disticha (typical) in having white flowers, the spathe about 2 cm. long, the pedicels about 3.2 cm. long or shorter, the perianth tube about 0.5-0.6 cm. long, the perianth segments about 2 cm. long.

Gethyllis Angelicae Dtr. & G. M. Schulze, new sp. Bot. Jahrb. Engl. 71:521-522. 1941.

Bulb unknown, covered with a scarious collar of bulb scales; leaves numerous, narrowly linear, glabrous, widened toward base, up to about 15 cm. long, about 0.1 cm. wide; perianth tube cylindrical, the larger part included in a collar of scarious scales, about 6.5 cm. long or longer?, dilated toward the throat like a funnel, the segments of the perianth oblanceolate, about 4.5-5.5 cm. long, about 1.5-2 cm. wide; stamens 6, inserted in the throat of the perianth, the filaments about 0.3-0.4 cm. long, the anthers 3 on each filament, varying in length among themselves, up to 2 cm. long; style varying in length, more or less exserted from the throat.

Cryptostephanus Merenskyanus Dtr. & G. M. Schulze, Bot. Jahrb. Engl. 7:522-525. 1941.

Rhizome tuberous, ovoid, about 3 cm. long, 2.5 cm. thick; leaves strap-shaped, long sheathing (the sheath tubular), rounded at apex, altogether about 60 cm. long, about 3.5 cm. wide; scape erect, about 29 cm. long, about 1 cm. wide; valves of the spathe several, lanceolate, up to 4 cm. long; umbel lax, the flowers pedicellate, the pedicels varying in length, about 2 cm. long; tube about 3 cm. long, the perianth segments ovate-lanceolate, papillose at apex, about 1 cm. long, about 0.4 cm. wide; corolla scales 12 fleshy, small, toothlike gibbosities situated in pairs at the base of filaments, about 0.1 cm. long and broad; filaments filiform, dilated at base, exserted from the throat of the perianth tube, about 0.3 cm. long; anthers oblong-sublinear, about 0.5 cm. long; ovary subovoid, about 0.6 cm. long, about 0.3 cm. wide; style equal to the perianth, or exserted from the perianth?

Cryptostephanus (?) Herrei Leighton, South Afr. Gard. 22:137, 143. 1932.

Leaves 2 each year, strap-shaped, emarginate at apex, glaucous, up to 34 cm. long and 4.5 cm. wide; peduncle flattened, 36 cm. long, 1.5-2 cm. thick; spathe valves 4, narrowed upwardly, 7 cm. long, 1.2 cm. wide at base; pedicels 3-4 cm. long; flowers pendulous; perianth rather thick in texture, the tube red, 3-3.5 cm. long, the outer segments 1.5 cm. long, 6 mm. wide, the interior segments 1.4 cm. long and 7 mm. wide, greenish-yellow; corona composed of 12 scales 1.5 mm. long; filaments 6 mm. long; anthers 3 mm. long, attached at the middle; ovary obscurely angled, 8 mm. long; style equalling the perianth.—Richtersveld, Karrachab, Namaqualand, Africa, collected by Herre (S. U. G. 3461). Flowers in March and April.

Cryptostaphanus haemanthoides Pax, Engl. Bot. Jahrb. 15:142-143. pl. 7. 1893.

Leaves unknown; scape low, thick; spathe valves many, reflexed, linear, acuminate; flowers dark purple, very numerous, crowded, pedicellate, the pedicels equalling the flowers or a little shorter; perianth tube cylindrical, elongate, straight, a little widened toward the throat, the segments ovate, a little bearded at apex, one half shorter than the tube, spreading or subreflexed; corona composed of 12 free, linear, yellow scales, one half shorter than the perianth, situated in pairs between the filaments; filaments short, inserted on the perianth tube between the corona scales, flliform, adnate to the tube, decurrent, exserted from the throat together with the corona scales; anthers oblong-linear, equal to the filaments; ovary subglobose, 3-celled, the cells many-ovulate; style filiform, exserted from the throat, exceeding the anthers, crowned with a very small stigma.

FOREIGN AMARYLLIDS WANTED

In this section, the names and addresses of those who desire to import amaryllids from foreign countries are entered. There is a very great need for the importation of new species for use particularly in hybridizing.

Mr. L. S. Hannibal, Concord, Calif.
Mr. W. M. James, Ojai, Calif.
Mr. Cecil Houdyshell, La Verne, Calif.

Note.—Those interested in importing amaryllids should send in their names to the Secretary for inclusion in 1943 HERBERTIA. —*Ed.*

REGISTRATION OF NEW AMARYLLID CLONES

Description of new clones of hybrid amaryllids for this section should reach the editor by June 1 if at all possible. Information sent after that date may be held over to the next issue if space is not available. This information is published to avoid duplication of names, and to provide a place for authentic recording of *brief* descriptions. Names should be as short as possible—*one word is sufficient.* It is suggested that in no case should more than two words be used.

At present there is a limit to the number of descriptions included from any one member. Hereafter not more than five brief descriptions of clones under each generic heading will be published free of charge from any one member in any issue of HERBERTIA. Additional descriptions will be published in the advertising section at regular ad rates. The first five descriptions will appear in this section and the excess will be continued in the section entitled, "Buyers Guide".

HYBRID DAYLILY (HEMEROCALLIS) CLONES

Trial Gardens. Cooperative daylily trial gardens have been established at (1) *Cornell University, Dept. of Floriculture, Ithaca, N. Y.;* (2) *University of Florida, Dept. of Horticulture, Gainesville, Fla.,* (3) *Southwestern Louisiana Institute, Dept. of Horticulture, Lafayette, La.;* (4) *Whitnall Park Arboretum, Milwaukee City and County Park Board, Milwaukee, Wisc.;* (5) *Texas Agricultural Experiment Station. Dept. of Horticulture, College Station, Texas;* and (6) *Des Moines Park Board, Des Moines, Iowa.* [Complete addresses are given under *Officers and Committees,* below.]

Introducers should send complete collections of hybrids to these cooperating agencies in order that the new daylily clones may be impartially evaluated.

Introduced by Glen Saint Mary Nurseries Company, Glen Saint Mary, Florida. Originator, John V. Watkins.

Welaka. Foliage very narrow, gracefully horizontal spreading, to 18 inches in height. Scapes slender, somewhat declinate, to 29 inches, once branched in the upper three inches. The blossoms, opening in late

May in Gainesville, Florida, are medium sized, of good substance, distinctly crepe-like and rippled in texture. The color is Mandarin Orange (M&P* Plate 11 B-2) suffused with a rosy fulvous tone. The flowers are quite distinct from those borne by the commercial varieties that are growing in the Daylily Display Garden at the University of Florida. This seedling resulted from five generations of selective breeding and has been under observation since it first bloomed in May 1939.

Introduced by Willard M. Kellogg, North Granby, Conn.

Cantabile. Height: 27 inches; bloom size 4½ in.; sepals ⅞ in. wide; petals 1¼ in. wide; sepals—cream flushed rose; petals rose, cream band, fluted cream edge; yellow throat. Branching: Fair; substance: Very good. Season: Medium early.

Tigridia. Height: 26 inches; Bloom size: 4¼ in.; petals—1½ in.; Sepals—⅞ in. wide; flower almost identical in form to the Tigridia; Effect of pure copper orange with overlay of sparkling gold; heart deep gold; texture very pebbly, somewhat like seersucker cloth. Branching: Excellent—span of 1 foot. Substance: Excellent, very firm. Season: Medium early.

Pink-a-Boo. Height: 36 in.; size: 3 in.; P—1 in.; S—½ in. wide; effect of pink mauve, lighter at edges, gold heart; by Dictionary of color: plate 10, 9A with hint of muskmelon rose, and mauve. Substance: Good, fades evenly. Branching: Excellent, 12 inch span. Season: Early.

Bold Commando (Thompson-Kellogg). Height: 60 inches; size: about 4½ to 5 in.; scarlet red with center band of cream yellow. Substance: Excellent. Season: Mid.

October Sunset. Height: 42 inches; size: 4 in. P—1⅛, S—¾ in. wide; effect: rich chestnut red self. It does not burn, and does not fade severely. By chart—much brighter and more intensified than Pheasant Testaceous. Halo of Korea. Substance: Very good and firm. Branching: High, poor, but foliage so remarkable as to discount high branching, for the lush leaves reach to a height of 31 inches. Season: late, here almost all August.

Totem. Height: 44 inches; size: 5 in; S—1″; P—1¼″ wide; bright almost scarlet; self except for glowing gold heart; fades but very little. Substance: Excellent, very heavy. Branching: Fair.

Cathedral Window. Height: about 42″; size: 4½ in. across; effect of bright rose and copper blend. Substance: Good to excellent. Season: Mid.

Blood. Height: only about 26; Size: 4″; effect is of pure velvet red—or rather blood-ruby, very deep. Substance: Extremely heavy. Season: Mid.

Mandalay. Height: 40″; size: 4″ across; S—¾; P—1¼″ wide; effect of brilliant pink blend, a pinker Talisman rose. Substance: very stiff and smooth; holds up all day. Season: Long, early to mid.

* Maerz and Paul, A Dictionary of Color.

Seminole. Height 40 in.; flower 4½ in.; P—1½; S—1 inch wide; bright bicolor, approaching blend of orange red and peach; substance excellent, fades, but very attractively; heavy ruffles stay fresh for a long period; midseason.

Introduced by Eric E. Nies, Hollywood, Calif.

Rosy Day. Height 3 ft.; medium yellow throat, sepals yellow, edges washed with rose; petals, inner half yellow, outer half rose; segments recurved except lowest which extends forward without recurving; very fragrant.

Introduced by Robert Wayman, Bayside, Long Island, N. Y.

Apache—29 in.; flowers 7 in.; narrow segments Dragon's Blood Red, wider segments orange cinnamon on center portion with star of bordeaux. Golden yellow throat.

Bordeaux—44 in.; flowers 5½ in.; rich velvety Bordeaux, uniform throughout, just faintest hairline of lighter tone down center of wider segments. All petals smooth as satin and recurved.

Brilliant—32 in.; flowers 6 in.; pure carmine, lighter narrow hairline down center of segments. General effect, brilliant carmine self with bright orange star at throat. Perfect form, petals recurved.

Brown Beauty—32 in.; flowers 5 in., soft brown tone, an artist termed it copper bronze.

Brown Symphony—34 in.; flowers 5 in.; Hazel to Coffee Brown with Hays Rust star and soft yellow vein down center of segments. Nicely formed.

Carmine Champion—42 in.; flowers 6 in.; pure carmine self; Huge flowers of fine form.

Carmine Gem—32 in.; flowers 6 in.; Carmine self with a brilliant orange throat.

Duchess—32 in.; Nopal red.; segments recurved and uniform in color.

Exquisite—40 in.; flowers 6½ in.; Pure Pompeian Red. Color uniform. Deep orange throat.

Extravaganza—48 in.; flowers 7 in.; Maroon with ⅛ in. pure orange stripe down center of segments and brilliant orange throat; striking and colorful.

Fireworks—40 in.; huge flowers, 7 to 8 in. pointed segments copper red blend with deep orange throat.

Forest Fire—30 in.; flowers 6 in.; exceedingly rich, uniform velvety, real Ruby Red with small orange star at throat.

Glamour—40 in.; flowers 6 in.; wider segments Brick Red; narrower segments same color, heavily brushed over an orange ground. Brilliant orange throat.

Grenadine—26 in.; flowers 5½ in.; Color close to Grenadine Red. Small orange throat.

Jack Rose—48 in.; Flowers 5½ in.; True Brazil Red self with narrow hairline of yellow down center of wider petals.

Pink Beauty—34 in.; Flowers 5½ in.; soft pink (Onion Skin Pink) with brilliant light yellow stripe down center of segments.

Pink Champion—42 in.; flowers 5½ in.; Deep pink or light russet in effect; narrower segments Flesh Ochre, wider segments Carrot Red (a deep pink).

Pomegranate Beauty—39 in.; flowers 5 in.; Pure Pomegranate Purple self, small orange throat.

Rapture—25 in.; flowers 5 in.; Brilliant velvety rich oxblood red, color uniform.

Red Beauty—28 in.; flowers 6 in.; Jasper Red, almost Fire-Engine Red in brilliance with copper suffusion and distinct copper edge. Brilliant orange throat.

Red Brilliance—34 in.; flowers 5½ in.; somewhat more brilliant than Jasper Red, uniform throughout with lemon chrome throat.

Red Empress—30 in.; flowers 5 in.; between Flame Scarlet and Grenadine Red, with Cadmium Orange throat in fine harmony.

Red Flare—36 in.; Flowers 6 in.; English Red with Morocco Red star and small chrome throat.

Red Glory—44 in.; flowers 5 in.; Ox-blood Red with small orange throat.

Red King—33 in.; flowers 5 in.; pure brilliant deep rich Spectrum Red to Scarlet, uniform with slightly darker velvety area toward the center. Brilliant orange throat.

Red Lustre—32 in.; flowers 6 in.; huge brilliant lustrous Ruby Red.

Red Raider—36 in.; flowers 6 in.; Brazil Red overlaid Morocco Red, color uniform with deep orange throat.

Red Satin—36 in.; flowers 4½ in.; uniform rich velvety Bordeaux Red.

Red Skin—30 in.; flowers 6 in.; wider segments Brazil Red; narrow segments English Red. Deep red orange throat.

Red Sox—Height 38 in.; flowers 6 in.; true Carmine pure and uniform with lemon chrome throat.

Red Splendor—43 in.; flowers 6 in.; rich velvety Bordeaux Red self with brilliant orange throat.

Red Wing—29 in.; flowers 6 in.; Acajou Red, approaching carmine. Color uniform with deep orange throat.

Rose Beauty—42 in.; flowers 5½ in.; dark old rose effect (Pompeian Red) with Van Dyke Red star of same general color tone but darker. Orange throat.

Rose Champion—39 in.; flowers 5½ in.; unusual deep old rose tone, near Pomegranate Purple self with deep yellow throat.

Ruby Queen—52 in.; flowers 7 in.; huge massive flowers, Morocco Red to Maroon with thin orange hairline down center of petals and brilliant lemon yellow throat.

Scarlet Beauty—27 in.; flowers 5 in.; pure scarlet with slightly darker flush toward throat and faint yellow vein down center of segments, but almost a self.

Terra Cotta—42 in.; flowers 5 in.; pure Terra-Cotta, with narrow, soft yellow stripe down center of wider segments.

Unique—34 in.; flowers 5 in.; unique blend, narrow segments light salmon, flushed soft rose; wider segments of striped effect, with buff stripe ⅛ inch down center; next to this, on each side of stripe, is a bright red area, then a crimped cream-colored buff border.

Wildfire—36 in.; flowers 5 in.; almost pure Spectrum Red, color uniform.

Zulu—39 in.; flowers 4½ in.; Bordeaux with black velvety flush; very rich and velvety color, uniform. Flower of perfect form.

Introduced by Wyndham Hayward, Winter Park, Fla.

Tahiti Belle (1924); medium compact to full flower dark claret petals and sepals, deep orange throat; medium height.

Babette (1942); dwarf to medium dwarf small-flowered compact orange.

Bolivar (1942); loose petaled semi-open type flower, rich copper red; medium height.

Dom Pedro (1940); large full open type flower, stiffly compact, fulvous copper shading on orange cream; medium to tall.

Glamor Girl (1941); wide-spreading somewhat separated petals and sepals, golden pastel-cream shading, light yellowish green throat; semi-dwarf to medium height.

Orlando (1941); large full, spreading flower, slightly uneven, brick to copper red tone with variation in shading; medium plus in height.

Introduced by Ralph W. Wheeler, Winter Park, Fla.

Angelus (22-80-2). Evergreen; large flower on 3 foot stems; good petal width, well open, with segments roundly recurved; color is light lemon yellow with very faint eye zone dusting. Stands up well all day in full Florida sun.

Brackel (27-44-6). Very large flower with wide petals, the well open flat face type with slightly recurved sepals; flowering stems 2½ feet; a vigorous grower and was a re-current bloomer in its first flowering

season at 21 months from seed; color pattern is something new in daylilies and resembles an irregular, allover design in brocade in rich, dark wine and mahogany shades.

Empress (22-58-2). Evergreen in Florida; flowering stems 3½ feet; large flower of excellent form; of deepest purple maroon with bright, golden yellow throat, this same color extending in narrow bands through petals. Remarkably resistant to full sun for such a dark color.

Paul Ihrig (F-51-3). Evergreen, vigorous grower, four foot flowering stems, re-current bloomer; very large flower, well open, wide sepals and petals which are somewhat re-curved; flower color close to Champagne of Standard Color Card and is decidedly a pastel; throat greenish gold; narrow cream lines extend through the sepals and petals. Stands full Florida sun all day.

Tom Thumb (H-29-1). Definitely a dwarf under best cultural treatment; semi-deciduous; foliage very narrow and 6 inches to 8 inches in length; flowering stems numerous and 6 inches to 8 inches tall; flowers small and cardinal red.

Introduced by William T. Wood, Merriewoode, Macon, Ga.

Merriewoode Star; bicolor, yellow sepals and throat, balance of petals a lovely pink.

Hybrid Amaryllis Clones

Introduced by Ralph W. Wheeler, Winter Park, Fla.

Queen of Sheba. First Prize in its Class; First Class Certificate; Best Flower in the Show—Southeastern Show of the American Amaryllis Society, 1942. Leopoldi, Type A; large flower with wide, well rounded sepals and petals and of good Dutch form; salmon red shading to much deeper tones in the throat, which is satiny and clean in color.

Harry L. Stinson, Seattle, Washington

Bomarea campaniflora

Plate 228

4. CYTOLOGY, GENETICS AND BREEDING

ALSTROEMERID BREEDING POSSIBILITIES

HARRY L. STINSON, *Washington*

Very few if any serious efforts have been made to hybridise the various species of *Alstroemeria* or *Bomarea,* and what hybrids are mentioned in the literature have been the result of accidental rather than deliberate attempts to secure desirable crosses. Possibly one reason for this is the fact that it has been only in the last few years that a sufficient number of species have been available for hybridization, and these in widely separated sections of the country. Another reason might be that they had never been brought to the attention of any one who might have the time and facilities to carry on a serious line of extensive experiments, although in one reference I did find that they had been used in laboratory work in the study of chromosomes. Now that more species are available and a deepening interest is being shown in them, it would seem that they offer a fertile field for the plant hybridizer.

From recent reports I have been given the impression that Messrs. Brydon and Hannibal have been experimenting to develop some special characteristics in some of their favorite plants. How successful these have been I have not heard.

Personally I have done little along these lines as I simply do not have the necessary time which would be required to do it properly. The coloring of *Alstroemeria psittacina* (*pulchella,* in the trade) at one time intrigued me to try to see if it could be hybridised with some species which would make the flowers more open and show the coloring to a better advantage. With this in view I crossed six plants with *A. chilensis* and the same number with *A. pelegrima* var. *alba.* They set seed and germinated but to-date they have not shown the desired results. Further crossing of the hybrids may eventually produce something worthwhile. Several times I have tried to self-pollinate *Bomarea campanulata* (Plate 228) and *Alstroemeria nemorosa* but with no results. This last year they were left alone and both set a couple seed pods and several seedlings are coming along nicely.

In the field the varieties of *A. aurantiaca* show the effects of cross pollination with one another but no evidence has been observed of crossing with *A. chilensis* which is growing adjacent to them. Likewise, *A. pulchra* shows no indications of being affected by the pollen of any of the other species. Seedlings selected from certain desired colors have the tendency to come about 90 per cent true to the parent color without resorting to hand pollination.

The bomareas seem to set seed quite readily, but I have not been successful in getting them to germinate. Possibly they are sterile as I have been fairly fortunate in getting imported *Bomarea* seed to germinate.

SUMMARY OF WORK ON CYTOLOGY OF NARCISSUS L.*

PROF. DR. ABILIO FERNANDES
Faculty of Sciences, University of Coimbra, Portugal

The more important results of my research in the genus Narcissus L. concerns the following questions:

I—THE NUMBER AND FORM OF THE CHROMOSOMES

During my research, I have established the number and chromosome formula of the following species:

[*Translators note*—Dr. Fernandes uses the customary cytological short hand to describe the idiograms (chromosome complements) of the various species of *Narcissus*. This system indicates the relative length of the chromosome and approximate position of the centromere. The initials L, M and P are taken from the Latin words, *longus* (long), *medius* (medium) and *parvus* (short), to which Dr. Fernandes has added the intermediate types l and i; m; and p. An apostrophe indicates the satellite chromosome.—*Thomas W. Whitaker*].

Narcissus scaberulus Henriq.	14	2:LL+2:Ll+2:Lm+2:Lp+2:li+2:lp+2:Pp'
Narcissus calcicola Mend.	14	Ditto
Narcissus rupicola Duf.	14	Ditto
Narcissus Watieri Maire	14	Ditto
Narcissus juncifolius Lag.	14	6:Lp+2:lm+2:mP+2:PP+2:Pp'
Narcissus dubius Gouan	50	2:Lp+4:L.+2:lm+2:1.+4:P.'+2:pp+6:p.+12:Lp+4:lm+4:mP+4:PP+4:Pp'
Narcissus gaditanus boiss. et Reut.	14	2:Lm+2:Lp+2:Lp+2:Lp'+2:li+2:Pp+2:P.
ssp. *minutiflorus* (Willk.)	14	Ditto
Narcissus Jonquilla L.		
var. *Henriquesi* Samp.	14	2:Ll+2:Ll+2:Lm+2:Lp+2:li+2:lp+2:lp'
Simple odorante	14	Ditto
Double odorante	14	Ditto
Narcissus jonquilloides Willk.	21	14 *Jonquilla* +7 *gaditanus*
Narcissus viridiflorus Schousb.	28	4:Ll+4:Ll+4:Lm+4:Lp+4:li+4:lp+4:lp'
Narcissus intermedius Lois.	17	1:LL+4:Lm+6:Lp+1:1m+1:lp+1:P.'+3:p.

* The original was written in the French Language. The Society is indebted to the eminent scientist, Dr. Thomas W. Whitaker, La Jolla, California, for the very excellent English translation. The original manuscript in the French Language has been deposited in the United States Department of Agriculture Library Washington, D. C., where students may consult it.—**Ed.**

Narcissus Tazetta L.		
var.?	20	4 :Lp + 4 :L. + 2 :lm + 2 :lp + 2 : P.' + 6 :p.
Almalguez	21	4 :L. + 2 :lm + 2 :lp + 2 :l. + 4 : P.' + 1 :pp + 6 :p.
Narcisse à bouquet totus albus	22	2 :Lp + 4 :L. + 2 :lm + 2 :l. + 4 : P.' + 2 :pp + 6 :p.
Narcisse à bouquet totus albus grandiflorus	22	Ditto
Cêrca do Convento de Mafra	22	Ditto
Jardim da Quinta das Varandas, Coimbra	30	
Narcissus Panizzianus Parl.	22	2 :Lp + 4 :L. + 2 :lm + 2 :l. + 4 : P.' + 2 :pp + 6 :p.
Narcissus papyraceus Ker	22	Ditto
Narcissus pachybolbos Durieu	22	Ditto
Narcissus polyanthos Lois.	22	Ditto
Narcissus biflorus Curt.	17	
Narcissus Broussonetti Lag.	22	2 :Lp + 4 :L. + 2 :Ll + 2 :l. + 2 : P.' + 2 :P. + 2 :pp + 6 :p.
Narcissus elegans Spach		
ssp. *intermedius* (Gay) F.Q.	20	6 :Lp + 4 :L. + 2 :lm + 2 :P.' + 4 : P. + 2 :p.
var. *fallax* F.Q.	20	6 :Lp + 4 :L. + 2 :P.' + 4 :P. + 2 : p. + 2 :pp
Narcissus serotinus L.	30	4 :LL + 4 :Lp + 2 :Lp + 2 :L. + 4 :li + 4 :lp + 2 :P.' + 2 :P. + 6 :p.
Narcissus triandrus L.	14	6 :Lp + 2 :lm + 2 :PP + 2 :Pp + 2 :Pp'
Narcissus reflexus Brot.	14	Ditto
Narcissus Bulbocodium L. x N. *reflexus* Brot.	14	
Narcissus Pseudo-Narcissus L.	14	4 :Lp + 2 :Lm + 2 :li + 2 :lp + 2 : Pp + 2 :Pp'
var.?	14	4 :Lp + 2 :Lm + 2 :li + 2 :lp + 1 : lm + 2 :Pp + 1 :Pp'
var. *bicolor* (L.)	28	8 :Lp + 4 :Lm + 4 :li + 4 :lp + 4 : Pp + 4 :Pp'
Narcissus incomparabilis Mill.	14	6 :Ll + 3 :Lp + 1 :li + 1 :lp + 1 : Pp + 2 :Pp'
Narcissus odorus L.	14	
Narcissus asturiensis Pugsley	14	8 :Lp + 2 :lm + 4 :PP
Narcissus cyclamineus DC.	14	4 :Lp + 2 :Lm + 2 :li + 2 :lp + 2 : Pp + 2 :Pp'
Narcissus Pseudo-Narcissus L. x N. *cyclamineus* DC.	14	4 :Lp + 2 :Lm + 2 :li + 2 :lp + 2 : Pp + 2 :Pp

Narcissus Bulbocodium L.		
var. *genuinus*	14	6 :Lp + 2 :lm + 4 :PP + 2 :Pp.
ssp. *nivalis* (Grlls.)	14	Ditto
Vimeiro	14	4 :Lp + 2 :'Lp + 2 :lm + 4 :PP + 2Pp'
Leca do Bailio	21	
Redinha	28	12 :Lp + 4 :lm + 8 :PP + 4 :Pp'
Chiqueda	27	2 :Ll + 8 :Lp + 2 :Lp + 2 :lm + 8 : PP + 2 :Pp + 2 :P. + 1 :p.
Chiqueda	26	2 :Ll + 8 :Lp + 2 :Lp + 2 :lm + 8 : PP + 2 :Pp + 2 :P.
Mira de Aire	26	Ditto
Pinhal do Valado	26	Ditto
S. Martinho do Porto	26	Ditto
Foz do Arelho	26	Ditto
Tapada da Ajuda	26	Ditto
Parede	26	Ditto
Raposeira	26	2 :Ll + 8 :Lp + 2 :Lp + 2 :lm + 8 :PP + 2 :Pp + 2 :P.
Pontal	26	Ditto
Pinhal de Leiria	35	15 :Lp + 5 :lm + 10 :PP + 5 :Pp
Povoa de Lanhoso	42	18 :Lp + 6 :lm + 12 :PP + 6 :Pp

II—Relations Between Cytology and Systematics

A comparative study of the idiograms shows that in general the degree of resemblance of the chromosome garniture parallels the degree of resemblance of the external morphological characters. In certain cases, I have verified the idea that cytology indicates the relationship between species whose similarities from the point of view of external morphology have been perceived by the taxonomists. A careful study of the external morphology of these species reveals, in a sufficiently clear fashion, the existence of these similarities. Among cases of this type, one can cite the following:

1. In a study of the group *Jonquilla* (in the sense of Bowles), I have found that the species of this group can be divided into three sub-groups, each of which have a different karyotype. A study of the morphological characters shows that the same three sub-groups can be formulated:

A—*N. scaberulus* Henriq., *N. calcicola* Mend., *N. rupicola* Duf. and *N. Watieri* Maire.

B—*N. juncifolius* Lag. and *N. gaditanus* Boiss. and Reut.

C—*N. Jonquilla* L. and *N. jonquilloides* Willk.

2—*N. elegans* Spach has been included by several authors in the section *Autumnales* Gay. The cytological evidence, in contrast, has shown that its idiogram has a great many analogies with that of *N. Tazetta* L. in the section *Hermione* (Salisb.) Spreng. After obtaining this evidence the external morphological characters have contributed evidence to show the justification for this point of view.

3—*N. viridiflorus* Schousb. has also been considered as belonging to the section *Autumnales* Gay. Its idiogram shows a clear relationship with those of the section *Jonquillae* Parl. The same similarities have been discovered by a study of its external morphology and, consequently, this species must be placed in the section *Jonquillae* Parl.

These facts show, therefore, in the genus *Narcissus*, there is in general a rather clear parallelism between the characters of the idiograms, and those of external morphology, and that as a result, the cytological data can be used to serve, in connection with other characters (morphology, anatomy, physiology, ecology and geographic distribution), to bring to a focus questions of systematics, especially when one knows the processes which are active in the evolution of these groups.

Once this conclusion has been acquired and tested, we have succeeded in solving some doubtful questions concerned particularly with the delimitation of certain species, the systematic position of others, the relationship between sections and sub-genera, etc.

Assuming that the comparative study of idiograms can contribute a very appreciable amount of information concerning those processes by means of which species are differentiated, we have succeeded, based on cytological characters, and on the facts of external morphology and geographic distribution, in elaborating a phylogenetic classification of the genus, which is almost on the point of being published.

III—Cytology and the Problem of Evolution

The problems for which the data of comparative cytology can furnish a solution are most significant for evolution and for the establishment of philogenetic relationships.

With the genus *Narcissus*, evolution frequently affects the form and number of the chromosomes. In considering the genus as a whole, one can say that the processes which have been active, and are still active in its evolution are the following:

(a) Mutation of genes
(b) Hybridization
(c) Loss of chromosomes
(d) Polyploidy
(e) Chromosome alterations (fusion, fragmentation, translocation, deficiency, inversions and reduplication)

It is important to note that in general these processes do not act separately, but can be combined in any way, thus making the evolutionary process extremely complex.

In certain cases, it has been possible to reconstruct, with precision, the processes by means of which certain species have been produced. Thus:

(a) Gene mutations (alone or associated with chromosome alterations, not demonstrable by cytological methods).

1. Differentiation of *N. asturiensis* Pugsley and *N. cyclamineus* DC. originating perhaps from *N. Pseudo-Narcissus* L.
2. Origin of *N. reflexus* Brot. starting from *N. triandrus* L., where these two species originated from a common ancestor.
3. Differentiation of *N. scaberulus* Henriq., *N. calcicola* Mend., *N. rupicola* Duf. and *N. Watieri* Maire starting from a primitive species probably similar to *N. scaberulus* Henriq.

(b) Polyploidy.

Origin of polyploid forms of *N. Bulbocodium* L. (3b, 4b, 5b and 6b), *N. Pseudo-Narcissus* L. (3b and 4b), *N. Tazetta* L. (3b) and *N. poeticus* (3b).

(c) Hybridization of species.

1. *N. odorus* L. = *N. Pseudo-Narcissus* L. x *N. Jonquilla* L.
2. *N. biflorus* Curt. = *N. Tazetta* L. x *N. poeticus* L.
3. *N. intermedius* Lois. = *N. Tazetta* L. x *N. Jonquilla* L.
4. *N. gracilis* Sabine = *N. Jonquilla* L. x *N. poeticus* L.

(d) Polyploidy + hybridization of species.

N. Jonquilla L. (b=7) produces tetraploid forms (4b=28). By means of crossing the gametes of one of these forms (n=14) with the haploid gemetes of *N. gaditanus* Boiss. and Reut. (n=7), *N. jonquilloides* Willk. (2n=21) originated.

This case is remarkable, since the data of external morphology, in demonstrating the characters which permit distinction of *N. jonquilloides* Willk. and *N. Jonquilla* L.; either represent intermediate conditions between *N. gaditanus* Boiss. and Reut. and *N. Jonquilla* L.; or else correspond to the characters of *N. gaditanus* Boiss and Reut.—are completely in accord with idea proposed for the origin of *N. jonquilloides* Willk. In addition, it has been possible, to utilize the facts of geographic distribution and time of flowering, to establish that these species were produced recently, in the interior of an area delimited by a line passing through Cadiz, Sanlucar de Barrameda, Sevilla, Grazalema, Medina-Sidonia, Cadiz.

(e) Polyploidy + hybridization of species + chromosome duplication.

N. juncifolius Lag. (b=7) produces some tetraploids (4b=28). As a result of conjugation of the gametes of one of these plants (n=14) with the haploid gametes of *N. Tazetta* L. (n=11), forms with 2n=25 have been produced, which, by chromosome duplication has give rise to *N. dubius* Gouan (2n=50).

It is probable that this species was produced in the southern part of the Province of Catalonia (Spain) and that, in this region it spread first towards the north and then towards the east.

(f) Chromosome alterations.

1. Differentiation of *N. Jonquilla* L. and *N. juncifolius* Lag. from a primitive ancestral species.
2. Differentiation of *N. gatitanus* Boiss. and Reut. from *N. juncifolius* Lag.
3. Origin of several races of *N. Bulbocodium* L., *N. triandrus* L., *N. reflexus* Brot and *N. Tazetta* L.

(g) Polyploidy—chromosome alteration (reciprocal translocations—elimination of chromosomes).

1. Differentiation of *N. Bulbocodium* L. var. *obesus* (Salisb.).
2. Origin of forms of *N. Tazetta* L. with 20 somatic chromosomes.

(h) Secondary polyploidy + chromosome alterations.

1. Differentiation of forms of *N. Tazetta* L. with 2n = 22.
2. Origin of *N. Broussonetti* Lag.
3. Differentiation of *N. serotinus* L. (30 = 4b-2).

IV—Polyploid Forms in their Relation with Ecology

Studies pursued with *N. Bulbocodium* L. have shown that diploids cannot live in acid soils (p. H. values between 3.7 and 6.2), while the forms with 2n-26 (hypotetraploides) can grow on soils of moderate acidity, and on neutral and alkaline ones (pH values between 5.7 and 7.8). The polyploids represent therefore, in comparison with their respective deploids, a new physiological equilibrium which is related to the concentration of the hydrogen ion of the soil. In this manner, polyploids, besides constituting material for the differentiation of species, are of extreme importance for the survival of species, because it permits them to enlarge their areas by the conquest of regions where diploids cannot prosper.

V—Polyploidy and Size of the Individual

In the polyploid series found in *N. Bulbocodium* L. (2b, 3b, 4b, 5b and 6b), one notes that there is not a consistent relation between the degree of polyploidy and the size of the individuals. In spite of a statement of the existence of a progressive augmentation of the diploids up to the pentaploids, a hexaploid form has been found in which the height is less than those of diploid individuals. To explain this fact, Muntzing assumes that the number 6b passes the optimum chromatin content, beyond which the individuals become less vigorous or even inviable. Some unpublished research, shows that within the degree of polyploidy 6b, the plants appear to differ considerably one from the other from the point of view of their height. For this reason, it is probable that the appearance of a hexaploid with small dimensions is due to the fact that it has been derived from a diploid race homozygous for factors of dwarfism.

One can therefore conclude, that although the existence of a chromatin variable according to the organism is probable, the height of polyploids not only depends upon the increase in the number of chromosomes, but depends also on the genes which condition development.

VI—Mixoploidy

This phenomena, evident in the root tips of *N. reflexus* Brot., originates by means of the fusion of the diploid nuclei of two neighboring cells, after the absorption of the wall which separates them.

It is not probable that this process of chromosome duplication plays as important a role as those which are concerned in the establishment of polyploid forms in *Narcissus*. It is more probable that polyploids are produced by the fusion of polyploid gametes formed as a result of anomalies that frequently take place during the reduction divisions.

VII—Significance of Satellities and Their Evolution During Mitosis

The satellites represent nucleologenic regions (nucleolar-organizing bodies of McClintock), that is to say, these regions depend upon the nucleolar material which condenses during telophase.

There are two categories of satellities: heterochromatic and euchromatic. The first represents, either regions that are completely nucleologenic (holosatellites), or else the more or less larger parts of these regions (merosatellites). The latter are the euchromatic portions of the chromosomes, separated from the nucleologenic region by means of a filament produced as a result of growth of the nucleolus.

In 1936, I have verified, in opposition to a firmly held belief, that the satellite filament stains with aceto-carmine. As it was necessary to wait some time to accumulate the results obtained by the use of this stain, I recorded my observations the following year, before knowing of the work of Schaede (1936, 1937), that the filament is sensitive to the Feulgen nucleal reaction and that, in consequence, it represents a part of the chromonema distended under the action of the developing nucleolus.

Having proven that the satellite filament exhibits a positive reaction, indicative of the presence of thymonucleic acid, the expression SAT-chromosome (Sine Acido Thymonucleinico), from Heitz, should be substituted for that of nucleolar chromosome.

In the root tips of *N. reflexus* Brot. and *N. triandrus* L. variations in the length of the satellites have been discovered. These results have been questioned by Gates, who attributes these variations to intensity of staining. Other investigators among whom are some of Gates' students have, however, verified the existence of this phenomena, not only in species of the genus *Narcissus* (Sikka, 1940) but also in other material (Sato, 1937; Mensinkai, 1939; Pathak, 1940).

Variation in the dimension of the satellite has been attributed, either to translocations, or to variation in the position of the point of greatest activity of the nucleogenic region, or to these phenomena acting together.

During interphase and almost all of prophase, the satellites are found on the surface of the nucleoli and are joined to their respective chromosome by means of a satellite filament, it also is attached to the surface of the nucleolus. More frequently, the nucleolar chromosome remains attached to the nucleolus, until the complete dissolution of this body; sometimes, however, liberation takes place before the complete dissolution of the nucleolus.

VIII—Polyploidy and Nucleolar Chromosomes

Based on the principle that diploid organisms (both plants and animals) possess in their chromosome set a single pair of nucleolar chromosomes, Gates vigorously insists on the value that must be attributed to the number of chromosomes of this type (where the number corresponds to the nucleoli) in that it indicates a polyploid origin, and the degree of polyploidy of certain species. Some observations have shown, although, quite frequently these data lead to precise results, one should be extremely cautious in their application, for the following reasons:

a) Failure of the generality of the principle that all monoploid genoms possess a single nucleolar chromosome.
b) The possibility of the existence, among diploid individuals of the same species, of variability in the number of nucleolar chromosomes.
c) The possibility of the appearance of structural alterations in the genoms of polyploids which would increase or diminish the number of nucleolar chromosomes.
d) The possibility of the appearance in polyploids of the phenomena of amphiplasty. Its occurrence must be particularly frequent in alloplolyploids.

IX—The Number of "Chromonemata" in Mitotic Chromosomes

A study of the mitotic behavior of a heterochromatic chromosome found in a plant of *N. juncifolius* Lag., shows in a sufficiently clear fashion, that at anaphase and interphase this chromosome has two chromonemata.

POLLEN GERMINATION AND TUBE GROWTH IN MILLA AS AFFECTED BY PURE GROWTH SUBSTANCES[1]

Frederick T. Addicott,
Santa Barbara State College,
Santa Barbara, California

The germination of pollen and the growth of the pollen tube is of considerable general and practical interest to plant breeders, geneticists

1 Report of work carried out with the assistance of a Grant-in-Aid from the Society of Sigma Xi. The investigator is indebted to Mr. W. M. James and Mr. A. B. Lytel of Las Positas Nursery for the flowers of **Milla biflora** employed in the experiments.

and cytologists as well as to plant physiologists. Any of the above types of workers may have occasion to germinate or culture pollen artificially. Hence it was felt that many of the readers of HERBERTIA might find the results of the following experiments of interest. This paper outlines a technic employed in the germination of *Milla* pollen and presents the principal results of experiments testing the effects of 33 pure growth substances on the germination and growth of the pollen tubes of this Genus.

A number of methods of germinating pollen have been used by various investigators. The media employed have been of two principal types, those involving agar or gelatin and those using only liquid. A liquid medium was selected for these experiments because it permitted more ready observation of the pollen tubes during the period of growth. Eight drops of medium were placed on the under side of the cover of a Petri dish. They were measured by means of a fine pipette to give an average volume of 0.005 ml. per drop. About 1 ml. of distilled water was placed in the bottom of each dish to give a saturated atmosphere.

The basic medium contained water double distilled from pyrex glass, Hoagland and Arnon's Nutrient Salt Solution I (Univ. Calif. Exp. Sta. Circular 347. 1939) in which the boric acid content had been raised to 0.01%, and 12% glucose. The salt solution may not be essential. Many workers have cultured pollen in media containing only sugar and agar or gelatin. However it was used because it contained all the known inorganic chemicals required for plant growth. The relatively high boron concentration is known to be required by the pollen of many species of plants and was essential to *Milla*. The glucose concentration was the optimum tested of several concentrations of sucrose, fructose, glucose and glycerol. The pure substances were added to this basic or "control" medium in five concentrations to determine if they were capable of increasing germination or tube growth.

From 15 to 30 pollen grains were placed in each drop of medium. The size of the drop and the amount of innoculum were kept as constant as possible because it was noted that pollen tube growth was increased when the number of grains was very high in proportion to the amount of medium. Since this phenomenon was presumably due to a diffusable chemical, the innoculum was kept very low so that the chemical would be detected if it were among those added to the medium. At the end of two hours all growth had ceased and the results were recorded. The cultures were kept as close to 25° C as possible during the experimental period.

Results were taken in the form of the percentage of germination and the average length of the pollen tubes in each concentration tested. The averages for each substance were compared with the corresponding controls. A statistical analysis was performed to determine how great a difference was necessary to indicate a significant increase over the controls. Table I lists the pure substances tested and shows which were effective in promoting germination or pollen tube growth.

TABLE I

A SUMMARY OF THE PURE SUBSTANCES TESTED ON THE GERMINATION AND GROWTH OF MILLA POLLEN TUBES, AND THEIR ACTIVITY

Substances	Most Effective Concentration		Activity	
			Germination Percent	Tube Length
Water Soluble Vitamins:				
Thiamin #		—	—	—
Niacin #		—	—	—
Niacinamide #		—	—	—
Riboflavin	0.1	mg./liter	—	*
para-aminobenzoic acid	1.0	mgl/liter	*	*
Inositol	10	mg./liter	*	—
Pyridoxin #	0.01	mg./liter	—	*
Ascorbic acid		—	—	—
Ca-pantothenate	0.01	mg./liter	—	*
alpha-naphthyl acetamide		—	—	—
Oil Soluble Vitamins:				
2-methyl-1, 4-naphthoquinone		—	—	—
alpha-tocopherol		—	—	—
Plant Hormones:				
Indole-acetic acid	0.1	mg./liter	—	*
Traumatic acid		—	—	—
Animal Hormones:				
Estrone		—	—	—
Pyrimidines and Purines:				
Uric acid		—	—	—
Adenine		—	—	—
Xanthine		—	—	—
Guanine	0.001	Saturated	—	*
Thymine	0.1	mg./liter	—	*
Cytosine		—	—	—
Uracil	1.0	mg./liter	*	—
2-methyl-4, 6-dihydroxypurine		—	—	—
2-methyl-4-hydroxy-5-hydroxy-methylpurine		—	—	—
2-methyl-4-amino-5-thioformamidomethylpurine	0.1	mg./liter	—	*
4-methyl-5-hydroxymethylluracil		—	—	—
2-methyl-4-hydroxy-5-amino-methylpurine-hydrochloride	100	mg./liter	—	*
2-methyl-4-amino-5-amino-methylpurine-hydrochloride	1.0	mg./liter	—	*
Miscellaneous Compounds:				
Pimelic acid		—	—	—
Allantoin		—	—	—
Alloxan		—	—	—
2-chloroisothiamin-iodide	1.0	mg./liter	—	*
Acenaphthene	0.01	Saturated	*	*

These substances may also be classified as plant hormones.
* Activity sufficiently above the controls to have statistical significance.

Josephine Henry, Gladwyne, Penna.

See page 138.

Henry hybrid Cyrtanthus—C. MacKenii X C. parviflorus—in 7 inch pot, under 2 years old.

Plate 229

It may be of interest to note that several physiological types of substances are active. These include vitamins, plant hormones, and the pyrimidines and purines. The latter are important chemical building blocks in cell structures, particularly the nucleus. The fact that there are so many active substances might suggest that a combination of them would lead to very active growth of the pollen tube. Unfortunately this was not the case. Two combinations of the most likely substances when incorporated in the medium did not increase germination or tube growth beyond that of the more favorable single substances. Stigma exudate, however, had a very potent effect upon the pollen. This viscous liquid, which is produced upon the open stigma under humid conditions, supported a tube growth of about twice as much as in the most favorable synthetic medium. Presumably it contains some chemical factor(s), yet to be discovered, which is responsible for its effectiveness. A search for this factor(s) is now underway and it is hoped that its discovery will lead to a more complete understanding of the physiology of pollen tube growth.

CYRTANTHUS IN THE LITTLE GREENHOUSE

MARY G. HENRY, *Gladwyne, Penna.*

Surely there are others who, like myself, enjoy mid-winter gardening in a tiny greenhouse.

For those who prefer working in an out-of-doors garden, underglass work is but a poor substitute. Nevertheless in winter in our part of the world, it is gardening indoors or no gardening at all.

Among the most popular of South American flowers are the large flowered hybrid *Amaryllis.* Most of us have seen and admired the beautiful new creations raised by hybridizers. The colors are exquisite and the symmetry leaves nothing to be desired. They are indeed marvels of perfection. Nevertheless the luxuriant leaf growth of these handsome plants is far too bulky for a tiny greenhouse. A few of them in mine would leave room for little else.

Cyrtanthus, miniature amaryllids from South Africa, are pleasing and entirely satisfying substitutes, to my way of thinking, and they have a wider range of coloring, for in addition to reds, pinks and whites, there are excellent yellows and creams.

The first *Cyrtanthus* that came into my possession years ago was *C. parviflorus.* The flowers of this species are small but are colored a fine red. *C. lutescens,* which bears yellow or cream flowers and *C. Mackenii,* pure white, were my next additions. Then I received from the United States Department of Agriculture a plant numbered 78510 "*Cyrtanthus sp.* received under the name '*Flammeus*' ". This latter bears flowers of a very pretty shade of deep pink.

My first batch of seedlings were raised from this one. It was an agreeable surprise to find how quickly the seeds germinated, and how fast the little bulbs developed and came into bloom. *C. "flammeus"* is evidently a hybrid for scarcely any of the seedlings were alike and none was as good as the parent. These bulbs have all been discarded but they

gave me an idea, so I proceeded to cross the species. The results have been most gratifying and more than repaid the small outlay of time and trouble expended.

The first cross I made was *C. Mackenii* X *C. parviflorus*. The seed pods matured in quick order. Seeds planted January 25th, 1940 germinated in five days, which seems to be the usual time for fresh *Cyrtanthus* seeds. The resulting bulbs began to bloom April 2d, 1941, just fourteen months and one week from date they were sown.

The flowers came in many utterly delightful shades, mostly in coral and sea shell colorings, along with whites and reds. Only two of this lot were sufficiently attractive to segregate for vegetative propagation. (See Plate 229.)

Cyrtanthus Mackenii x *Cyrtanthus lutescens* was my next cross. *C. lutescens* has lately been designated as *C. Mackenii* var. *Cooperi*, but it is still commonly listed as *C. lutescens*. I planted these seeds March 10th, 1940 and they began to bloom May 18th, 1941. As was to be expected, the flowers of most of the plants were in various shades of yellow and cream and a few were pure white. Some had yellow buds which opened to ivory white flowers. These seedlings are especially vigorous and several bore flowers that were a great improvement on the parents. A plant with nice sized flowers of daffodil yellow is very pretty; another with comparatively large cream-colored flowers, and broad rounded segments is extremely lovely.

Cyrtanthus lutescens was then crossed with the hybrid *C. "flammeus"*. These seeds were planted March 12th, 1940 and the first one bloomed May 15th, 1941. There is a great variety of color and form in this group of seedlings. The best ones are colored deep crimson pink with fairly large well shaped flowers, but some of the creamy pinks and apricot yellows are very lovely and strange to say, the best white *Cyrtanthus* comes from this lot.

The flowers of the foregoing hybrid *Cyrtanthus* are all attractive. There is not an "ugly" in the lot. Naturally some are very much finer than others. It has indeed given me keen pleasure to evaluate and tag the best ones for propagation later on.

It is an added charm that the leaves of these *Cyrtanthus* are evergreen and although these little bulbs never require a real drying off, they do bloom more freely if they are kept "on the dry side" for a while during the summer if autumn flowers are desired or during autumn when flowers are wanted for the winter season.

The soil in which I plant the seeds is a mixture composed of about two-thirds sand and one-third New Jersey peat with a little crushed charcoal added if I happen to have it or a small amount of cinders.

The first repotting for the little seedlings comes when the bulblets have two or three leaves. At this time they require a richer soil. The mixture I use is one-third peat, one-third forest soil and one-third coarse sand. For blooming sized bulbs very old cow manure can be added with advantage. My bulbs are repotted whenever I can find time to do so. They are very tractible and if kept on the dry side for a few days, soon become established.

They are fast growers and produce offsets very freely. Plants less than two years old frequently produce a dozen offsets. If planted singly, these accommodating bulbs can remain in three inch pots until their first flower stalk has faded. Six to eight can be flowered in a five inch pot or nine to twelve in a six inch pot. They seem to do best when top dressed or preferably repotted every season. However, in the matter of repotting, they will stand considerable neglect, and will often bloom under adverse conditions.

The simplest method of obtaining a good display of *Cyrtanthus* is to plant the seeds fairly closely and evenly in the pots in which they are to bloom. A seven inch pot containing 16 to 20 seeds can be kept grow-

Fig. 77. Flower of Cyrtanthus sanguineus. Photo by Josephine Henry, Gladwyne, Pa.

ing for about twenty months. A slight drying off at this time will cause the entire lot to bloom simultaneously, preferably in February.

Many of the bulbs will throw several flower stalks and the pot will remain a delightful ornament for a surprisingly long time, three weeks or more.

Grown in this manner, the roots of course become badly matted, so the bulbs should be separated and repotted immediately after blooming. Much of the foliage should be removed at this period. During the midsummer season I give my plants some shade.

Their compact habit of growth, their stiff stems that require no support, their neat evergreen foliage and above all their exquisitely lovely flowers, not to forget the ease with which they may be grown, are all golden qualities and few plants possess so many valuable traits. *Cyrtanthus* are indeed among the choicest winter-flowering plants that I have ever grown in my tiny greenhouse during an experience of over twenty years, and I know of few more attractive objects than a small turquoise vase with a handful of stalks of *Cyrtanthus* in their various shades of peaches and cream.

CYRTANTHUS SANGUINEUS

The beautiful amaryllid that is called "The Inanda Lily" according to Miss K. Stanford, is undoubtedly one of the handsomest and one of the showiest members of the Genus *Cyrtanthus*. To a casual observer the single-flowered stem and large spreading corolla of *Cyrtanthus sanguineus* (Fig. 77) does not bear a close resemblance to the commoner members of the family. In fact to my mind it seems more like a small *Amaryllis*. In any case, no matter what the name, it is an ornamental and highly desirable bulbous plant for the small mixed greenhouse of an amateur gardner.

On December 7, 1937, I planted fifteen seeds with keen interest and with great care. On the 31st, their slim green spears had pierced the surface. The first one bloomed July 25, 1940. Eleven of the fifteen seeds grew and reached maturity. Unlike the usual types of *Cyrtanthus* which produce a nice sheaf, *C. sanguineus* produces but one to three leaves. With me it seems to be a summer bloomer and I do not know if this is the common habit of this plant or not.

The very beautiful flowers are a full deep rich pink; matched with Ridgway's, they come close to "Rose doree". They are 2¾ inches long and the corolla has a spread of two inches across. The pollen is bright yellow. The flowers last about a week in bloom.

Anyone who has a fondness for members of the Amaryllis Family, should surely make an effort to obtain this choice plant, for truly it is a "gem of the first water".

RECENT TRENDS IN DAFFODIL BREEDING

JAN DE GRAAFF, *Oregon*

PART I

A careful survey of the new daffodils introduced during the past few years will reveal that in England, Australia and even in this country a very definite preference is developing for certain characteristics in the flowers at the expense of others. As a daffodil breeder of some experience, not only in the field of raising new varieties, but also in the field of introducing them commercially and distributing them to the public, I am not altogether happy about the standards set or strived for in new daffodils by most hybridizers.

We may well pause a minute and ask ourselves whether it is right to set up certain standards to please only the few very advanced amateurs and the very few commercial daffodil growers who are interested in new daffodils and to lose sight completely of the fact that new daffodils such as we are raising today are primarily destined to reach the public at large. It seems to me that one of the most important considerations in the selection of new flowers and in the standards set for this selection should be whether the flower is attractive to the average amateur gardener and whether it can be used to good advantage both for garden decoration and as a cut flower for arrangements in bowls and vases. To all of us hybridizers it should be the crowning glory of our work to see one's flowers generally accepted by the public and gladdening the heart of even the poorest gardener.

Let me cite an example of what I have in mind. We grow in our nurseries a very nice stock of *N. Incomparabilis, Fortune's Bowl,* a variety which according to prevailing standards rates very high. While I will gladly concede that *Fortune's Bowl* is a fine flower for garden decoration and that it is a superb show flower, it is much too stiff and formal to be used to good advantage as a cut flower in informal arrangements. On the other hand, we recently obtained some fine English hybrids of *N. jonquilla* such as *Hesla* and *Lanarth* which are ideal not only for garden decoration, but also for any type of arrangement in vases or bowls that the amateur gardener might wish to make. In fact, nothing can be prettier than a large bowl filled with flowers of *Hesla* and *Lanarth,* loosely arranged with some contrasting foliage and flowers from spring flowering shrubs.

My point is then whether insistence upon certain characteristics such as smooth overlapping perianth, a short neck, sharply contrasting colors, smoothness of texture, etc., is really justified, knowing as we all do that the public at large cares little about the "show" qualities of their daffodils and probably knows less about our standards than we hybridizers imagine.

I grow a very large collection of the finest English hybrid daffodils. Often we cut some flowers of each variety and put them on display in our warehouse or office. Studying these varieties, which represent the cream of recent introductions, every observer, even the most expert, will be struck by the monotony of their carefully standardized characteristics and will turn with evident relief to some varieties which have charmingly twisted perianths or gracefully drooping flowers.

A great deal of criticism has been leveled at the failure of some recent Dutch introductions to conform with the British standards. A review of the British Horticultural Society Daffodil Yearbooks for the past few years will reveal numerous paragraphs in which the Dutch novelties and even some British (notably the introductions of Mrs. R. O. Backhouse) are dismissed as being too "rough" and too "coarse." One critic, writing in the 1942 Yearbook, disposes of the various Dutch introductions in the Yellow Trumpet division by saying that as a class they are of distinctly less importance for his purposes (breeding), in

that some are quite below par in garden behavior, while others incline too greatly toward coarseness or clumsiness to merit unqualified admiration. He concedes, however, that many of them have exceptional value for forcing.

Now I do not know this critic's standards for garden behavior of daffodils, but I wonder how a variety can have exceptional value for forcing—which means, of course, as cut flowers from forced bulbs—and have no value as cut flowers from garden plantings. There seems to be a contradiction there, since conditions that might bring out good qualities during forcing can be easily duplicated in almost any garden. Such conditions might be growing the daffodils in a shady position so as to obtain a softer color scheme or to have them sheltered from strong winds and hail which can be done quite easily. The point is, however, that these Dutch Yellow Trumpet daffodils perform beautifully in any garden and under any conditions, in fact, we can grow here in Oregon just as perfect flowers outdoors as in the greenhouse, something that cannot be said for many of the new English hybrids. Now it happens that the varieties discussed by this critic are from three different raisers: M. van Waveren & Sons, C. G. van Tubergen, Ltd., and the de Graaff Brothers Co., so that I cannot be accused of having too much of a personal interest in the matter. As a matter of fact, it can be easily shown that the daffodils introduced by these three firms are today playing a leading role in the assortment of daffodils preferred by the public in this country.

The same critic compares White Trumpet *Beersheba* (Engleheart "supreme variety, fully proven, chaste" with White Trumpet *La Vestale* (de Graaff) "hardly so pure and refined", admitting at the same time that La Vestale is "a wonderfully good flower for one so plentiful and cheap". *Beersheba* was introduced in 1923 and *La Vestale* in 1927, *Beersheba* sells still at a price of over one dollar each and *La Vestale* is freely available at a fraction of that price. Obviously *La Vestale* is a better propagator and since it is in great demand, it must be a flower that appeals to the public. Evidently a flower that is possibly not so pure and refined but good in the garden as well as for cutting answers the needs of the amateur. Would we then be wise to use in breeding *Beersheba* in preference to *La Vestale* or *Dawson City* "one of the most satisfactory trumpets" to *Diotima* and *Ben Hur* "rough and coarse". I think not.

To me the modern daffodil has but one task to perform. It has to be attractive wherever used. I do not believe that the perfectly geometrically precise symmetry of these new English introductions is of great value, either in the garden or as cut flowers. I certainly do not believe that the production of a race of flowers that can only be used as "show flowers" is of great value to the public. Certainly the American gardening public does not seem to think so since they continue to demand daffodils of more informal habit.

I believe, then, that we have come to a very sharp cleavage between the taste of the British daffodil raisers and their American followers and the taste of the gardening public. It seems pertinent to

ask: "Where are the British daffodil raisers taking us?" To flowers of still greater refinement, of still greater and more perfect symmetry? Surely that cannot be an ideal. It takes the daffodil farther and farther away from what the gardening public expects from it. It leads to such excesses as the building of special shelters for "show" flowers as is done in Ireland (see Daffodil Yearbook 1942, page 13). Frankly I do not consider it a compliment when I hear, as I do so often at daffodil shows, comments such as: "Why, that flower does not look like a daffodil at all." I am inclined to take such remarks as an implied criticism, as an indictment of what, among the "experts", is considered "ideal" form.

I certainly do not want to be an iconoclast and I shall continue quite gratefully to use the so-called "perfect" English introductions as seed and pollen parents for my new daffodils. But, I am fully cognizant of the fact that in doing this I must not merely follow in the tracks of our foreign mentors and adopt their standards of judging and selecting.

Is it not with these new daffodils, so cleverly publicized by our British colleagues, as it is with certain forms of art where refinement brought the art to a stage where it no longer lived? Looking at the "ideal form" of many of Mr. Guy Wilson's and Mr. Lionel Richardson's new daffodils, I cannot help but be reminded of pre-Raphaelite painting at its best. The perfection of these paintings, their delicacy of line and detail and their magnificent coloring are of little but passing interest to us today. At any rate these paintings are now of no importance to the public other than as a transitory phase in the historical development of art. It is my belief that a definite analogy exists between the extreme refinement of our modern daffodils and the refinement of these paintings.

In conclusion I may as well admit that I am very fond of the "perfect" show daffodils and that we, at the Oregon Bulb Farms, are very busy raising a good many seedlings in the British tradition. But we are also trying to produce some daffodils which conform with none of the high standards of geometrical perfection that the British raisers hold of paramount importance in the hope of raising some new varieties which may be "coarse" and "rough" but which will look like daffodils to anyone familiar with Golden Spur, Empress and Sir Watkin.

These new seedlings, the advent of which I impatiently await, will be very large. They will have tall stems, be extremely prolific and disease resistant, have brilliant colors, and will be hardy and strong. But the perianths may be twisting, the trumpet may be widely flaring and deeply imbricated. It may be very hard to fit them nicely into one of the R. H. S. divisions but at least I expect the public to say: "Look at those *Daffodils"!* Rather than, "I did not know a daffodil could look like *THAT.*"

PART II

In the foregoing article I have tried to point out that it is essential for the daffodil hybridizer, as it must be for the hybridizers of any plants, to keep in touch with his public. Giving the public not what it

wants, but what it should have, is of value only when there can be no doubt about the standards set by *bona-fide* experts.

Having made these statements it behooves me to state more fully how I arrive at the conclusion that the "perfect" daffodils of the leading British hybridizers have failed to conform to the standards set, for

TABLE 1

Medium Priced Narcissus Varieties for the Garden

Class	*1913*	*1942*
1a	*Emperor* (Back.) *King Alfred* (Kendall, J.)	*King Alfred* (Kendall, Jr.) *Emperor* (Back.)
1b	**Madame de Graaff* (de Graaff) **Mrs. Betteridge* (de Graaff)	*Mrs. E. H. Krelage* (Krelage-Krelage) *La Vestale* (de Graaff)
1c	**Empress* (Back.) **Weardale Perfection* (Back.)	*Spring Glory* (de Groot) *Victoria* (van Veen, J. H.)
2	*Gloria Mundi* (Back.) **Homespun* (Engle) **Lady M. Boscawen* (Engle.) **Lucifer* (Lawrenson, Mrs.) *Croesus* (Will, J. C.)	*Croesus* (Will, J. C.) *John Evelyn* (Cope.) *Francisca Drake* (Back., Mrs.)—de Graaff *Yellow Poppy* (Cart. & Good) *Helios* (Engle.)
3	*Barrii conspicuus* (Back.) **Albatross* (Engle.) **Southern Star* (Engle.) **Firebrand* (Engle.) *Brilliancy* (Engle.)	*Diana Kasner* (Back., Mrs.)—de Graaff *Bath's Flame* (Engle.)—Bath *Alcida* (Back., Mrs.) *Firetail* (Cros.) *Shackleton* (v. Tub.)
4	*White Lady* (Engle.) **Duchess of Westminster* (Back.) **Ariadne* (Engle.) **Empire* (Cros.) **White Queen* (Engle.)	*Nette O'Melveny* (Back, Mrs.)—de Graaff *Silver Star* (Back., Mrs.)—de Graaff *Hera* (de Graaff) *Gertie Millar* (de Graaff) *Lord Kitchener* (Back., Mrs.)
5	**J. T. Bennett-Poe* (Engle.) *Queen of Spain*	*Thalia* (v/Wav.) *Moonshine* (de Graaff)
6		*February Gold* (de Graaff)
7	*Buttercup* (Engle.) *od. rugulosus*	*od. rugulosus* *Golden Sceptre* (de Graaff)
8	*Aspasia* (v. d. Sch., R.) *Elvira* (v. d. Sch., R.)	*Laurens Koster* (Vis.) *Klondyke* (v/d/Sch., R.)
9	*Horace* (Engle.) *Cassandra* (Engle.) *Ornatus*	*Ornatus* *Horace* (Engle.) *Actaea* (Lubbe)
10	*Argent* (Engle.) **Plenipo* (Engle.) *Primrose Phoenix*	*Twink* (de Graaff) *Cheerfulness* (v/d/Sch., R. A.) *The Pearl* (Zeestraten, G.)

* Varieties no longer available

good daffodils, by the gardening public. In order to do this I should have to have a poll of present-day public opinion in regards to daffodils —something which is not available. I believe, however, that a careful survey of what is offered to the public in the catalogs of our American

seedsmen can be accepted as an indication of what the public is buying. And since we can assume that in making their choice of varieties from these catalogs, the public is guided by its preference of certain types and varieties to others, the relative quantities sold must be a clear indication of that taste.

As it happens, some thirty years ago a similar selection of the most popular varieties was made in England and it is interesting to compare this list with the one that I made up. The 1913 list was arrived at by popular vote at a large daffodil show and the varieties are listed in the order of their popularity. The 1942 list is arrived at as described above and the varieties are listed according to the demand existing for them.

I fully realize that in both lists the factor of price and availability of the bulbs may have outweighed purely aesthetic considerations. Yet it must also be remembered that a variety becomes freely available and low-priced only if it grows well and strongly and propagates quickly. These factors are of equal importance to the commercial grower and the amateur gardener alike, since they indicate a certain resistance to diseases and an ability to withstand climatic and soil handicaps.

Has the fact that the introduction of new daffodil varieties to the American public was largely in the hands of Dutch growers influenced the selections available today in this country? In this connection it must be remembered that in the recent Daffodil Yearbooks Dutch varieties have generally been condemned as being too "rough" and "coarse". I should like to counter this with the suggestion that there is no such thing as "Dutch" varieties. The facts are that the original stocks of hybrid daffodils came from England, notably from Leeds, Backhouse and Barr. The first great step forward in hybrid daffodils was made by the varieties *Madame de Graaff* and *Glory of Leiden*, both raised in Holland from varieties imported from England. Tracing the ancestry of any modern white trumpet daffodils we invariably find *Madame de Graaff* as one of the ancestors. One could cite innumerable such instances where the parentage will reveal what I might call Anglo-Dutch origin. It seems entirely wrong then to speak of "Dutch" varieties versus "English" ones. We should speak of Dutch versus English selections.

It is true that the varieties in the 1942 list were largely selected by Hollanders or originated by them. But these commercial growers did select those varieties that would perform well in almost any garden and that would please the largest number of buyers. Many considerations enter into the final selection of a variety for commercial production. Catering to the "ivory tower" taste of a few experts was not one of them.

This argument, however, is of little importance to the average gardener. He is interested in good daffodil varieties and when he chooses them for his garden or for cutting he is not interested in the fact whether these daffodils were raised in Holland or in England, nor whether they conform with the present British standards.

Looking over the 1942 list from the point of view of the standards set for "show" daffodils we find that very few of the varieties selected are of the geometrically perfect symmetry that is now so highly praised

by some experts. As a matter of fact the great popularity of such varieties as *Diana Kasner, Mrs. E. H. Krelage, King Alfred, Twink* and many others is directly attributable to their informality.

In my opinion, then, the parents of our future garden daffodils should be found among these more informal types and greater stress should be placed by the breeders on adaptability to average garden conditions. What we need first is more strong, prolific and disease resistant daffodils. And, secondly, we need more flowers that are adaptable to garden as well as home decoration. When we once have plenty of such daffodils, we can then begin to worry about refinement of form.

[Callicore-Brunsvigia—*Continued from page 102.*]

definitely to *Callicore*. The California common form, widely distributed, is obviously an inbred strain resulting from many years of pure line breeding—few variations appear, although the plants are often self sown in many localities. Other similar forms are also available. All produce very few seed, but as indicated, if any of these strains are crossed they are very productive, and, as one may expect, quite variable in types of flowers produced. Some excellent new colors and forms can always be anticipated, and in numerous cases *Blanda* and *Brunsvigia* types are apparently present. Unquestionably certain *Callicore* genes are dominant, but the writer suspects that few *Callicore,* even those from the wild, are apparently entirely homozygous—some *Brunsvigia* genes being present which turn up as recessives in the progeny.

We must realize that a genus is to some extent an arbitrary grouping for convenience, but there is hardly sufficient reason for a generic division between *Brunsvigia* and *Callicore* especially when fertile hybrids are so readily produced; even Dean Herbert (1825) argued in this fashion, and reinforced his statements with experimental evidence. Why he did not follow his arguments to the logical conclusion we do not know. If the reasons advanced in this present article are adequate then it might be advisable to unite *Brunsvigia* and *Callicore*. The original brunsvigias could constitute one Subgenus and the callicores another. The following new grouping is proposed:

Genus BRUNSVIGIA Heist.

Subgenus No. 1: *Eubrunsvigia* (to accommodate all spp. except the ones newly added).

Subgenus No. 2: *Callicore* Link (To accommodate the following proposed spp.)

1. *B. rosea* (Lamarck) Hannibal, comb. nov.; Syn. *Amaryllis rosea* Lamarck, Dict. Encyc. dr. Bot. Vol. I, P. 122, (1789); *Amaryllis belladonna* Herbert non Linn, Bot. mag. *19,* t. 733. (1804); *Callicore rosea* Link, Handb. erkennen Nutzb. etc. p. 193 (1829).

2. *B. blanda* (Gawler) Hannibal, comb. nov.; Syn. *Amaryllis blanda* Gawl: Bot. Mag., t. 1450 (1812); *A. belladonna* var. *blanda* Baker.

NOTES ON RESISTANCE OF DAFFODILS TO VIRUS DISEASES

Earl Hornback, *Oregon*

In growing a large number of varieties of daffodils over a period of years, we were struck by the fact that apparently some groups of hybrids seemed to be more susceptible to virus infections than others. It seemed likely therefore that various degrees of resistance to virus infections exist in different groups of hybrid daffodils and that this factor of resistance can be an inherited characteristic.

In modern plantings we still find old forms of *N. Poeticus* and *N. Tazetta,* to all practical purposes identical with the species. These invariably are found to be entirely free from virus diseases, even though they may have been grown over a long period of years in close proximity to other daffodils with a known virus history.

However, old forms of trumpet daffodils, such as *N. minor, N. lobularis, N. spurius* and *N. obvallaris,* unless carefully selected and grown in an isolated plot, soon become seriously infected and die out. *N. triandrus* and *N. triandrus, var. calathinus* have even less resistance to virus diseases and must continuously be renewed from seed. *N. jonquilla simplex* is also susceptible to virus diseases, although not as badly as the above mentioned species. Its hybrids show some degree of resistance to virus diseases.

Among the newer hybrids we find all those derived from *N. Tazetta* highly resistant or possibly even immune to virus diseases. *N. triandrus* hybrids are inclined to weakness, especially when the other parent (such as one of the Leedsii varieties) carries the blood of the old trumpet species or varieties. The percentage of *N. poeticus* blood in the Leedsii used is apparently not high enough to give a good degree of resistance. On the other hand, crosses between the old trumpet daffodils and *N. Tazetta (such as St. Patrick)* seem to be immune so that apparently the disease resistance of the Tazetta blood is a very strong factor.

The introduction of *N. hispanicus var. maximus* blood to trumpet varieties and later to other types through *King Alfred,* gave a marked improvement in resistance to virus diseases as compared with varieties derived more directly from the old trumpet types.

One hard thing to explain is the tendency of nearly all double varieties to become infected with virus diseases, regardless of their ancestry. For example, the double forms of *N. jonquilla, N. cernuus* and *N. poeticus* are definitely more susceptible than the single forms. *Cheerfulness,* the double sport of Tazetta hybrid *Elvira,* seems to be entirely immune.

In the Leedsii, Barrii and Incomparabilis divisions all degrees of resistance are observed, which is easy to understand in view of their very mixed ancestry. Generally speaking, we can notice that those varieties that are most resistant either carry a lot of Poeticus blood or have been improved by the introduction of the Maximus strain. One group of red-cups, which we can trace back to *N. poeticus poetarum* and which culminates in such varieties as *Peking* and *Scarlet Leader,* seems

to be very strongly resistant. At any rate, we have never observed traces of virus diseases in these varieties. On the other hand, varieties which trace their ancestry to *N. poeticus ornatus* do not have this same degree of resistance.

Under the climatic conditions prevailing at our nurseries in Oregon, we should classify the hybrid daffodils on the basis of resistance to virus diseases as follows—(in the order of greatest resistance to greatest susceptibility):

1. *N. Tazetta* and hybrids
2. *N. poeticus* and hybrids
3. *N. cyclamineus* and hybrids
4. *N. hispanicus, var. maximus* and hybrids
5. *N. jonquilla* hybrids
6. Old trumpet types *N. minor, lobularis, spurius,* etc., and their hybrids.
7. *N. triandrus* species and hybrids
8. Doubles (except double *N. Tazetta* hybrids and Poetaz and Poeticus varieties)

Since modern breeding is being done with varieties carrying either large amounts of *N. poeticus* or *N. hispanicus, var. maximus* blood, or both, it would seem that we are already well on the road to further improvement in this respect. It would seem, however, that more use could be made of *N. Tazetta* blood, in an attempt to raise the resistance of our modern daffodil hybrids to virus infections.

In seeking an answer to the great susceptibility of the double daffodils to virus diseases, we find a possible clue in the fact that all daffodils are most susceptible during a short period just before flowering. Attempts to spread the disease artificially by mechanical means were only successful in that period. This period coincides with the stage of the bulb development when the least amount of food is stored and it might be argued that the bulb is at its very weakest stage. Since the formation of the double flower with its multitude of petals would take more food from the bulbs, it might also be argued that the bulbs of double daffodils are weaker than single forms (of the same variety) would be at the same stage of development and hence more susceptible to virus infections.

There seems to be no reason, however, to assume that the varieties in group 6 should be weaker before flowering time than those of group 5 or group 4, while in practical tests a difference in susceptibility can be noticed.

The lack of disease resistance in the N. triandrus group might be ascribed to the fact that these varieties are not well adapted to garden culture and that annual lifting and replanting does not seem to agree with them. The same thing might be said, however, for the *N. poeticus* group and we find a remarkable degree of resistance in this group, no matter how the bulbs are handled.

The influence of climatic conditions on the resistance to virus diseases should be noted. Thus we find that some varieties ordinarily resistant in colder climates, will be very subject to the disease when planted in a warm climate. Heat seems to accelerate and intensify the symptoms and infected plants have a shorter span of life in a warm climate than similarly infected plants have in a cooler climate.

Since the *N. Tazetta* species originated in countries with a warm climate (that is, countries with optimum conditions for the spread of virus diseases), it may well be that only plants with an extremely large degree of resistance could survive and that this characteristic became an important factor.

Dividing the daffodils, however, between those originating in warm climates and those originating in cool climates does not offer us any clue to disease resistance factors, since *N. Tazetta* from warm climates are resistant while *N. poeticus,* which come from cool regions, have an almost equally strong resistance.

We must note, however, that the Tazetta species and varieties differ from all others in that they show a marked tendency to flower before the foliage has grown to any length. Is it possible then that the bulbs are not in as weakened a condition as the bulbs of other species would be in the period just preceding flowering? The Poeticus varieties differ also from other daffodils in that they are never dormant and therefore may be supposed to have a greater store of food than other types of bulbs.

Is it then a food deficiency that would make a daffodil susceptible to virus diseases and can greater immunity be given to our hybrid daffodils by feeding them more strongly in the period of greatest susceptibility? Or would a greater supply of light during this period induce them to store more starches and give them greater resistance?

An answer to these questions would be of the very greatest value to all lovers of the daffodil.

MOSAIC VIRUS IN THE AMARYLLIDS

L. S. Hannibal, *California*

Mosaic disease has long been known in *Narcissus;* some clones like "Minister Talma", "Bernadino", and *Triandrus* hybrids are distinctly subjected to it, especially in Southern California. The presence of this virus is shown by a striping or mottling of small light green areas scattered over the surface of the leaf. Aphis have been considered the vector for its spread in Europe, but such is not the case here; although some of the *Tarsonemus* mites may possibly have a hand in it. Bulbs seriously affected by mosaic are weakened and often fail to bloom. Control is only possible by rogueing all infected plants.

Cecil Houdyshel first called my attention to the existence of this disease in *Crinum* and Hybrid *Amaryllis,* and recently Dr. Traub commented on its presence in the *Hymenocallis.* Being well aware that the infection was in a few of my *Amaryllids,* I had been keeping it under observation, without attempting to rogue out the diseased plants since

no serious effects have ever been noted. In a recent examination of about 140 species representing 30 or more genera only the following specimens were found subject to the infection in varying degrees, those marked "xx" being the most seriously affected: *Hymenocallis occidentalis* x; *H. pauciflora* (4 spp. Florida swamp type) x; *H. tenuiflora* x; *Amaryllis rutila fulgida* xx; *A. crocata* ?; *A. Johnsonii; A. solandriflora* var. *conspicua* xx; *A. belladonna* (Equestrian Lily) x; *A. reginae —x. fulgida* hyb. xx; *A. Amaryllis aulica* maj.; *Crinum imbriaticum* x; *C. Crinum gigantea* spp. xx; *Crinnodonna Howardii* ?; *Callicore Rosea* form ?; *Cyrtanthus spp.* ?; *Urceolina peruviana* x; *Phaedranassa Carmoli; Eucharis Grandiflora.*

Fortunately not many spp. apparently respond to mosaic. It is interesting to note that *Crinum, Amaryllis, and Hymenocallis* (excluding *Ismene)* seem the most likely to be subject to the infection, but no definite reason can be formulated as to why certain species contract the virus while others are resistant—the most notable being that *Amaryllis rutila* (the type) is resistant while the variety *fulgida* and hybrids are not.

Seeds are not supposed to carry the disease, at least *Narcissus* does not, but whether the green fleshy seed like that of *Crinum* will has not been determined.

BURBANK'S WORK WITH AMARYLLIDS*

Dr. W. L. Howard, *University of California at Davis, California*

At the outset I should explain that I am not an Amaryllid specialist or even an amateur florist, but a general horticulturist, whose major interests have been with fruits rather than with ornamentals.

Ten years ago, as a horticultural problem, I began a study of the work of the late Luther Burbank of Santa Rosa, California. No one seemed to know the facts of his professional life, so I undertook to dig them up and set them down on paper. The job is now finished and the results will be published as a Experiment Station bulletin.

Burbank kept no continuous record of his productions. He merely bred new varieties of fruits, flowers, etc., sold them "lock, stock, and barrel," as he often said, and then set about producing something else. Sometimes he announced his new things in his catalogs and price lists, and sometimes they were first advertised by dealers who purchased them as unnamed hybrids. My task has been to study all of his publications that I could find, as well as the announcements of his chief customers, and also to review the leading horticultural literature of the time, for references to anything he might have produced. The magnitude of the

* In this article the amaryllid nomenclature adopted by the American Amaryllis Society and by Standardized Plant Names, 1941, is used. The generic name **Amaryllis** Linn. (not Herbert) is used in place of the synonym **Hippeastrum** Herbert. Accordingly **Amaryllis vittata,** for instance, is used in place of the synonym **Hippeastrum vittatum** Herbert. The generic name **Callicore** Link is used in place of the synonym **Amaryllis** Herbert (not Linn.). Accordingly **Callicore rosea** Link is used in place of the synonym **Amaryllis belladonna** Herbert (not Linn.).

task is indicated by the fact that his working life extended over a period of fifty years, and his total output amounted to between eight hundred and a thousand varieties.

By combing the entire United States I have found one hundred and twenty-seven of his catalogs and price lists which range in size all the way from handbills to an 80-page catalog, in which he offered something for sale. Only one of these publications was devoted to Amaryllids, an 8 by 10-inch circular, 12 pages and cover, entitled "A brief descriptive list of the new Burbank Amaryllis," which was issued in August, 1909. He called this his "First and last Amaryllis bulletin."

Burbank gave active attention to the hybridization of *Amaryllis* Linn. (syn. *Hippeastrum* Herb.) *Crinum,* and *Sprekelia*—all of which he included under the heading of "Amaryllis"—for a period of twenty to twenty-five years and kept some of his hybrids under observation much longer than this. In addition he also introduced hybrid *Hemerocallis.*

Amaryllis were the first experimented with—*A. Johnsoni, A. vittata* and *A. Reginae.* The *Johnsoni* is itself a hybrid, having been produced by an amateur breeder in England in 1799, so that a cross between it and *A. vittata* (which was one of Burbank's early successes), represented a union between a hybrid and one of its parents. In the next generation *A. aulica* was introduced and then *A. Reginae,* the other parent of *Johnsoni.* Beginning with the fifth generation, he tells us, "several other species of *Amaryllis* were introduced into the combination." There were then crosses and re-crosses between the various hybrids. After about twelve years, he says he had "a colony of mixed hybrids that showed wide departures from any of the ancestral forms." This is the history of his new race of hybrids known as the "Giant Amaryllis."

When he felt that he had reached the practical limits of variation to be attained by hybridizing the different species of *Amaryllis;* he extended the experiments by attempting to cross "the new *Amaryllis* hybrids with other allied genera, notably with *Sprekelia* and *Crinum.*"

He claims that the *Amaryllis-Sprekelia* cross was at least a partial success. He says: "I have worked on the *Sprekelia* more or less for twenty years, raising probably a hundred thousand seedlings. [doubtless an exaggeration.] But I succeeded only once in hybridizing the plant, with the production of fertile offspring. The hybrid *Amaryllis,* that made union with the Jacobean Lily was my *vittata* type, [his 'Giant Amaryllis'], having pale red flowers striped with white. Only a single hybrid of this union bloomed, but from this a number of seedlings were grown. The hybrid offspring of these plants of different genera had long, narrow, strap-shaped leaves much like those of *Sprekelia* (the pollen parent), but the blossoms were very much larger than those of that plant, and they had very curiously twisted petals, unlike those of either parent." [See Figure 78]

He also claims to have successfully hybridized *Callicore* with the genus *Crinum.* "Interesting hybrids were produced by crossing the Crinums, not with the members of the [*Amaryllis*] colony (this proving

impossible), but with the form of [*Callicore*]. The hybrids thus produced were a very curious lot. They seemed undecided whether to take on the flat, strap-shaped leaves of the [*Callicore*] or the tunicate leaves of the other parent. The compromise led to the production of a leaf with a long, curious neck."[1] The *Crinum* he used might have been either *americanum, amabile (augustrum), asiaticum, Moorei* or *bulbispermum* for he used them all.

Dr. George H. Shull, who spent four or five years in Santa Rosa checking Burbank's experiments for the Carnegie Institution of Washington, supports this belief, at least passively. He has kindly supplied me with a paragraph from the manuscript of his report with the comment that he could "only vouch for the fact that this statement had Mr. Burbank's approval." The statement follows?

"Another noteworthy hybrid which Mr. Burbank produced was between ..... [*Callicore rosea*] and *Crinum americanum,* the [*Callicore*] being the seed-parent. While these [*Callicore-Crinum*] hybrids are of little economic value, they are of much interest scientifically. The leaves of the [*Callicore*] are flat and strap-shaped, and those of the *Crinum* are curved and overlapping or rolled over in such a manner as to form a distinct neck to the bulb. In the hybrids the leaves seem to be distinctly intermediate between these two types, being more or less curved at the base and becoming strap-shaped above, sometimes exhibting a distinct offset between these two portions of the leaf. The flowers are intermediate between the two parents being smaller than the [*Callicore rosea*] and more tubular, but varying through light pink to deep rosy crimson like the [Cape] Belladonna lily. These curious and graceful hybrids multiplied quite rapidly and are easily grown, but have never borne any seed. Efforts to cross them with the two parents have also been without result. None of these hybrids have been distributed, and only a few remain in existence at the present time."

The other achievement with *Amaryllis* was the development of the giant-flowered race of hybrids.

Apparently only eight or ten named varieties of *Amaryllis* were introduced, but a large number of hybrids were announced—136 at one time—and sold without names. Likewise, *Crinum* hybrids were sold without names and without being advertised, according to a statement by Burbank. So far as can be determined all have now disappeared from the trade or have been further improved and their original names lost.

Hybrid Amaryllis

Amaryllis vittata hybrida.—Announced in 1905. This was not a single variety but a collection of hybrids from which individual types were selected and given variety names.

Boy Rolf.—About 1905. No information—merely a brief mention in a clipping from an unknown periodical. Possibly one of the *vittata* hybrids.

---

1 This is a hybrid that Herbert (1837) mentions in a footnote, and that was later also made by Ragionieri in Italy, **(Crinodonna Corsii),** and by Fred Howard in California **(Crinodonna Howardii).—Ed.**

Burbank's Dwarf Everblooming Fragrans.—Announced by John Lewis Childs, of Floral Park, N. Y., in his catalog for 1909. No information as to its origin, although Burbank once spoke of having received a dwarf *Amaryllis* from Southern Chile.

Fig. 78. Burbank's Sprekelia—Martinique. Photo from Burbank catalog by W. L. Howard, Davis, Calif.

Burbank's Giant Hybrids.—1906. This was a race of large-flowered *Amaryllis* that Burbank claimed required ten generations of breeding to produce. The first step appears to have been a cross between *Amaryllis Johnsoni* and *A. vittata.* Then, *A. aulica* and *A. reginae* were brought

into the combination, followed in the fifth generation, with several other species." A few of these hybrids were given variety names and sold, but a far greater number were sold unnamed. One of the types was apparently sold to John Lewis Childs, of Floral Park, N. Y., about 1909.

Coronado.—1913. (Provisional name). The inference is that this variety might have been sold and given some other name. One of the giant hybrids with a complicated ancestry. Said to be an early bloomer and a "prodigious" multiplier. "The flowers, surrounded by a foliage of light green, are of a pure intense scarlet with varied shades of oriental crimson, set three or four to the stalk." Flowers eight inches across—petals three inches. If the variety survived very long, it must have been under some other name.

Martinique.—1909. Described as a cross between *Sprekelia formosissima,* the Jacobean lily, and *Amaryllis vittata.* This was credited at the time with being a unique hybrid among bulbous plants. (See Fig. 78.) "The flowers are a fiery crimson—like those of the Jacobean lily but very much larger. The blooms are nine inches in diameter and are even more remarkable for their long curious, twisted petals, which give the flower a strange appearance and which is not found anywhere among the *Amaryllidaceae.* The leaves are pale green, upright, strap-shape, one inch wide and eighteen to twenty inches long." Following his usual custom of getting rid of new things, in toto, Burbank offered his entire stock of 58 large bulbs and 57 small ones, of this new hybrid, without reserve, for $350. He added, that seed capsules were produced abundantly but with rarely a viable seed.

Mrs. Burbank.—1901 (?). No information beyond a brief announcement in one of the County newspapers. "In size the variety will average about eight inches across. They increase slowly." Perhaps a hybrid of the same origin as Martinique.

Pomona.—1913. (Provisional name). One of the Giant Hybrids. Described as a very regular flower with a clear, fiery bloom, with broad petals, much overlapping and recurved. "An exceptionally free bloomer, having four to seven flowers to each stalk. The flowers measure nearly two feet around and have a sharp, narrow, white stripe on four petals." No information as to whether it was re-named.

Portola.—1913. (Provisional name). Another one of the Giant Hybrids. That may have been given another name, if sold to a dealer. No record of it has survived. Described as having an immense flat flower measuring nine inches across, pure white, ground-lined and flaked with carmine. "The bulbs are prodigious bearers, having several stalks to a bulb and four flowers to a stalk."

Profusion.—1903. One of the early hybrids, presumably between *Amaryllis vittata* and *A. Johnsoni.* Years later Burbank referred to *Profusion* as having been the most abundant bloomer of its time. In 1909 John Lewis Childs, of Floral Park, N. Y., offered a variety under the name of "Vittata Profusion Amaryllis", with the claim that it was "a superior type of the giant race of *Amaryllis* x *vittata* hybrids." The meaning of this is not quite clear, unless it was intended to inform the reader that the *Profusion,* too, was one of the Giant Hybrids, then being

flamboyantly announced. And it was, but the latter had had the benefit of two or three additional years of improvement.

Seedling Amaryllis.—1909. One hundred and thirty-six numbered hybrids were announced at the same time. All were the result of a series of complicated crosses involving four or five species. These, collectively, were known as the Giant Amaryllis.

There was a total of 3,117 bulbs in the lot, priced at an average of about $1.55 each. The number of bulbs to each number ranged from one to over two hundred. In all cases the purchaser was expected to purchase the entire stock of a particular hybrid with full control. The copy of the announcement from which these notes were compiled evidently had been used the year before—or earlier—as thirty-three of the numbers are marked in red ink, "sold." There is also a notation on the front cover page, in red ink, in Burbank's handwriting, announcing "50 per cent discount to the trade," and a conspicuous notice is pasted on the inside to the effect that he could now offer the seedlings described at a greatly reduced price from those originally quoted. Apparently they did not sell too well. Perhaps the prices were thought to be too high or the buyers wanted more than one number but did not care to invest more than a moderate sum at one time. At any rate, almost without exception, those that were sold were in the low-price brackets, indicating that they went to small dealers and amateurs. Then followed a brief description of each of the 136 numbers.

Hybrid Crinums

In his autobiography Burbank says: "I have grown about twenty species (of *Crinum*), some of them of tropical origin. Numerous crosses were made among these species until I had a cross-bred strain of Crinums of ancestry as complex as that of my [*Amaryllis*]. The seed parent of a large proportion of the hybrids was the species known as *Crinum americanum,* but a few were grown from the seed of *C. amabile (augustum)* and *C. asiaticum.*" He claimed that in the various crosses, the traits of the species of temperate zones appeared to be dominant. Several of the hybrids were sold as numbered seedlings, but there is no information as to whether any have survived.

Burbank Hybrids.—1901, 1906, 1914, 1927. "- - - - - white and pink shades, immense bulbs - - - - - great snow-white blossoms often shaded pink and rosy-crimson; generally slightly or strongly fragrant. A cross of the best greenhouse species with a hardy one - - - - -. The flowers are various shades of pink and white, about six or seven inches across borne on stout stalks three to four feet in height resembling enormous Easter lilies. - - - - - the *Crinum* bulb grows to gigantic size, often weighing as much as four to eight pounds - - - - -."

Hybrid Hemerocallis

It is not clear what work was done with the daylilies *(Hemerocallis),* that is, whether the four varieties announced were known hybrids or merely selected seedlings.

Burbank.—1917. Advertised as a hybrid, but there is no confirming evidence. A. B. Stout (Daylilies, p. 43), says the plants were "as much as thirty-four inches tall and the flowers yellow with rather narrow segments. Very like *H. Thunbergii.*" Distributed by Carl Purdy, of Ukiah, California.

Calypso.—1918. No information as to its origin. "The flowers of *Calypso* resemble big pure, lemon-yellow lilies - - - - -. The flowers are produced nearly all the season; the petals are revolute like the true lilies; height three feet." Distributed by Carl Purdy, of Ukiah, California.

Cygnet.—1924 (?). George L. Slate (Lilies for American Gardens, p. 46), says of the *Cygnet,* "Mentioned by Mr. Morrison in 1924 (House Beautiful 55:69) and origin credited to Burbank." No further information.

Surprise.—1917. Spoken of as a "cross-bred seedling." "Flowers, a very light straw-yellow—almost white—very large, full and open. Blooms almost constantly through the season; height, four feet."

DIVERSITY OF FORM IN DAYLILIES

J. Marion Shull, *Chevy Chase, Maryland*

Half scientist, half artist, the author admits his inability to classify what follows so will leave to the trained librarian the problem of determining whether it should be filed under the heading of Art or Science.

In presenting this study of daylily form there is no intention to assume the role of advocate. All forms may be good, and no one is best, whether good or not so good is entirely beside the question at the moment. The presentation may be far from complete; certainly there are infinite graduations from one to another among those here shown. Neither is there any intent to trace these forms back to their specific origin. Instead I offer them merely as observed facts, mostly culled from seedlings grown in my own garden during some fifteen years of breeding work with *Hemerocallis.* Included are several named varieties from other sources. The designations in the case of unnamed seedlings have no other significance than to serve as suitable labels for reference. They grew out of the breeding records and have been retained here purely as a matter of convenience. With this apologia out of the way I plunge into such discussion as seems warranted.

With the exception of *Duchess of Windsor, Mayor Starzynski,* and *Rajah,* whose ancestral backgrounds I can only surmise, the clones illustrated here all have *Hemerocallis fulva* as a grandfather or great-grandfather, with *H. serotina (thunbergii)* in corresponding relationship on the maternal side. Collaterally introduced into the life stream of some of them, sometimes on maternal side, sometimes on the paternal, are such other partially known entities as Perry's *Iris Perry,* probably closely related to *H. aurantiaca; Florham,* of quite dubious ancestral status, and Franklin Mead's *Hyperion,* presumably related to *H. citrina.*

Inasmuch as none of this makes evident sense or seems to explain anything in relation to the variability of form under consideration the reader is invited to accept it merely as a passing observation devoid of intentional value as proof or support on any particular thesis.

Upper row, Daylily flower form: left, A-1 (Shull) X Rajah; petaline segments erect; sepaline segments recurved; center, petaline segments erect with lips recurved, sepaline segments recurved; **right,** Gorgio X Rajah, sepaline segments erect, petaline segments recurved.

Lower row, Daylily flower form: left, D-5 (Shull), Ophir X "Thulva", spidery aspect with long narrow segments; right, B-1 (Shull) X Rajah, wide petaline segments, sprawling, flamboyant.

Plate 230

The grouping into figures has of necessity been something of a compromise between related characteristics and the exigencies incidental to the engraving and printing arts. Partly it is determined by natural similarities of the subject matter, partly by the demands of space utilization.

In Plate 230, upper row, for instance, we have types that are not of very frequent occurrence. This is fortunate perhaps since for the most part they have little garden value. They are similar in that all three provide different aspects of the two sets of segments, the sepals and the petals. At the left the sepals are recurved while the petals are ascendant to nearly erect and not recurved.

In the center the petals are both ascendant and recurved giving a two-storied effect suggestive of hose-in-hose as occurring in some other garden flowers.

At the right the characters are reversed and it is the sepaline segments that ascend while the petals are markedly recurved. This variety is derived from *Gorgio* by *Rajah* neither of which shows any suggestion of such characteristics.

The lowered garden value of this group is largely due to the fact that in nearly all daylilies, except some of the yellows, the inner faces of the segments are more richly colored than the outer and specimens such as are shown at left and center do not provide a proper display of these better colors.

In Plate 230, lower row, we have a striking study in contrasts. Both are much above average size, the left with long and narrow segments and a general spidery appearance not at all unpleasing in its clean pale lemon yellow. This is derived from *Ophir* by *"Thulva"* and related through the latter to *Thunbergii* and *Fulva*.

On the right is a huge blowzy thing with red petals and orange to red sepals, whose ancestry includes *Iris Perry* by *"Thulva"*, which means that *Fulva* is the great-grandfather. Immediate pollen parent of this is *Rajah* which may account for some of its color but contributed little in the matter of form.

In Plate 231, upper group, there is an apparent kinship of form in left, right and lower. They possess in common great width of segment relative to length and all show a considerable degree of regularity. The seedling at left, and *Duchess of Windsor* at right, are almost perfectly regular. These two open out almost flat. Seedling at left is a grand-child of *Iris Perry* by *"Thulva"*; a great-grand-child of *Thunbergii* by *Fulva*. Derivation of *Duchess of Windsor* is unrecorded.

Below is Dr. Traub's *Mayor Starzynski*, a variant to the extent that the tips of the petals are thrust forward instead of being slightly recurved as in the other two.

Above, and in contrast with these, is the narrower segmented triangular built *Rajah* of Dr. A. B. Stout. *Rosalind* and many others are of this same type.

Rajah, as immediate pollen parent of six of the varieties selected for use in these figures, does not seem to have contributed materially to their inheritance of form.

Upper group, Daylily flower form: left, a seedling of B-1 X Rajah, with wide segments and quite regular; right, Duchess of Windsor, with very broad petaline segments, opening nearly flat; below, Mayor Starzynski, petaline segments broad with tips thrust forward; above, Rajah, segments narrower, triangular form (fairly frequent occurrence).

Lower row, Daylily flower form: left, Musette, oblanceolate petaline segments not recurved, gives distinct star shape; right, A-1 (Shull), full sister of Musette, very irregular, seedling of Hyperion with serotina and Fulva as great-grandparents.

Plate 231

In Plate 231, lower row, are two full sisters from *Hyperion,* parents, grand-parents and great-grand-parents the same. At the left, *Musette* (A-6-Shull), a bright, ripe-banana color; segments hardly at all recurved and presenting a starry form unlike anything else on the place by reason of the oblanceolate segments, widest at about two-thirds their length from the base.

On the right, A-1 (Shull) has all its sepals and two of the petals exaggeratedly recurved while the one remaining petal is usually a long thrust out tongue, making a flower that is extremely irregular. Color is a light lemon yellow throughout.

Not a matter of form but nevertheless a matter of interest is the fact that these sisters not only differ in form but *Musette* is strictly a day bloomer, opening early in the morning and remaining until dark, while A-1 opens in the evening and is spent by late afternoon.

Figure 79 presents an interesting study in curls. At right is F-3 (Shull), a very strongly marked bicolor, petals mahogany red and sepals

Figure 79. Daylily flower form: right, F-3 (Shull), all segments greatly recurved; left, F-3 X Rajah, segments spidery-curly-twisty; center, F-3 X Rajah, petaline segments broad, curly-twisty.

sienna yellow but the chief immediate interest being form, attention is called to the extreme curling back of all segments. F-3 is itself a great-grandchild of *Thunbergii* and *Fulva,* and it, with *Rajah,* gave rise to the two at center and left of Figure 79. These two sisters, therefore, are great-great-grand-children of *Thunbergii* and *Fulva*—but how very unlike! At the left is a very smooth bright yellow that might be characterized as spidery-curly-twisty, a very graceful and lovely flower in every respect, somewhat on the order of Dr. Traub's *Theodore Mead.*

Its full sister, center, is long-curly-twisty also but not so spidery by reason of its wider and more ruffle-margined petals. These rather long, twisty and curling segments appeared in nearly all members of the family F-3 by *Rajah.*

As was said in the beginning I am not advocating any of these varied forms as superior to any others. So long as proportions are good and color effective any form is or should be acceptable. That we should have personal preferences, likes and dislikes, is only natural and to be

expected, and it is always a mistake to elevate any group of requirements to the status of perfection and then ask that all others be measured in terms of, or in comparison with, this proclaimed standard.

I personally like a number of these forms, but I never stop marveling at their diversity, for which I find no explanation in contemplating the ancestral picture back of them. True, that picture is not entirely clear. There are blurred spots in it. Collateral lines are not always fully recorded, sometimes not recorded at all, like a foundling left anonymously on some friendly doorstep. I do not know what lies back of such things as *Florham, Iris Perry, Ophir* or *Rajah,* but in themselves I do not find any suggestion of the variations that have come out in these descendants of *Thunbergii* and *Fulva* in the course of several generations. And the color variations are almost equally bewildering.

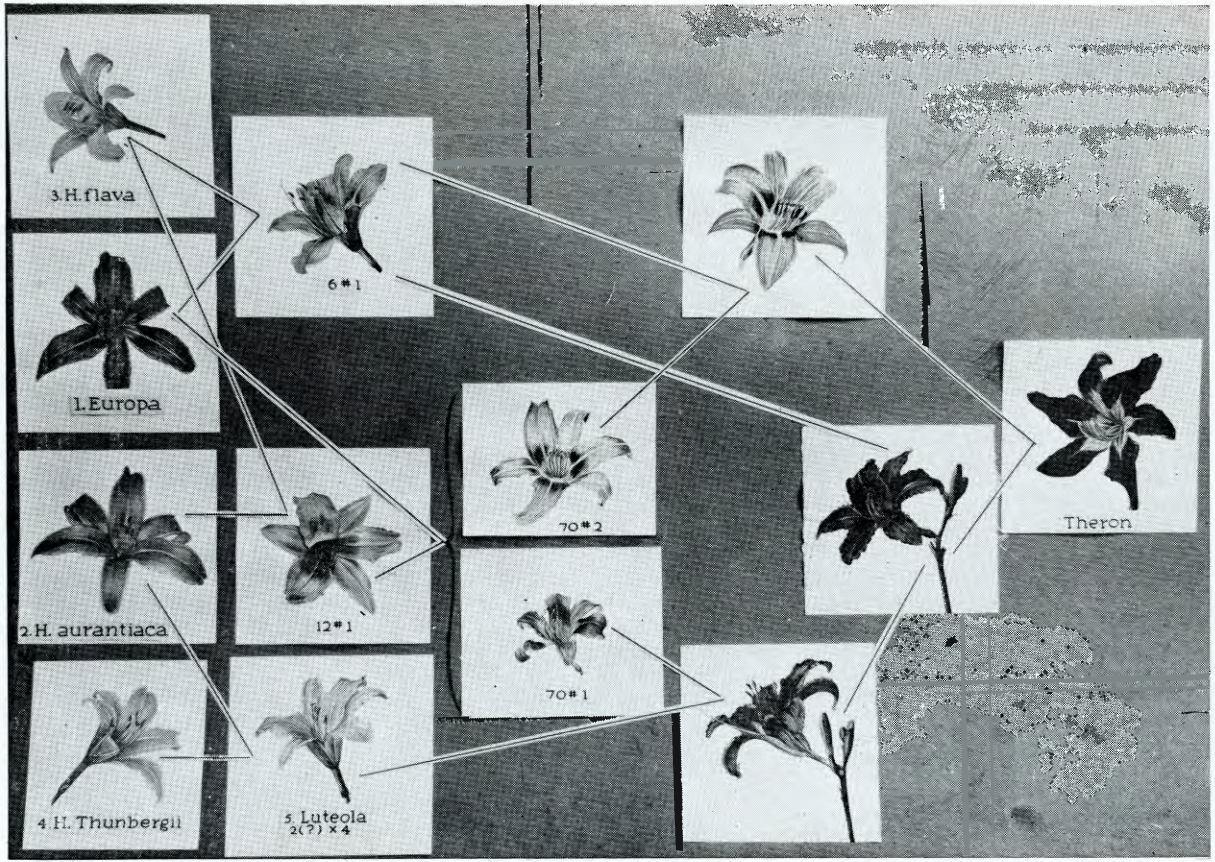
ORIGIN AND GENETICS OF SOME CLASSES OF RED-FLOWERED DAYLILIES

A. B. Stout,
The New York Botanical Garden

The term "red-flowered" may be applied to the daylilies which have in addition to non-red pigments some shade or degree of red sap pigments, presumably anthocyanin in chemical nature, visible on the inner face of the open flowers. The members of the species *Hemerocallis fulva (4, 5, 14**) (including the *H. disticha* and the *H. longituba* of certain writers) have flowers of this character in a considerable range of patterns and tones that are mostly orange-red in color. A clone that was named *"H. aurantiaca" (6)* has flowers with dull orange red coloring in a relatively simple pattern that is two-toned distal (near no. 4 of plate 233). The breeding behavior of this clone clearly indicates that it is heterozygous for two important characters, (a) the evergreen habit of growth and (b) the fulvous red coloration of its flowers. This clone can not be considered as a type of a "good species." It is evidently a hybrid and in this article it will be considered as a horticultural clone and designated as the *Aurantiaca* Daylily. A clone with flower coloring very near to that of the *Aurantiaca* Daylily has been considered a type of a variety which was named *H. aurantiaca littorea* Nakai. A somewhat rare clone in cultivation in the Royal Botanical Garden at Edinburgh, Scotland, under the name *"H. fulva angustifolia"* has small flowers in the face of which there is a halo of red coloring. Except for the daylilies mentioned above the "species" of *Hemerocallis,* at least of those known and named at the present time, have flowers that are only yellow or orange in the face of the open flowers.

Distribution of red sap pigments in plants of Hemerocallis. It should be noted that many daylilies, including most of those that display no red in the face of the flowers, do have red pigments somewhere in the plant. Dull dark-red pigmentation in the back side of the sepals and on the tube is characteristic of the flowers of some, but not all, members of *H. Dumortierri, H. minor, H. Middendorffii,* and *H. multiflora* and

* References to literature citations at end of article.



Dr. A. B. Stout, New York Botanical Garden

Pedigree of Theron Daylily; shading indicates pattern and degree of red-coloring in flowers of each plant involved in the ancestry.

Plate 232

red coloring is noticeable in the bracts and scapes of many plants of these species. The *Lemon Daylily* and some plants of *H. citrina* have purplish-red or almost black coloring in an area at the tip of the sepals. Some plants of *H. citrina*, *H. Thunbergii*, *H. minor*, *H. Middendorffii*, and *H. esculenta* have rose-pink or even bright red coloring in the base of the leaves and often the capsules are strongly colored to a red that is nearly black. Dull brownish red pigmentation appears in the older roots of certain daylilies but this may not be due to anthocyanin. Individual members of most of the species mentioned above appear to have no red coloring anywhere in the plant, and this is the case for the clone known as *"H. aurantiaca Major"* and some of the horticultural clones. Thus a survey of the wild species and the types represented in the older of the cultivated clones of daylilies indicates that many have red pigments somewhere in the plant but only a few have red coloring in the face of their flowers.

Other pigments and their influence on red coloring. It should be mentioned that in addition to the anthocyanin sap pigments in flowers of daylilies there are also yellow and orange pigments that are important in the flower coloring. When homozygous clear orange-flowered daylilies are hybridized with clear yellow-flowered daylilies the flowers of the F_1 hybrids are, in my experience, *always* intermediate in shade of coloring, and there is a wide range in the grades of coloring in the later generations. It is the rule in the fulvous daylilies that red pigments do not develop in the throat of the flowers and in this area the green, yellow, and orange pigments provide the coloring. Outside of the throat in the outer two-thirds of the radius of a flower the yellow or orange pigments of the inner tissue blend with the more epidermal red pigments to produce the coloring effects which one sees. The same quality and intensity of red pigments will appear differently when combined with orange than when combined with yellow. Thus in hybrids obtained by complex hybridizations and selective breeding two rather distinct effects are to be recognized. The various yellow and orange pigments modify the appearance of each class of red pigmentation merely as mixtures of pigments, and there are modifying reactions between genetic factors which produce changes in the quality and the intensity of red pigmentation and in the patterns of distribution.

The early breeding for red-flowered daylilies. Few members of the fulvous daylilies of the Orient were known in Europe and America previous to the collections obtained by The New York Botanical Garden beginning in 1924 *(5; 7; 8; 14; 17)*. In fact not more than a half dozen fulvous daylilies from the Orient were propagated as clones previous to 1924 *(4, 5, 14)*, and it happened that these had flowers relatively dull orange red in coloring. The limited breeding that was done with these clones in Europe was confined to the production of a few members of a first generation. None of these had other than rather dull fulvous coloring, if one is to judge the introductions *Halo, Gold Ball, Pioneer.* and the *Fulcitrina Hybrids (14)*. Also the fulvous daylilies introduced for horticultural culture previous to 1930 and a large number of those introduced since that date have dull orange red coloring.

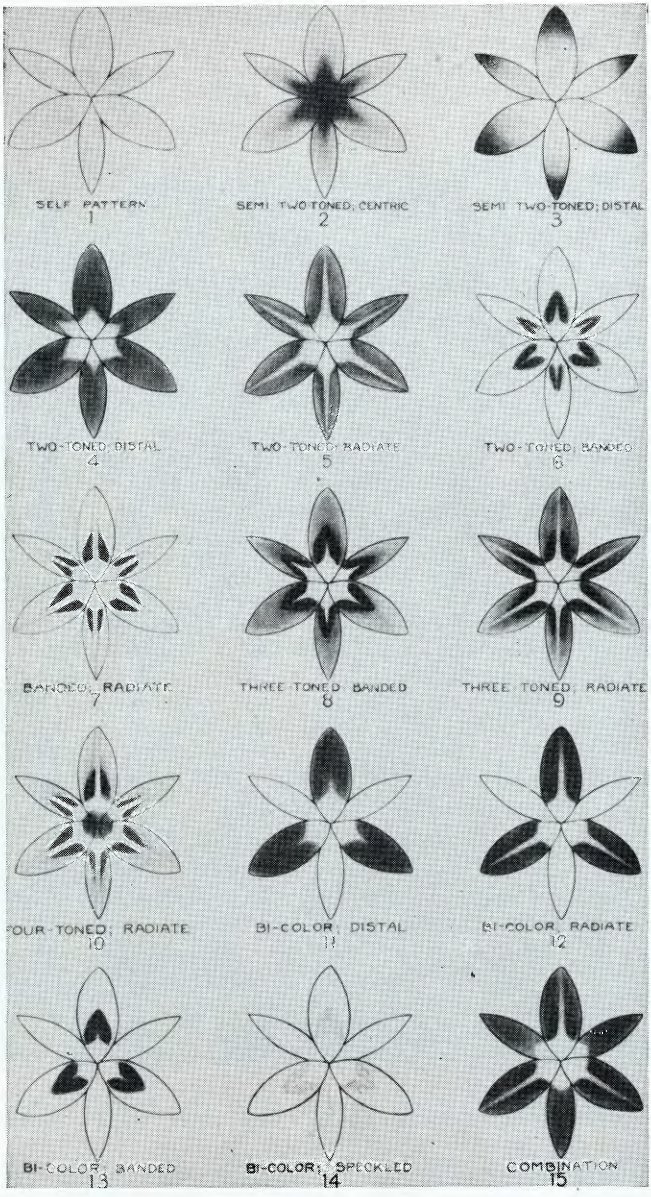


Illustration showing principal color-patterns in flowers of Hemerocallis. This plate drawn at New York Botanical Garden by Miss Eleanor Clarke, through cooperation of Works Progress Administration (O. P. 165-1-97-8. W. P. 5).
Plate 233

Complex hybridizations and selective breeding. The production of new types of red-flowered daylilies was one of the aims in mind when the writer began breeding work with *Hemerocallis.* At that time, except for the double-flowered clones *Kwanso* and *Flore Pleno,* the only fulvous daylilies available at The New York Botanical Garden were (1) ramets of the triploid clone (3n=33 chromosomes) which is the Linnaean type of *H. fulva* and which was later named the *Europa* Daylily *(4)* and (2) ramets of the *Aurantiaca* Daylily. These clones proved to be so completely self-incompatible that no mature and viable seeds have thus far been obtained at the New York Botanical Garden from either one by self-pollination. Hence there has been no opportunity for selective breeding within selfed progenies of either of these two fulvous red daylilies. [See addendum on bottom of page 173.]

Attempts to hybridize these two clones began early in the investigations. Many cross-pollinations were made using each as a seed parent, but no viable seeds were obtained. The *Aurantiaca* Daylily has since been hybridized with certain other members of the species *H. fulva.* What may be called an indirect hybridization of these two clones was accomplished. Each clone was hybridized with certain yellow-flowered and orange-flowered daylilies that were available and then certain of the hybrids thus obtained were interbred and also crossed with the other fulvous clone that was not already in the ancestry. In this way pedigreed progenies which totaled about 500 seedlings were soon obtained which had both the *Europa* Daylily and the *Aurantiaca* Daylily in their ancestry (3).

With these seedlings at hand further lines of breeding were undertaken. (a) There were further hybridizations with members of yellow-flowered and orange-flowered species and with other types of daylilies (including fulvous daylilies) as these were obtained from various sources; (b) there was selective breeding in respect to particular qualities, and especially for those that were new; and (c) there was selective breeding for new combinations of two or more characters.

It should be mentioned here that none of the first two generations of the breeding indicated in Plate 232 was ultimately considered worthy of introduction as a horticultural clone. Some of these were kept as selections for several years but were discarded when they were definitely surpassed by individuals of other progenies and especially of later generations (11).

Complex hybridizations and selective breeding have continued to the present date and the progenies obtained have provided remarkable diversity and extremes of expression in quality and intensity of colorations and in the patterns of color distribution, especially in respect to red pigmentations.

Since pedigree records have been rather fully kept, many aspects of the genetics of new color classes and pattern classes are known. But in daylilies incompatibilities often prevent self-breeding which would result in pure lines and they also limit free cross-breeding among all members of a progeny. When selfed progenies have been obtained they were usually so weak from loss of heterosis that they were worthless.

Hence tests in pure line breeding for the breeding behavior of characters and for the precise genotypic compositions of phenotypes and genotypes have not been made. The selective breeding which the writer has done with daylilies has involved the cross-breeding of individuals.

For adequate and comparative descriptions of the many clones of horticultural daylilies it is desirable, if not necessary, to recognize the main classes of coloring and the types or classes of patterns in the distribution of pigments. A survey of the latter was made by the writer *(18)* with publication of the plate which is here shown in Plate 233. It may be stated that the supply of the issue of the Journal which contained this article and of the reprints of the article itself was entirely distributed soon after the printing.

The Theron class. One line of the selective breeding mentioned above produced a class of dark red daylilies of which *Theron* is the first of the named clones *(12; 14)*. Plate 232 shows the pedigree of this plant and the extent of the shading in the flowers that are represented somewhat indicates the intensity of the red pigmentation in the flowers of each of the plants involved in the ancestry.

In the several generations of hybrid progenies which included the plants of the pedigree of *Theron* there were segregations which had simpler color patterns than that of *Europa,* and also there were segregations for both reduced coloration and intensified coloring. The *Theron* class is an end product in the selection for intensified dark red coloration.

The immediate parents of *Theron* were (1) a plant of series 145 which had flowers with the outer part light red fulvous and a midzone of a dark red that approached maroon and (2) a plant whose flowers were a dull and somewhat maroon shade of red that was rather uniform for the entire blade. Neither of these two plants set seed to self-pollination. It is noteworthy that *all* of the 16 plants, in the progeny of which *Theron* was a seedling, had flowers that were, except in the throat, dark red in shades near maroon and Mars violet as these are shown in Ridgway's Color Standards *(1)* and that in the quality and degree of red pigmentation they surpassed every individual of the ancestry and every member of all progenies of daylilies hitherto grown by the writer. There were minor variations among the 16 plants in the precise shade and intensity of the pigmentation especially in the mid-zone of the petals. In what may be called the THERON CLASS the coloring approaches maroon, violet carmine, Mars violet, and their associated shades including black.

Several aspects of the genetics of the new color class which the *Theron* Daylily represents are clear. It is not a reversion to a wild ancestral type but is quite new to the genus *Hemerocallis.* There is a new association of genetic factors which are complementary in producing intensified pigmentation, not only in the mid-section of the flower but also in the distal portion. It seems obvious that there is an increase in the quantity of pigment; it is quite probable that some feature of the chemical composition is new.

The *Theron* Daylily has thus far yielded no seeds to self- and intraclonal pollinations. The results of selective breeding indicate that intrabred progenies of the THERON CLASS may give progenies all of which

are of the same color class, with however some minor variations. The *Theron* Daylily has been a parent in twenty-two different hybridizations. With homozygous yellow-flowered and orange-flowered daylilies the F_1 hybrids have flowers that are much paler and duller than are the flowers of *Theron,* but usually there are somewhat maroon and even purplish shades in the coloring that suggest the quality of pigmentation seen in *Theron.* Plants with flower color and pattern similar to *Theron* have segregated in various progenies of complex origin. In some cases there has been only one such plant in a series of considerable number along with segregations for clear orange or yellow coloring. Some of the segregations approach black in coloring and others are in shades approaching purplish black.

Several other seedlings which have flowers of dark red coloring have been named as horticultural clones. Of these the *Vulcan* Daylily has in its ancestry the *Aurantiaca* Daylily, the *Luteola* Daylily and a red-colored selection derived from wild plants of *H. fulva.* Another dark red daylily with orange influence is *Wolof* which has in its ancestry *H. Thunbergii,* the *Aurantiaca* Daylily, and *H. fulva rosea* clone *Rosalind.* The seedling that was named *Nada,* which had flowers of Morocco red and claret-brown coloring, has in its ancestry the *Aurantiaca* Daylily, the *Europa* Daylily, *H. flava* which has yellow flowers, and *H. nana* which has orange flowers. It should be noted that the development of the dark red or THERON CLASS of daylilies, or daylilies of any red color except pink, has *not* depended on the use of *H. fulva* var. *rosea* as stated in HERBERTIA volume 8, page 103.

Thus far the results obtained by the writer indicate that the THERON CLASS of coloring appears in pedigrees that have in their ancestry (a) the *Aurantiaca* clone, (b) members of the species *H. fulva,* and (c) either one or both of the yellow-flowered daylilies known as *H. Thunbergii* and *H. flava.* It has also reappeared in progenies that had *Theron* in their ancestry. It has not appeared in any intra-breeding thus far done with members of the *H. fulva* group including the *rosea* variety, but in such progenies there have been plants with somewhat intensified coloring.

The Mikado pattern and its origin. In this daylily (for colored plate see *9* and *14)* there is a mid-zone of the petals with intense red coloring that is close to Morocco red of Ridgway, there is sometimes a faint narrow band in the corresponding area of the sepals, and there is little fulvous coloring elsewhere in the face of a flower.

The banded feature seen in the *Mikado* Daylily segregates in the F_1 progeny obtained when the *Aurantiaca* Daylily is hybridized with the pure yellow-flowered *"H. flava"* (clone in cultivation known as *Lemon* Daylily) or with the orange-flowered *H. Middendorffii, H. exaltata* and *H. Dumortierii.* But in these F_1 progenies the degree of the coloring in the mid-zone is usually pale. The seedling that was named *Mikado* is one of series 118 whose pedigree is indicated in Plate 232. The hybridizations of this pedigree brought together modifying factors which broke up the patterns seen in the *Aurantiaca* and the *Europa* Daylilies and the mid-zone feature or element was segregated. Then the selective

breeding assembled or increased in number certain intensifying factors. Thus far, the *Mikado* pattern has not segregated in the intra-bred progenies of plants exclusively *H. fulva.* But plants whose flowers have a rather uniform red pigmentation (two-toned distal, as No. 4 in Plate 233) have been seen both in wild plants of *H. fulva* and in their intra-bred progenies, and some of these, as the *Cinnabar* Daylily, have been propagated and named as clones.

Several hundred seedlings have been obtained which had flowers with the two-toned banded pattern. Among these there is almost endless variation (a) in the width, size, and shape of the colored area, (b) in the shade of color, and (c) in the intensity of the coloring. Also the mid-zone may develop in the sepals (Nos. 6 and 7, Plate 233) in numerous further variations or it may develop only in the petals (No. 13 in Plate 233) to produce a fully bicolored pattern. It is obvious that *many hereditary factors operate* in producing the more secondary features of this pattern.

The bicolored pattern. Many wild fulvous daylilies have flowers in which the petals are more strongly colored than the sepals. But still greater extremes of difference which give distinctly bicolored flowers soon appeared among hybrids. The most noticeable of these have the distal two-thirds of the petals outside of the throat strongly red colored while the sepals have little or no red coloring. Further modifications are seen in whether the pattern of fulvous coloring is rather uniform (no. 11 in Plate 233), or radiate (no. 12), or banded (no. 13) or two-toned (as the petals only in no. 8).

The bicolored pattern with distal distribution of red coloring (no. 11, Plate 233) appeared in F_1 progenies of crosses between (a) certain plants with flowers of clear yellow or orange colors and no fulvous coloring and (b) plants with fulvous coloring *(16).* In such a case the characters concerned are *yellow non fulvous x fulvous = bicolor.* One may consider that in this case the yellow character of one parent is dominant in the sepals while the fulvous character of the other parent is dominant in the petals. In several cases all the seedlings of such a progeny had bicolored flowers. Fully and strongly bicolored flowers have not been obtained by the writer in any intra-breeding among plants of *H. fulva.*

Compared with the pattern of the *Europa* Daylily the bicolored patterns exhibit a reduction in the extent or area of the fulvous pigmentation and a segregation of sepal coloring from petal coloring. Genetically the origin of this class involves the interaction of factors brought together by certain hybridization.

Frequently one notes flowers of fulvous colored daylilies in which the sepals are more strongly colored than are the blades of the petals. Occasionally seedlings have been obtained in whose flowers the sepals are noticeably more strongly colored than the petals with the color of the latter decidedly reduced. In such a pattern the relative coloring of petals and sepals is the reverse of that shown in no. 11 of Plate 233. Horticultural clones with this reversed bicolor pattern will probably be known in the near future.

Flowers of wild fulvous daylilies. Nos. 1 and 2, from near Kuling; 3 and 4, from Purple Mountain near Nanking; 5 and 6, intra-bred seedlings. No. 1 is near the **Europa** Daylily in pattern and coloring; Nos. 2 and 4 are pale fulvous; No. 3 is somewhat darker orange red than is **Europa;** No. 5 is rose pink; No. 6 is crimson red and has the narrow petals characteristic of many of the wild fulvous daylilies.

Plate 234

Rose-pink daylilies. An approach to rose-pink tints in the flowers of daylilies has appeared in the flowers of some of the seedlings obtained when certain fulvous daylilies including the *Europa Daylily* were hybridized with *H. Thunbergii.* I judge that others have had similar results. But thus far no really good rose-pink or pink-flowered daylilies, have, I believe, been obtained in the progenies of such plants.

A race or variety of definitely pink-flowered daylilies has been derived from plants that came to The New York Botanical Garden in 1924 in a shipment of live plants collected in the wild near Kuling, China by Dr. A. N. Steward. When these plants flowered at New York it was first noted that three of them had flower coloring definitely rose-pink in tint. These plants were propagated and used extensively in intra-breeding and in hybridizations. Divisions of the original plants and of some of their seedlings were distributed from the New York Botanical Garden. The botanical name *Hemerocallis fulva rosea* was given *(8)* to this pink-flowered variety, including the intra-bred progeny and the wild members presumed to exist in China.

The individual plant selected as the type of this variety and illustrated in a colored plate *(8)* is one of the plants from the wild. Its flowers have a banded three-toned color pattern (no. 8 in Plate 233), but with the band rather weak in the sepals. The pattern is near that of the *Europa* Daylily which is the Linnaean type of the species *H. fulva.* The type plant has been propagated and widely distributed and to this clone the name *Rosalind* has been given *(17).* For one of the wild plants and for some of the intra-bred seedlings, as *Charmaine,* the mid-zone or band of darker coloring is lacking and the coloring outside of the throat is almost uniform for both petals and sepals giving a two-toned distal pattern (no. 4 in Plate 233). It has already been mentioned that this pattern is frequent in fulvous daylilies of other than pink coloring.

Dr. Steward *(2)* has described the region where the collection was made which included the pink-flowered plants. But data are not reported regarding the abundance and range of the pink-flowered plants and what admixture of color types exists in the daylily population in the region about Kuling. Later shipments of seeds and living plants of daylilies from Dr. Steward and from the Lushan Arboretum have not included a single plant which had pink-colored flowers, nor has any such plant been obtained by the New York Botanical Garden from any other locality in the Orient.

The writer has used *Rosalind, Charmaine,* and numerous pink-flowered seedlings in selective breeding and in hybridizations *(17).* In the F_1 generation the pink-color character is decidedly recessive to other shades of red pigmentation; it is even greatly modified and often reduced when one parent is a non-fulvous daylily with either orange or yellow flowers. The pink character segregates in later hybrid generations, sometimes in a few of the progeny and sometimes in considerable number depending on the genetic composition of the parents. Among the derived seedlings there is almost endless diversity in tints of pink and in gradations to the tints next to pink as given by Ridgway *(1),*

and in some cases the coloring appears to the eye as somewhat purple. It seems that the clearest pink colorations are associated with yellow or pale orange pigments or with the absence of plastid pigments in the outer part of the flower.

Most fulvous daylilies have poor foliage in mid-summer when the older foliage becomes more or less dead and unsightly. This condition has been the rule for most plants of the *rosea* variety. Also some plants have suffered severely from winter injury and others from damage by thrips. Many of the most beautiful of the pink-flowered selections, and also of the scarlet red class to be mentioned next, which have been under propagation have been discarded because of one or more of these conditions.

The scarlet-red color class. This color class in daylilies may be described as a somewhat brighter red than is seen in the *Europa* Daylily. The range of coloring more fully approaches spectrum red, scarlet red and scarlet as these are represented in plate 1 of the Ridgway Color Standards.

Several individuals of the wild fulvous daylilies collected by Dr. Steward near Kuling have flowers with coloring of this quality. Plants received from other parts of China also have somewhat brighter red coloring than have the flowers of the *Europa* Daylily. One of the clones of this class obtained from Chengtu, China, was named the *Chengtu* Daylily *(15)*. The flower coloring is orange scarlet of a tone near grenadine red and the mid-zone of the petals is near Nopal red. Intra-breeding with these plants soon gave a race of which *Red Bird* is representative for coloring. Some of these seedlings were first shown in a colored illustration in 1930 *(10)*. Various seedlings of this class, and also of the rose-pink class, that were discarded in the selections were included in the distributions made in 1934 to members of The New York Botanical Garden *(13)*.

Plants of the scarlet-red class have been extensively used in cross-breeding and some of the named clones of complex origin, as *Dominion, Baronet, Rajah* and *Port*, have some one or more plants of the scarlet-red color class in their ancestry. The *Rajah* Daylily has for one parent *Mikado* and for the other parent the flowers are crimson red in a two-toned distal pattern. In *Rajah*, therefore, the two features of red coloration seen in the three-toned banded pattern are recombined. Compared with *Chengtu* the coloring is more orange red and the mid-zone is more intense and more sharply defined.

Of the intra-bred selections for red from the wild parentage, the rule is that the flowers have narrow petals (see 6 in Plate 234) and sepals of such thin and tender structure that the perianth segments "roll up" in bright sun during hot days. In the hybrid selections mentioned above this defect is almost absent or not noticeable. Numerous seedlings of the scarlet-red color class are now under observation for evaluation.

It is, I believe, correct to state, that in the breeding efforts of the writer no plants with colors that match the best of the scarlet-red class have been obtained in lines of breeding indicated in Plate 232, unless there was introduced at least one parent of the scarlet-red class derived from the wild plants obtained from China.

The scarlet-red character, at least in homozygous condition, appears to be dominant over pink in hybridizations, but in the seedlings obtained there are gradations to many tints and shades between the various pinks as indicated by Ridgway and the crimson-red class. It may be noted that the scarlet-red color class approaches the spectrum red colors, that the range of shades of these same colors which approach black include the THERON CLASS, while their tints which approach white lead to the pink.

Brown coloring in daylilies. Shades and tints of coloring ordinarily described as brown, chocolate, and tan have appeared in daylilies. These colors are not closely matched by any of the color cards in the first 12 plates of Ridgway's Color Standards which show the entire range of 36 spectrum colors and their main tints and shades. It is necessary in matching the coloring in these "brown" daylilies to refer to the plates which show the "dulling" effects in pigments produced by admixtures of neutral gray. And in these the coloring is most closely matched in those plates in which either (1) red and orange or (2) orange and yellow are the main component colors. Brown color effects appeared in the flowers of some of the first hybrids obtained by the writer, especially when (a) *H. flava,* (b) some one of the fulvous daylilies and (c) orange-colored flowers were all involved in the ancestry. One such seedling, discarded in the early selections of the writer, was subsequently named *Brownie.*

The seedling which has been named *Brunette* has a mid-zone of coloring near maddar-brown and a blade coloring of a lighter shade that may be called tan-red. This plant has in its ancestry a plant of series 145 (see Plate 232) which was hybridized with *H. Middendorffii.* Then one of this progeny was hybridized with *H. flava.* There was extreme variation among the members of the progeny that was obtained. The flower coloring included pale clear yellow, fairly good red. both orange and yellow plastid colors combined with various shades of fulvous coloring, and brown shades.

Daylilies with noticeable dull and brown shades of red have been obtained from the wild and especially in a collection of plants reported to be growing wild in Japan. The intra-bred offspring of these have been reasonably true to the color type. F_1 hybrids and later selections, especially when the *Lemon* Daylily was a parent, have given progeny whose flowers are still more brown-fulvous or tan-fulvous and in some of them the pattern is decidedly centric (no. 2 in Plate 233), which is a pattern quite new for daylilies. What is here called brown or tan coloring is more definitely brown than are the dull fulvous daylilies, as *Aurantiaca, Cypriana,* and numerous of the named horticultural clones.

Reduction in red pigmentations. A rather diverse lot of seedlings have segregated in various progenies which have faint red pigmentation. In some of these the pattern is semi two-toned and distal (no. 3, Plate 232) as in *Autumn Pioneer.* In *Boutonniere* the faint fulvous coloring is mostly in the petals and the pattern is faint bicolor and distal (no. 11, Plate 233). In *Dauntless* the pattern is almost a banded bicolor (no. 13, Plate 233) with the band rather large and broad but very

faint. The pale fulvous colorings exhibit the effects of reduction factors and they exist in each of the several classes of red color, in connection with the different plastid colors, and in many if not all patterns.

Spotted pattern in flowers of daylilies. A report regarding the origin of this pattern may be made here as it illustrates the origin of a color character that does not exist in the parents. Certain hybridizations between species which have *no* fulvous coloring in the face of the flower have given F_1 hybrids in whose flowers anthocyanin pigmentation appeared in minute spots scattered over the face of the flower. The parents were either (a) pure orange *x* pure orange or (b) pure yellow *x* pure orange. Not all the sister plants of any of these F_1 generations had the spotted coloring. Also there were wide differences among the plants which had the coloring; for some there were few scattered spots; for others the number of spots increased until, in the extreme, there were thousands of them in a single flower. The spots were usually most numerous in the mid-zone of the petals. In an examination with the aid of the microscope it was observed that as few as two and as many as 47 epidermal cells containing red sap pigments were grouped in a single spot of color. It would appear that there are wide differences in the total amount of red pigment produced in the flowers of these plants but that this is expressed in the number of the spots rather than in their size. If the number of spots should remain relatively few and well scattered but the area of each should increase in size then large-spotted patterns would perhaps appear.

Numerous seedlings derived from fulvous daylilies have flowers in which the fulvous coloring is flecked, scattered, or dispersed but each one of these conditions seems to be different from that of the spotted pattern mentioned above.

Genetically the spotted pattern is a new expression in that anthocyanin is produced in certain F_1 hybrids in positions in the flower in which such pigmentation is not found in either parent.

Concluding remarks. The several classes (a) of coloring and (b) of patterns in the flowers of daylilies that are here discussed are some of the more extreme and conspicuous of the developments in the red colorings of daylilies. In this report it has been the aim to describe these and to record the most important facts regarding their origin and genetics.

The New York Botanical Garden,
Aug. 15, 1942.

ADDENDUM

Since the last two sentences of the first paragraph on page 165 were written, a few seeds were obtained from the *aurantiaca* clone from self-pollination with the hormone spray known as Fruitone. —A. B. Stout.

LITERATURE CITED

1. Ridgway, Robert. 1912. Color Standards and Color nomenclature. Washington, D. C.
2. Steward, Albert N. 1939. Hemerocallis in Eastern and Central China. Herbertia *6:* 168-172.
3. Stout, A. B. 1925. New daylilies. Jour. N. Y. Bot. Garden *26:* 169-178.
4. ——. 1929. The fulvous daylilies — I. The *Hemerocallis fulva* clon *Europa.* Jour. N. Y. Bot. Garden *30:* 129-136.
5. ——. 1929. The fulvous daylilies — II. The wild fulvous daylilies of the Orient. Jour. N. Y. Bot. Garden *30:* 185-194.
6. ——. 1929. *Hemerocallis aurantiaca.* Addisonia *14:* plate 461.
7. ——. 1930. *Hemerocallis fulva longituba.* Addisonia *15:* plate 483.
8. ——. 1930. *Hemerocallis fulva rosea* . Addisonia *15:* plate 484.
9. ——. 1930. *Hemerocallis* clon *Mikado.* Addisonia *15:* plate 487.
10. ——. 1930. Daylilies for your garden. Ladies' Home Journal. Feb. 1930.
11. ——. 1931. Notes on new hybrid daylilies. Jour. N. Y. Bot. Garden *32:* 25-33.
12. ——. 1934. *Hemerocallis Theron.* The Gardeners' Chronicle *95:* 43.
13. ——. 1934. Distribution of seedling daylilies. Jour. N. Y. Bot. Garden *35:* 189.
14. ——. 1934. Daylilies. New York. Macmillan Co.
15. ——. 1935. The daylily on the cover. *(Chengtu Daylily).* Horticulture *13:* 394.
16. ——. 1936. Bicolored daylilies. House and Garden. June 1936.
17. ——. 1938. Daylilies with rosy pink coloring. Horticulture *16:* 226.
18. ——. 1941. Color patterns in daylilies. Jour. N. Y. Bot. Garden *42:* 40-42.

DAYLILY BREEDING ROUNDUP

This is a continuation of similar symposiums published in 1940 and 1941 HERBERTIA. All daylily breeders who have not already reported should send in brief summaries of their work with daylilies.

EXCURSIONS IN DAYLILY ACHIEVEMENTS

ROBERT SCHREINER, *Minnesota*

During the past few seasons I have added over one hundred new daylilies to my collection, principally originations of Mrs. Nesmith, our Secretary, Mr. Hayward and Dr. Stout. In lesser numbers, but none the less important, I have added developments from the hands of Dr. Traub, Mr. Sass, Mr. Wheeler and Mr. Clint McDade. Many acquisitions have not blossomed characteristically enough to judge them as yet but those that have I have studied carefully and I have found many stunning, exciting new varieties. It is apparent that rapid progress is being made. The future prospects seem both encouraging and promising. As Dr. Stout pointed out in last year's HERBERTIA since large numbers of seedlings are grown there is greater chance for the rare recombinations of recessive hereditary factors and the new combination of complementary factors which are responsible for the expression of certain characters.

I do not believe in a complex color classification system Rather I am interested in acquainting the average gardener with the newer Daylilies and the average gardener does not go at his work with the approach of a scientist. In my years of experience I have found a simple classification appreciated deeply. An elaborate color classification serves to

discourage before interest can be whetted. I roughly put my *Hemerocallis* in the following groups for the present time: Pale yellow, Golden yellow, Orange, Pastel, Rose, Red and Maroons. I will confine my article to the reds, pastels including "pinks" and bicolors.

However, I cannot neglect mentioning two or three of the best new yellows and golden yellows. Rather than obtain many yellow varieties I would concentrate on a half dozen of the best which would include *Hesperus,* a real achievement; striking *Moonbeam,* closest approach to white, a creamy yellow; *Nebraska,* rich soft apricot-orange, a beautiful color; *Patricia,* an earlier development of Dr. Stout's and a splendid plant; free flowering *Mrs. A. H. Austin* and indispensable *Hyperion* would be a very fine selection.

Before I mention some of the new colors I want to make a few observations on the color descriptions found in most catalogs and in many bulletins and magazines. My plea is for a simple, direct color description. To date I have not seen a daylily I could truthfully call purple as several new ones have been described. They tend toward that color but have not arrived as yet. To say a flower is Chinese pink or Jasper pink means nothing to the average gardener but to simplify it by saying it is a dusty pink or a chamois tinted pink would be a much more accurate picturization. I think the so called "pinks" have been given tremendous overemphasis. In my opinion there is no true "pink" hemerocallis as yet. *Fulva Rosea* is an approach but it is a rose red, very fine. *Sweetbriar,* a striking new variety is toned more rose than pink. When a flower lover anxiously awaits the opening of his "pink" hemerocallis only to find it chamois colored with only a tinting of pink he is keenly disappointed, particularly if he is picturing in his mind's eye a pink or rose tone as in Lilum superbum roseum. Many of these "pinks" I prefer to call pastels and among these I have found several creations I consider very fine lilies. These include the trio of *Piquante, Pink Lass,* and *Heather Rose* as closest approaches to pink. A delightful color of soft chamois is *Crystal Pink* and Stout's new *B. H. Farr* looks very interesting.

The shades of red and maroon are an interesting and fast coming group which I think are destined to be more popular than the "pinks" once they are known. Right now there is a great deal of confusion due to too many seedlings being named and introduced but inevitably the best will win out. Of this group I have been impressed by *Morocco Red* which I think is a real achievement in dark tones. It and *Purple and Gold* are two grand "maroon browns". I consider the name of the latter most unfortunate. There is an interesting variation in the reds from the rich maroon reds to fiery terra cotta reds. *Matador* is a standout, bright and gypsy-like. Just a shade darker, *Victory Taierhchwang* gave a brilliant effect. My choices of several interesting reds of Dr. Stout's include *Baronet* for its clarity and purity tho not large and two larger but more conventional red toned kinds, *Sachem* and *Dominion.*

I believe the widest interest is in the newest breaks in color. *Black Falcon* to date is about the darkest colored hemerocallis. The two remaining groups I would like to discuss briefly are the eyed group and

the bicolor group. These are provisional groupings and further acquaintance with these new color schemes may call for some shifting about. But among the varieties I am acquainted with I think the clear marking on contrasting yellow background of *China Sea* makes it a noteworthy variety. *Moonray* is as neat and trim a subject as I have enjoyed, very trimly marked. *Aladdin*, earlier blooming, zoned brown on light tan is very smooth and glossy. Not a large class I am looking forward to more of the interesting and promising new developments with sort of peacock feather markings.

A few years ago I blossomed *Bold Courtier* and I was immediately impressed by this handsome bicolor. Today it is one of the standards in any collection. By far the most vivid, striking new Hemerocallis of this pattern group to bloom was Mr. McDade's *Jean* a beautiful contrast of rich orange and rich red velvet. It is very brightly colored, very large and ruffled. Best visualized as a far better *Festival*. Mr. McDade has a unique series of bicolor types I will mention just a little later. *Su Lin* of Mrs. Nesmith is a lovely sort of ashes of roses and yellow bicolor. Dr. Stout's *Bicolor* as it flowered for us was small flowered and not patterned as exact as the description seemed to imply.

There is universal interest in extreme late flowering Hemerocallis as witness the interest in Multiflora and its hybrids. Mr. McDade concentrated on developing a series of later flowering varieties and his efforts were very successful in the creation of an entire series of late blooming bicolor varieties. He has named this series the Bright Morning Series and has selected seven of the most striking variants. The series is characterized by trumpet shaped blooms with yellow petals and various registers of red colored sepals from light to dark. Were they not valuable for their extreme lateness and their size they would be valuable for their color patterns alone.

In closing I just cannot neglect mentioning a few highlights that impressed me as being distinct and unusual. For broad petals and a full flower *Chloe*, a sanded and peppered sepia on light tan is a splendid sort. *Burning Star* is a bright, very narrow petalled type, pretty and novel. Diverse petal formation is interesting because it breaks the monotony of uniformity. *Duchess of Windsor* has very broad full petals and a lovely flower. *Yellow Tulip* has upright flowers suggesting a tulip. For color, *Minnie*, not large, seemed very much out of the ordinary, very rich deep, velvety maroon. It is one of the finest of Mr. Hayward's seedlings I have flowered and he can well be proud of it.

My own hybridizing is strictly experimental. Nothing has been achieved that is finer than already existent material in commerce. The war will seriously curtail any hopes of further experimentation but I do hope to keep abreast and add the new, promising creations as they are offered. I think it only fair to call attention to the fact that the scope of my review here is limited by space so omissions of worthy kinds is not intended. This paper is meant to review only interesting new developments as they have performed for me here in our Minnesota climate.

WHY I BREED DAYLILIES

CHAS. E. F. GERSDORFF, *Washington, D. C.*

I now breed daylilies for the same reasons that led me to breed, in order, roses, garden chrysanthemums, dahlias, gladioli and irises, because of my keen love for flowers of all types, the healthful outdoor exercise, and the pleasure in having produced something very impressive to others or which satisfied my wish for something different. To only grow the products of others' skill did not satisfy, nor could my small purse be stretched to the limits of my desire for plant material.

Continuing my efforts in iris breeding but on a much smaller scale than in the past, I began breeding *Hemerocallis* in 1935 in an endeavor to increase the color range in the small low types as well as in the large tall ones in which I also saw the need of better branching, better substance and increased lasting quality of individual blossoms.

My original collection for many years to 1932 comprised of *H. citrina, Flavina* (both now discarded), *flava* which died out, *fulva* (salmon overcast fulvous, veined darker, orange throat ending in a dark reddish star, slight fragrance) in quantity but now whittled down to two clumps, *kwanso, aurantiaca* (small, 24″, May-June, orange yellow with orange red reverse), *Middendorffii, Dumortieri* and *Thunbergii.* Through the kindness of a friend in 1932 I added *Radiant, Orange Glow, Apricot, Goldeni, Gypsy, Sovereign, Lemona* and *Golconda,* all recently given away because I liked certain of my own seedlings better or and I needed the space; also *Calypso, Bay State, Cressida, Lemon King, J. R. Mann, J. A. Crawford, Sir Michael Foster, Amaryllis, Mary Florence, Hyperion, Florham, Margaret Perry, D. D. Wyman* and *Golden Dream* (the last was destroyed by cats just after gathering numerous seed). These actually were the incentive toward breeding daylilies in 1935. In 1941 I added mostly for comparison purposes, color, size and branching (?), *Cissy Guiseppi, Dawn, Sunset, Sunkist, Imperator, Sir William, Bardley, Moonstone, Gracilis, Nebraska, Moonbeam* and *Star of Gold,* and in 1942 *Viscountess Byng.*

Of my first crossings none were saved. There were a few retained in 1937 of the low growing small sorts, 45 in 1940 and re-selected in 1941 and 42 in 1942. Those of 1942 remain in their seedling boxes on the roof of my home, with careful watering and fertilization until 1943 for re-selection. Though I sometimes plant soon after harvesting the seed to October, I usually prefer early March planting.

Most are planted in "California-grape boxes" on my slag finished roof—bottoms lined with peat moss, then fine loamy soil to fill the box to within two inches of the top, mixed well with superphosphate of lime, on which the seed are planted to stand one to three inches apart depending on quantity on hand, lightly covered with peat moss, then more soil, fertilizer and topped with half an inch of peat moss and given a thorough soaking, primarily to fix the peat moss dressing so it will not blow away—watered as needed. The garden seed plots are similarly constructed. The boxes average a depth of five inches, and the root growth

here is much more vigorous and prolific than in the garden proper. I obtain bloom in the boxes from one to three seasons after germinating, frequently in one year, but mostly in two.

My seedlings were derived from the use of *aurantiaca* (?), *Gypsy, Radiant, Sovereign, Thunbergii* and *Flavina*, mostly small and low growing, and taller large ones from the use of *Golden Dream, Calypso, Lemona, Sir Michael Foster, Cressida, Hyperion, J. A. Crawford, Amaryllis* and certain selected seedlings. I made my most crossings in 1942, mostly amongst my own seedlings, or these with a few others and find myself swamped with seed so that I will have to bloom these before breeding more of them, as my place is small.

All seedlings retained receive tentative names as numbers after once blooming are confusing to me. There will be continued replacements as new seedlings show to better advantage.

I discard by giving to people who normally would never buy plants, because I feel that these gifts either give pleasure to less favored people, or to some who are yet but novices and in time will through these gifts aspire to better named varieties.

Though I feel I have made progress in my short period of breeding, it is yet too early to say much about my seedlings except to mention a few developments in my roof garden which were unusual to me and might prove of interest to others. This year several seedlings from various parents, some of selected seedlings, have developed new plants on the stalks where normally buds or bud branches would or did appear. Some developed roots before removal, all are growing. I have rich orange to orange red tones to near flame scarlet, also very light yellows to light greenish yellows, seedlings that open at midnight, 1, 2, 3, 4, 5, 6 A. M., 3, 4, 5, 6, 8, 9, 10 and 11 P. M., blooms lasting 18 to 35 hours. Some show branching. Two clones from different sources had in three and two years from germination, respectively four and five divisions each with a bloom stalk, flowers only fair in size. One in 1942 growing in four inches of soil in a grape-box also containing two seven-year old iris clumps, has wide wavy very dark green foliage, luxuriant growth, a stalk of 40 inches, stiffly erect, high branched, which developed 44 buds opening to full blooms of *Amaryllis* form and 3¾ to 4 inches, in pale lemon yellow to oil yellow throat (Ridgway)—two years from germination. But one fan of foliage at blooming, now has two and was bodily lifted to a deeper box without a setback for bloom again on the roof. Sun resistant and the stalk bloomed for an entire month, out of *Lemona* x *Calypso*.

THE RUSSELL DAYLILIES

H. M. Russell, *Texas*

I was born in Wheatland, in 1901, a little town situated in the Indian Territory which, of course, has since become the State of Oklahoma. I am the youngest of ten children. My father, J. T. Russell, was the originator of the "Russell Big Boll Prolific Cotton", and had just moved West and established our home. When I was four months old my father

died. In one year my father produced forty-two bales of this Russell's Cotton on fourteen acres of unirrigated land and I have in my possession unimpeachable records to that effect.

Two years after my father's death my mother moved her family back to Alabama. Before I finished the sixth grade of school I quit and went to work. For more than twenty years I was engaged in the general nursery business in Alabama, Georgia, and South Carolina, and during this period, to a small extent, I worked with daylilies. I produced some very fine varieties many years ago that were never released through a catalogue to the general trade but were sold and planted on large estates. Twenty-seven thousand of these plants went on four landscape projects. Eleven thousand were planted on the Charles Urschel Estate in Oklahoma City.

When I decided eight years ago to abandon all my other work and go in exclusively for the breeding and growing of daylilies I spent several years collecting species as well as the best hybrids and moved all the stock, more than fifty thousand plants, from Sumter County, South Carolina to Texas. My nursery is located at Spring, Texas a little town twenty-three miles north of Houston, where I am now growing more than 250,000 plants on a twelve acre farm. I have spent much time in the past few years breeding for giant bi-colors and early blooming varieties in darker colors. I now have varieties in purples and reds that bloom as early as the earliest dwarf yellows and of course I am, as well as everyone else I suppose, working for continued bloomers, and those that remain open at night. I know of no one else in this field who professes to make a living solely from daylilies and I have been doing this now for more than eight years.

I have five children, and my oldest son, Jake, who is fourteen has crossed daylilies for seven years and with a definite purpose. He knows several hundred varieties by sight.

DAYLILIES IN ARKANSAS

J. W. House, *Arkansas*

There are quite a number of flower growers in Arkansas who have been hybridizing Iris for several years and there are some very fine collections of tall bearded Iris in this State. Daylilies, however, have been confined to the roadside variety, and they have not gained the popularity that they deserve up to the present time—although I think that in a few more years they will be equally as popular as Iris.

I have a few acres not far from Little Rock, which are devoted exclusively to flowering perennials shrubs. Not having any facilities for watering, I have to depend on perennials, which are principally Iris of several species, peonies and gladioli.

About four years ago I became interested in *Hemerocallis*, with a view of prolonging my blooming season, and on the first day of August this year I had about fifteen daylilies that were really a pleasure to see, with several later blooming varieties yet to flower.

After becoming interested in hybridizing daylilies, I undertook to secure a representative collection of the new varieties; and, last year and this year I had enough modern material, I believe, to enable me to at least raise a few swans. I found that a very convenient way of hybridizing is to take a small medicine bottle about 1 to 2 inches in length and ½ to 2/3 inches in width; and, with a pair of tweezers, pinch off the anthers from the desired bloom and drop in the bottle until it is about two-thirds full. In a short time the pollen will dry and cling to the sides and accumulate in the bottom of the bottle. Then take the flower you desire to pollenize, and push the stigma in the bottle opening and along the inside of the bottle, and it will accumulate an abundance of pollen in this manner. This is much faster than undertaking to separate the pollen by putting the anthers in paper trays. In this way, I selected my best "Reds" and put the anthers in one bottle and the best "Yellows" in another bottle and I could make crosses conveniently and very rapidly in this manner. The same pollen can be used several days if the bottle is left open. I have approximately two thousand seedlings from this method of crossing.

THE NIES DAYLILIES

Mr. Eric E. Nies, landscape architect, teacher of botany, biology and agriculture in the Los Angeles City Schools, President of the Hollywood, Calif., Garden Club, breeder of iris, particularly in the bearded, spuria and Louisiana groups, writes that he has been breeding daylilies for a few years, using the available commercial offerings as his breeding stock. He is the originator of the *Rosy Day* Daylily described elsewhere in this issue of HERBERTIA. —*H. P. T.*

5. PHYSIOLOGY OF REPRODUCTION

PROPAGATION OF ALSTROEMERIDS

HARRY L. STINSON, *Washington*

The literature on the subject leaves much to the imagination as to just how to propagate the various species of the alstroemerids, aside from the generalization that they may be propagated by seedage and plant division.

Seedage is a much more rapid method of increasing the stock but has the disadvantage, if seeds from open-pollinated flowers are used, of not being able to control the colors desired. When flowers are cross-pollinated by bees and humming birds they come about 90 per cent true to color from field run of seeds. No attempt has been made to control the results as to color by hand pollination except in the case of one or two choice colors, and even they showed some variations.

If seedage is to be the method employed to increase the stock, one must first catch the seeds. I mean that literally for one must watch just when the seed is mature and each morning go over the capsule to see which are ripe or else when the sun warms them up and they are perfectly dry they will dehise with such force that the seeds will be scattered several feet. So again I say catch your seed before you plant it*.

The seed beds should be prepared well in advance of the time to plant the seeds, so that the soil may be as friable and mellow as possible. This extra precaution at this time will save your temper and the tubers at harvest time. I find a bed about eight to twelve inches deep to be ample. To this is added peat moss, leaf mold or other humus until the soil will not pack solidly about the tubers. In this the seeds are planted one inch deep sometime during the months of October or November. The seeds will not germinate during the warm months so nothing is gained by earlier planting except for convenience. Frost does not seemingly injure them, for seeds scattered on the ground last fall survived a 16° F. freeze for several days, germinated and grew vigorously. Seeds planted at this time will make good growth and a few will bloom the first season. As soon as the tops die down the plants may be dug, which is usually during the latter part of June or early July. These "tubers" I generally use for planting stock, or I select out the larger to be sold as seedling "tubers," which do credit to themselves.

Alstroemeria seeds must have the sun to germinate, while *Bomarea* seeds must be protected from the direct sun or else they will not germinate. These latter are started by placing two or three seeds in a three inch pot and placing it in a warm location in the shade sometime during the month of June. The seeds of the tender species start readily if sown in a warm situation, and given some protection from the hot sun. The seedlings should be replanted when they become dormant.

* It is possible that the whole plant stalk, including the near ripe seed capsules, could be harvested and placed in a container so that the ripe seeds would be collected at the bottom. Experiments with only a few stalks of **Alstroemeria psittacina** at Mira Flores, Orlando, Florida, in 1939, seem to bear out this theory. Brown paper bags were used as containers.—**Ed.**

The types of crown, rhizome and roots of a few species of *Alstroemeria* are shown in the illustrations. Figure 80, left, shows the underground portion of the *A. aurantiaca* plant; on the right of the same Figure, these same parts are shown for *A. chilensis*. Figure 81 shows the underground parts of *Alstroemeria pulchra*. The underground portion is commonly called "tuber."

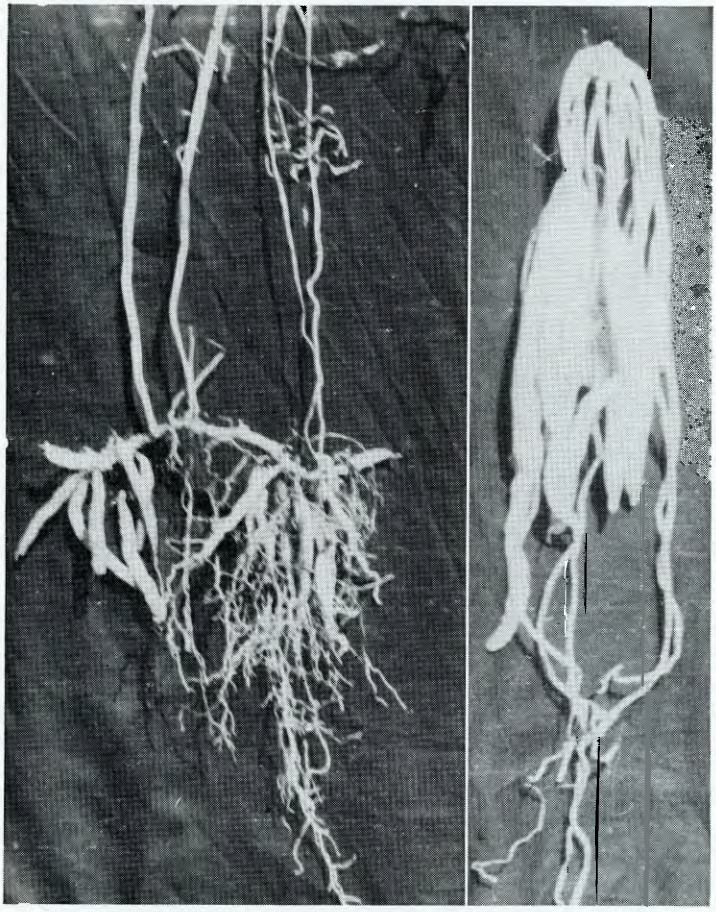


Fig. 80. Rhizomes and roots of Alstroemeria aurantiaca, left; and A. chilensis, right. Photo by Harry L. Stinson, Seattle, Washington.

Propagation by plant division is a much slower method of increasing stock but the only positive way, in the absence of inbred elite lines, of preserving a definite color. When a desired color shows up in the seed bed, dig down carefully along the stem until the attached "tuber" is located, and this is then planted separately. To control the "tubers" and make the digging of them easier I hit upon the method of using five gallon cans. The top and a side are removed and the open ends placed

together so that they form a long open trough. This is filled with good soil, the "tubers" are planted on the top, and the entire lot buried six or seven inches deep. After blooming the next year, the plants are dug up and carefully removed from the cans, divided and again replanted. Large pots would do equally as well, but the cans are available at no expense.

Fig. 81. Rhizomes and roots of Alstroemeria pulchra. Photo by Harry L. Stinson, Seattle, Washington.

Bomareas are increased by division in the same manner. At the time when they seem to be at their lowest growth the plants are carefully removed, divided and planted in separate cans.

ALSTROEMERIA & BOMAREA FROM SEEDS

L. S. Hannibal, *California*

Of all the Alstroemerids, a mixture of *Chilensis* hybrids, which includes the tall *Ligtu-Angustifolia* forms, offers about as much diversity of form or color in the pastel shades as anyone could desire from any one group * of plants—for one can find shades running from near white

* The writer prefers to group all the Chilean types with the highly compound umbel as one. It matters little if one takes a group of selected hybrids, or a number of plants from the wild, the attempts to key either would result in a botanical headache of the same magnitude. Many intermediate forms exist in the wild which have led to much confusion. Unless some specific characteristic of growth habit such as the quack-grass nature of **pulcra,** or the refusal of a form such as **violacea** to cross, can be detected, little reliance can be placed on leaf shape, flower color or form of compound umbel for species identity when these factors are so variable—even the experts are confused. Plants can be selfed and bred fairly true, but a mixed group accessible to bees or wind for pollen distribution can present some interesting forms which may involve **versicolor, Ligtu, Haemantha, pelegrina,** possibly one or two other apparent species.

L. S. Hannibal, Concord, Calif.

Alstroemerias naturalized at the University of California Botani Gardens, Berkeley, California

Plate 235

to straw, yellow, ochre, orange and pink, rose or any intermediate tone desired. In most cases the 20 to 50 blossoms which occur in a single umbel is sufficient for a complete bouquet of its own, and a branched pedicel with two or three bloom on it will rival any orchid for a corsage. The fine keeping quality as a cut flower has made this group a popular one during the summer with a number of West Coast florists. These plants are truly coming into their own.

The *Chilensis* forms are not difficult to start provided one can give them their desired environment. They can readily stand 10-15 degrees winter frost with mulching, but they will not tolerate summer ground temperatures much above 70 degrees F. while in growth. This latter condition may make them difficult to handle in So. California or Florida, but in the Pacific Northwest, or along the Atlantic Coast up to Long Island this group makes a beautiful showing. The tuberous roots can be planted in the fall in a rich, well drained loam where the plants establish themselves quite readily, but the best bloom seldom appears until after the second year. Plants from seeds, which the writer prefers, are equally as suitable. One requirement is that the seeds must be fresh, the other is that a well drained light humus be used for planting. In near frost free areas the seed can be sown in place as soon as received in the fall; otherwise it is best to use seed flats in some protected shelter where moisture and temperatures can be controlled. Some seed may germinate in the fall, but most of it will carry over to March or April before the first leaves appear. When about three weeks old the seedlings can be lifted from the flats and placed in individual 4″ pots, and as soon as danger of frost has entirely passed these plants can be placed outdoors, either by plunging the pot 2″ deep, or by transplanting—the latter being best. A few flowers may occur the first year and indicate the color of bloom, but it takes another year to get a mature plant, where the flowering quality may improve some 300% or more. After flowering, the *Chilensis* hybrids usually go dormant, or if the ground temperatures exceed 65 degrees F. they may go dormant even before the floral stalks completely develop, especially with young plants in pots. This condition has been experienced a number of times by the writer when delay occurred in moving young potted plants from the greenhouse to outdoor beds.

Root crowding is another condition that checks the growth of *Alstroemeria.* If winter conditions are such that potting is essential use a pot of 7″ or larger as soon as growth starts the second year, or better use a half nail keg. A crowded plant will never bloom.

Some of the seeds of other *Alstroemeria* species such as *pulcra,* which spreads by stem nodes at the surface of the ground like quack grass, or *psittacina (pulchella),* the Parrot Flower, require the same treatment as the *Chilensis* hybrids for seed culture, but *pulcra* (See Fig. 82) and its variations are not quite as winter hardy and need more protection.

Pelegrina forms and *A. violacea* are warm climate plants and the seed needs a sandy soil, not too moist at 50-60 degrees F. for germination. In contrast the seed of *A. aurantiaca,* the evergreen species with the big yellow blossoms, gives some difficulty—Mr. James discussed this

problem some time back. The seeds require cold treatment at 45 degrees F. or less, in other words: stratification. Here in central California they can be sown in the open where the winter rains and mild frosts seem to be what's desired, for every seed seems to grow. This species is exceptionally hardy and has a longer flowering period than other varieties. Its umbel is not as large as some of the *Chilensis* forms and is preferred

Fig. 82. Alstroemeria aurantiaca. Photo by L. S. Hannibal, Concord, Calif.

in some flower arrangements for that reason. It is an excellent plant for naturalizing.

Alstromerias have been known in this country for some time. Mr. Gordon Ainsley had them in his garden 12 or 15 years ago at San Jose, but the bomareas are something new. A half dozen species are possibly on the market. In general these are jungle plants that like shade, a deep mulch, humid conditions, and no winter frosts. The seed of these plants require warm moist conditions for germination whereas alstromerias favor the early or midspring temperatures. *Bomarea ovata,* which is quite widespread in Central America and notoriously variable in form, requires much warmth. *B. edulis, B. costaricensis, B. caldasinia,*

and *B. salsilla* require similar treatment, but *B. acutifolia* and *B. frondea* need milder temperatures. Incidentally *B. frondea,* which was distributed in '41 by the U. S. D. A. promises to be a very hardy plant. We hope its bloom is equally as attractive.

The fruits of *Bomarea* are often as interesting as the pendulant bloom. They are unlike *Alstroemeria* in that they hang from the vine for some time after ripening with the large red capsules resembling *pittosporum* seed with their split pods. When gathered fresh they can be stored dry for 6 or 8 months without harm, but old seeds that have been exposed to winter weather is seldom viable, or is slow to start.

Bloom are seldom had on *Bomarea* until the plant is well established. This usually occurs in the third or fourth year and unlike *Alstromeria,* the leaf and floral stems are not readily distinguishable. Usually the flowering period extends over most of the summer. Little is known regarding hybrids in this group, but apparently there exists an interesting future here. The best collection on the west coast is at the University of California Botanical Garden (See Plate 235) where a number of plants are grown in shade along with Azalea under oak trees, or under lath, where several new species await identification.

Neither *Alstroemeria* or *Bomarea* have many pests. Green aphis have been observed on some varieties in early spring and moles may attack the tubers. Occasionally a form of chlorosis may appear and then the flower parts all revert to vegetative growth. This plant family is not poisonous to stock; in fact the tubers are said to be quite edible although not too tasty. Has anyone tried *Alstroemeria* salad?

SOME OBSERVATIONS ON CROWN CUTTINGS OF HEMEROCALLIS

V. T. Stoutemyer
Bureau of Plant Industry, U. S. Department of Agriculture

The comparatively slow rate of increase of daylilies after a desirable variety has been developed has been recognized as one of the major obstacles in breeding and improvement *(1).* Desirable daylilies have sometimes remained scarce and relatively costly for a decade after introduction. On the other hand, with bearded iris and many other popular perennial ornamental plants when a desirable form is introduced, the price declines in a few years to a sum which permits wide dissemination to the average gardener.

The possible vegetative methods of propagation of daylilies have been summarized by Stout *(3).* The method of crown cuttage as introduced by Traub *(6) (7) (8)* has been particularly useful in the multiplication of rare sorts. In this procedure, the crown, leaf cluster or fan and attached portion of the rhizome or root system are divided vertically in halves, quarters or even smaller portions and are placed in a rooting medium of peat and sand or other suitable material until new shoots and roots have started. This procedure is best carried out in a greenhouse, lathhouse or frame. The plants may be potted up and grown on

until large enough to be planted out in the nursery. Certain questions regarding the most favorable frequency of division and other points of procedure remain uncertain at present because of the lack of experimental evidence.

Observation of the abundant sprouting from the crowns following occasional winter injury of evergreen sorts suggested the trial of crown cuttage in the nursery row. Hayward *(2)* has described a type of vegetative propagation in which fans were carefully removed from the rhizome which was left intact in the soil. Sprouts arose at the cut portion of the rhizome and could be used for multiplication later.

The following experiment was conducted with a modified form of crown cuttage in which the soil was pulled away from the bases of young new leaf clusters in the spring. These were then slit longitudinally into

Fig. 83. Plants of daylily clone Meehani; left, control; right, plants under six hours additional day length showing increased growth. (U. S. Dept. Agric. Negative No. 79,693).

halves, cutting through the attached portion of the rhizome or root system also, but not disturbing the feeding roots. This procedure avoids the violent shock to the root system involved in the standard procedure for crown cuttage. The absence of special equipment and the freedom from constant attention were advantages which seemed to justify an outdoor trial of this variation of crown cuttage.

In the following experiments, four selected clones of hemerocallis were used and were treated according to the above procedure on April 22. These clones were seedling selections derived from crosses made by Mr. B. Y. Morrison. The plants had been started from single-eye divisions made in the previous season. At this date all of the plants were in vigorous new growth and in most cases each plant had two fans or leaf clusters. The plots were laid off along the nursery rows, each con-

taining 10 experimental plants. In each clone, two plots were used for the control and two for the treatment. The plot arrangement as limited by the original planting was admittedly not ideal from an experimental viewpoint, but the soil and site conditions on this area were believed to be quite uniform.

By the end of May, most of the treated plants had recovered from the slitting and were producing new shoots. Later, flower stalks were usually produced in nearly as great abundance and height on the plants which had been cut as on the controls. However, the clones behaved in a diverse manner, and in No. 10704-B the flowering was greatly diminished by the treatment.

Since many commercial growers prefer to lift and ship hemerocallis in August, in this experiment the fans were counted on August 1. The results are shown in Table I.

Table I

Response of Various Daylily Clones to Crown Cuttage in the Nursery

Clone	Parentage of Clone	Number of fans per 10 plants			
		Control		Crown Cuttings	
		Lot 1	Lot 2	Lot 1	Lot 2
10704-B	Leo x **H. aurantiaca major**	50	57	71	73
10732-C	Margaret Perry X. Meehani	37	46	60	50
10746-D	(Florham x H. Middendorfii) x **H. aurantiaca major**	39	39	74	71
11790-A	(Margaret Perry x **H. aurantiaca major**) x (Florham x **H. Fulva**)	35	48	52	46

The data presented in Table I show that the treatment usually caused an appreciable increase in the number of growing points, although the response varied greatly according to the particular clone. Thus the treated lots of 11790-A had practically as large fans as the control lots but the increase in number was slight. On the other hand, with 10746-D the fans in the various treatments were about the same size, but the number was almost doubled by crown cuttage. The treatment was clearly advantageous with this clone. Clone 10704-B responded in a still different manner. The number of growing points was increased but the diminution in the size of the fans was sufficiently great to nullify this advantage. Clone 10732-C likewise did not respond satisfactorily to the treatment. Except with one clone, the results of this experiment were hardly promising enough to warrant the use of this method of crown cuttage in the nursery row.

One experiment conducted with crown cuttings handled in the conventional manner indicated that the use of supplemental electric light is highly advantageous in speeding up the growth and reproduction of hemerocallis, when a greenhouse is used to maintain growth of especially valuable sorts over the winter and thus secure a rapid increase of stock. Evergreen varieties may be maintained in practically continuous growth indoors, but the deciduous varieties will start more evenly and make better growth if a period of dormancy and exposure to cold precedes the period of forcing *(4)*. Daylilies should be potted in a rich soil, high in organic matter and should have abundant watering when grown indoors.

The remarkable increase of growth obtainable by supplementary

lighting was demonstrated by the following experiment. On October 1, clumps of the daylily variety Meehani were lifted and the individual fans were cut in two. Each portion or crown cutting was potted directly in a mixture of composted soil with abundant leaf mold and sand. Each crown cutting produced one or two fans during the early part of the winter. On Feb. 1 of the following year 32 of these plants which had single fans were selected for uniformity and divided in two lots. At this time the plants were growing in five inch pots. The plants were placed in the center of a greenhouse kept at 50-55° F. night temperature. A 100 watt incandescent light in a large dome reflector was placed over one lot of the plants and a screen was used to prevent any light from reaching the control lot. The pots were moved at weekly intervals to minimize effects of position. The light was turned on from 6 P. M. to midnight daily for six weeks by means of an automatic time switch. The plants receiving the additional light soon surpassed the check lot in vigor. The appearance of the plants under the two treatments is shown in the accompanying illustration. Stuckey *(5)* obtained a similar increase in length of leaf with orchard grass grown under increased length of day.

At the end of the period the plants were removed from the pots and the roots and tops were weighed individually. The summarized data, based on green weights, for the two lots are shown in Table II.

Table II

Response of Hemerocallis to Supplementary Light

Portion of Plant	Treatment		Increase in weight (grams)
	Control (Weight in grams)	With supplementary light (Weight in grams)	
Tops	348	689	341
Roots	785	833	48
Combined	1133	1522	389

Obviously the great increase was in the leaf development of the tops, since the green weight was nearly doubled and the plants were almost twice as tall. The mean difference of the weights of tops of treated and untreated plants was 341 plus or minus 9.75 grams. Since with 30 degrees of freedom in the two lots of 16 plants each, $t=2.750$ for odds of 99 to 1, a difference of only 26.8 grams would be highly significant. The increase in the development of the extensive storage root system of the plants was scarcely under way at the termination of the experiment, but doubtless the greater photosynthetic area of the plants receiving supplemental light would have caused a marked increase in the root system if the experiment had been prolonged. More than 16 plants could have been accommodated under the light and since only slightly more than four kilowatt hours of electricity were consumed weekly, the expense of the treatment could be justified for working up stocks of a new and valuable variety of daylily for introduction, particularly in the early stages of propagation.

Plants of most varieties of daylilies started into growth in the greenhouse usually grow well after planting outdoors and will bloom normally, although the date of the flowering season will be altered. Care

must be taken to avoid a checking of growth which may cause the plants to become semi-dormant for a certain period, thereby losing some of the advantage gained by growing under glass. Stout *(4)* noticed that if daylilies were grown continuously through the winter and spring in the greenhouse, the vegetative growth of the plants tended to be irregular and discontinuous during the following summer. Some additional information on the problems of greenhouse propagation is needed. Furthermore, the factors affecting the rate of propagation outdoors are not known well. However, an abundant supply of water and a soil with a reasonably high fertility and content of organic matter appear to be important factors in speeding up growth and natural increase in the nursery.

LITERATURE CITED

1. Emsweller, S. L., Philip Brierley, D. V. Lumsden and F. L. Mulford. Improvement of flowers by breeding. p. 945-947. U. S. Dept. Agr. Yearbook. 1937.
2. Hayward, Wyndham. New daylily propagation methods. Herbertia (1937) 4:201-204.
3. Stout, A. B. Vegetative propagation of daylilies. Journ. N. Y. Bot. Garden 38:13-17. 1937.
4. Stout, A. B. Foliage habits of daylilies. Herbertia (1940) 7:157. 1941.
5. Stuckey, Irene H. Some effects of photoperiod on leaf growth. Amer. Journ. Bot. 29:92-96. 1942.
6. Traub, Hamilton P. Propagation of *Hemerocallis* (daylilies) by crown cuttage. Herbertia (1936) 3:123.
7. Traub, Hamilton P. Propagation of the hemerocallis. Horticulture 14:478. 1936.
8. Traub, Hamilton P. Methods of propagating daylilies *(Hemerocallis)* vegetatively. Herbertia (1937) 4:205-209.

Harry L. Stinson, Seattle, Washington

One of Harry L. Stinson's fields of Alstroemeria chilensis in flower, upper; Alstroemerias cut and placed in deep water before packing and shipping to San Francisco World's Fair, lower.

Plate 236

6. AMARYLLID CULTURE

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

CULTURE OF THE ALSTROEMERIDS

HARRY L. STINSON, *Washington*

Although Father Feuillet, Ruiz and Pavon, Poeppig, and various other travellers do casually mention the growing of the alstroemerias in certain localities this information is so meager as to the horticultural aspects of these localities that we are given little or no tangible clues as to how, when, where, and under what conditions they grow in their native habitat. Linnaeus wrote that Alstroemer did find them growing in the garden of the Swedish consul, Don Bellman; Feuillet intimates in his preface to his description of *A. pelegrina* that because of its beautiful flowers it must surely have been grown in the wonderful gardens of the Inca Kings. Ruiz and Pavon add a sentence in their observation that *A. pelegrina* was grown in earthen pots in the gardens of America and Spain for the beauty of its flowers. More recent writers have been a little more considerate of the horticulturist for they write a little more in detail as to how and where they find them growing.

The culture of the hardier alstroemerias presents very few difficulties to the gardeners in and around Puget Sound and similar climatic regions (See Plate 236.) The winters in this region are usually cool and damp with some fog and misty rain and with sun-shiny days interspersed. Generally the temperature seldom drops below 40° F., however sometimes it does go down to 6° to 12° F. and the ground freezes down to a depth of four to six inches. At these times the *Alstroemeria* beds must be mulched to prevent the frost from going deep enough to reach the "tubers," which would be fatal to them. The tops will freeze off but new ones will soon replace them. During the summer season the temperature ranges from 60° to 90° F. during the day and cooler at night. These conditions seem to be much to the liking of the hardier alstromerias for they grow to a height of four to five feet without any special treatment other than that given to other perennials.

To obain the optimum results select a location where they may remain planted for several years without being disturbed as they resent transplanting. This location should be well drained and yet remain damp and cool during the summer months. A soil which is inclined to be on the clayey rather than on the sandy side of a loam is to be preferred. A clayey soil remains cooler than a sandy one and they appear to resent a hot and dry situation. At this latitude they do better in full sun, although they will tolerate some shade if intermittent. Further south where the sunlight is more intense possibly more shade will be required. To this soil should be added a heavy application of completely decomposed barn-yard fertilizer, compost, or leafmold and thoroughly integrated into the soil to a depth of twelve to eighteen inches. In this the tubers may be planted at least six inches deep and ten to twelve

inches apart sometime during the months of August or September, or not much after the first of October if the maximum of flowers is to be expected the following year.

In the colder sections of the country where the ground freezes more than two or three inches deep, they should be given the protection of a mulch or placed in a coldframe and covered during the severest part of winter so that frost does not penetrate to the tubers, which is fatal to them. The sterile stems start appearing during December or January

Fig. 84. Mrs. Stinson and daughter with Alstroemeria corsages. Photo by Harry L. Stinson, Seattle, Washington.

and are more or less immune to frost and even if frozen off the results are not disastrous for others will soon come through the ground. After the first year or two when the tubers become established they bury themselves so deeply in the ground that the danger from frost is minimized. I have seen *A. aurantiaca* growing almost on the summit of the Cascade Mountains but here they are protected by a heavy fall of snow before the severe freezing weather is experienced.

In case your soil is on the sandy order it would be well to mulch with peat moss or alder sawdust so as to hold moisture and prevent the soil from becoming dry and hot, or plant among other perennials such as peonies or open shrubbery which will shade the ground. I have heard of a gardener in the South who covered the bed with the prunings from peach trees through which the alstroemerias grew and afforded both shade and support.

The floriferous stems appear above the ground during the early spring and grow very rapidly until they flower during the latter part of June and into July. By this time the sterile stems have died down and as soon as the flowers are gone the tops may be removed unless you wish to save the seeds. A continuity of bloom may be had by planting shallow rooting bulbs such as tulips, daffodils or Dutch irises, which bloom and are gone by the time the *Alstroemeria* needs the space. For late bloom some of the taller lilies may be used.

The semi-hardy species of the alstroemerias have to be grown in coldframes or a cool greenhouse and given some heat during the severest part of our winters. After the danger of frost is past the coverings are removed for alstroemerias dislike being under glass or in confined air. The tender species must be protected from frost at all times. In a frostless region they may be grown out in the open but with us they must be grown in a cool greenhouse.

The culture of bomareas is still very much in the experimental stages although I have had very gratifying results. The bomareas are indigenous to temperate regions of the tropical forests and this gives a suggestion as to their cultural needs. The forests afford shade and the forest floor has an ample supply of leafmold as a growing medium. With these factors as a basis I take about one third each of leafmold, compost and garden loam for a potting mixture. They require a rather deep rooting space. I plant them in five gallon nut cans which can be shifted from place to place to suit our changing seasons. These are placed in the greenhouse during the cold winter months and with the approach of spring weather they are shifted to a lath-house for the summer. In these containers and under these conditions they appear to be perfectly happy and reward me with luxuriant growth and many clusters of their rich golden bells.

Alstroemeria blossoms are distinctly valuable as cut flowers since they are long-lasting (See Plate 236). They also make very attractive corsages (See Fig. 84).

NATURALIZING NARCISSI IN MISSOURI

EDGAR ANDERSON, *Geneticist*

Missouri Botanical Garden, St. Louis

The Arboretum of the Missouri Botanical Garden is at Gray Summit, Missouri well outside of the metropolitan area of Saint Louis. It is designed mainly to supply those features of a well-rounded botanical garden for which there is not room in the city or which can be carried

on more successfully in the clear country air. It has among other features a pinetum, a wild-flower reservation, and an orchard of oriental crab-apples all of which are made available to the public by a gravel road which winds for two miles between rail fences. Along the fences, in the meadows behind them and in the pinetum Narcissi have been planted from time to time during the last 15 years. They have done so well and created such a beautiful and interesting display that in recent years the Missouri Botanical Garden has attempted to make the collection as comprehensive as its budget would permit.

It is definitely, however, a collection of naturalized Narcissi and no variety is knowingly added to the collection which does not give promise of doing well under natural conditions. The stem must be stout and strong, the color must carry well at a distance, the blooms must wither quickly and as inconspicuously as possible, and above all the variety must have the vigor to compete with blue-grass sod and yet not to increase so rapidly that it requires frequent replanting. While it might be supposed that much of this information is already in the books we have found to our sorrow that it is not. There is the curious paradox that although of all bulbs Narcissi are the most satisfactory for naturalizing little or no *exact* information on the subject has been published. The collections at the Arboretum have been planned to supply that deficiency for the climatic region served by the Missouri Botanical Garden. By reading, by correspondence, by visiting other gardens, a group of promising varieties have been selected. Accurate records are made of the number of bulbs planted and so far as possible records are made each spring of the number of blooms obtained. Though this has been carried on for only five years and though it began in a very small way, valuable information has already been obtained. An elaboration of this method has suggested itself but has not yet been put into operation. If whenever an additional variety had been added to the collection the bulbs had been accurately divided into two equal portions and the halves had then been planted at different sites exact information as to site-preferences in this vicinity could very easily have been obtained.

One of the reasons exact information about the behavior of naturalized bulbs is so hard to obtain is the difficulty of keeping such a collection labelled. Several of our best varieties are unnamed because they came to us from other gardeners who had lost the labels or who had themselves received them in that condition. If one is growing narcissi in a grassy meadow it is next to impossible to label them in any ordinary way, since the labels interfere with the mowing and are easily lost and hard to locate. Mapping is fairly easy if there are only a few varieties but becomes difficult or impossible when a large number of varieties are grown. What appears to be a solution to this difficulty is to plant bulbs near permanent trees to which labels may be attached. In the meadow where the largest collection is located there are a number of volunteer red cedars which require only the aid of an occasional mowing to develop into specimen trees (mowing protects such cedars because it keeps out the broad-leaved trees which would otherwise shade and eventually

kill them). On the opposite slope from the cedars there are well-established specimens of various oriental crabapples. The cedars and crabapples are used as markers for the narcissi; each variety is planted near a tree, its label placed near the base of the tree where it is out of the way of the mowing machine, yet relatively easy to locate. This system seems to be working well at present but only time can tell if it will be permanently effective.

While it is too soon to make authoritative recommendations for this area, our preliminary results are suggestive, and should be helpful to others who are naturalizing bulbs on a fairly large scale. In general it appears to be true that smaller-flowered varieties have more strength to compete with the grass (though there are notable exceptions). It is also apparent that many of the best varieties for naturalizing are no longer common in the trade and must be searched for diligently. However, this is a blessing in disguise since it gives one the best of all possible excuses for visiting other daffodil collections. The varieties which we have had long enough to give a tentative recommendation are listed below in alphabetical order. Where the variety name, in spite of much effort, is still unknown, the listing is under our temporary nickname.

AEROLITE: This was tried out at Gray Summit because for some years it has had the longest blooming period of any yellow trumpet in the city garden. It has given a very good account of itself, coming through a late freeze in 1940 without any apparent injury and remaining erect through the almost continuous highwinds of the 1942 blooming season. Twenty-four bulbs planted in 1940 produced 48 flowers in 1941 and 57 in 1942.

BEERSHEBA: Our only objection to this variety is its price, which prevents our planting it in as large quantities as we should like. Six bulbs bought in 1938 gave us seven flowers in 1939, 9 in 1940, and 10 in 1941, though planted in heavy sod and given no special care. The flowers stay in bloom a very long time and are of such excellent texture that they can come through sleet storms without apparent injury. The disproportionately short stems are not a drawback in seasons with high winds.

BERYL: This variety was planted in semi-open woodland rather than in a blue-grass meadow and has done very well. It has increased from 4 flowers in 1939 to 22 in 1942. Those who see only a single flower of Beryl at a show may understand how the originator, Mr. P. D. Williams was about ready to throw away this charming little variety. Allowed to develop into a large clump it gives a better account of itself. The flowers open a greenish gold and slowly fade to white, so that a group of them shows a fascinating play of color.

BIFLORUS: This old-fashioned late-blooming variety does very well with us and has apparently never been winter-injured. In the region between Saint Louis and the Gulf Coast it is a common feature of many old gardens and has the ability to flower year after year with little attention.

EMPEROR: This has been one of the best varieties in our preliminary trials. Plantings of 50 bulbs each were made in two quite different situations in 1938 and all have shown steady increase of bloom year by year, whereas *King Alfred,* planted at the same time and in the same two locations, has shown fewer flowers year by year.

GLORY OF LISSE: Bulbs of this early-flowered Poet Narcissus were acquired locally and have behaved very well in our tests. It is useful because it flowers at the same time as many of the yellow varieties and gives variety in the landscape. The small flowers and rather crooked stems which make it a poor exhibition flower seem quite appropriate when it is naturalized in the grass.

LAURENS KOSTER: We have used this Poetaz in background plantings because it is fairly common in the lower Mississippi Valley and bulbs can be obtained very reasonably. While most of our plantings are only two years old they are apparently doing well.

LONG-STEMMED LEEDSII: We have not yet been able to identify this yellow mid-season variety which was given to us by Mr. John Howe of Pacific, Mo., for whom it has given excellent results when naturalized along an old fence row. The stems are tall but very stiff so that it comes through wind storms in good condition, even in exposed positions. The flowers are small but graceful in proportion to the stem and they are held so high that they give the impression of floating above the meadow.

OLD-FASHIONED YELLOW TRUMPET: This small, very early-flowering variety was obtained locally from an old garden and is one of the most satisfactory in our collection. It flowers only a few days after February Gold and has the same color in the perianth as in the tube so that its color carries well at a distance. It is hardy and vigorous and soon makes strong clumps when naturalized in the grass.

RECURVUS: We were fortunate enough to acquire a large stock of this splendid old variety from an old estate and it has done very well with us. While it prefers a cool spring it is one of the few poets which hold up well under hot dry winds from the southwest. We have put it in a variety of situations and it has done well in all of them.

SEAGULL: This variety was obtained from an old garden in the vicinity of Gray Summit. It was planted in semi-shade and has increased rapidly and makes a beautiful landscape display. If our preliminary results are significant it is better for naturalizing in this region than the very similar variety *White Lady.*

SIR WATKIN: This variety is very reliable under Missouri conditions. We have planted it in the city and the country, in full sun and in semi-shade, in poor soil with a poor turf and in rich soil with a heavy turf. In all these situations it has held its own with no pampering and has slowly but steadily increased year by year.

VON SION: This old-fashioned double yellow trumpet may not look attractive when it is grown in full sun and seen close at hand. Given a little shade it becomes a greenish yellow rather than a yellowish green and like many double flowers it stays in bloom for a very long time. Since it is cheap and easily obtained it makes a good background for choicer varieties.

We shall be very glad to hear from others as to their experiences in naturalizing Narcissi in this country, particularly in the middle west. We will be especially grateful for the names of varieties, either new or old, which should be added to the collection and for suggestions as to where they may be obtained.

THE DAFFODIL IN FLORIDA

Mary P. Finlayson, *Monticello, Florida*

"That comes before the swallow dares and takes the winds of March with beauty."—Shakespeare.

Are they a success in Florida?

If you could wander in my garden at blossom time and see "a crowd, a host of golden daffodils fluttering and dancing in the breeze" naturalized by the thousands in the grass beneath the spreading limbs of the old Live Oaks, you would no longer be a doubting Thomas. Wordsworth's lines rush to the lips of many visitors when first beholding the prodigal blossom. There could be no better description of the picture.

A Northern visitor, once when my garden was open for some charity, having almost outstayed daylight, suddenly spied me, and exclaimed —"are you the mistress of all this beauty? I think these daffodils wandered up and down the country-side looking for a congenial home, and when they found this place, tucked themselves in, and have been smiling happily every Spring since."

They are planted in great drifts or irregular flowing ribbons, each variety segregated. These large masses, so long established, are chiefly the old reliable sorts—*Sir Watkin, Emperor, Empress, Barrii Conspicuus, White Lady, Victoria,*—and form the backbone of the planting. Sizeable colonies of the newer kinds, too numerous to mention, have also been added. Especially effective are the new large white flowered Leedsi, white trumpets, and the spectacular red cupped or crowned ones. Newer ones are added yearly for interest. All ever tried perform well except *Croesus, Will Scarlet,* and that exquisite, fragrant *Alba Plena Odorata.* Too warm for the latter, and buds form on tall stems only to blast.

All doubles are failures. Most varieties, however, naturalize delightfully and indefinitely, except *King Alfred,* which requires replanting every four or five years to flower freely.

Almost my first large planting was a colony of *Sir Watkin,* in deeply prepared soil, well enriched. As in the old Virginia gardens, they continued to blossom and multiply for thirty-five years, with no other attention than a yearly sprinkling of bone meal. Their increase completely filled the grass spaces at the surface, and though they continued to be good doers, I thought they deserved more roomy living quarters. Dug the entire lot, and found they had not only touched noses at the surface, but had added their progeny below. They were dug in chunks of tight masses four or five bulbs deep. This increase, from an original few hundred bulbs, made a big start for my fields, as a garden of three acres would not hold the increase from various kinds.

Once, Dr. Hume brought Dr. Griffiths, of daffodil fame, to see the flowers which unhappily were almost past. He remarked "the success of daffodils in this climate is quite a surprise, but I am sure there is one variety—*Victoria*—that will not respond to coaxing." Promptly came the answer, "You guessed wrong—it flowers 100% regularly, long stemmed, large blossoms, great clumps of them." He was so surprised, he bluntly replied "I do not believe you." Dr. Hume courteously intervened, "Mrs. Finlayson is a truthful woman." I laughingly invited him to return next Spring in time to see them. Came his reply "I am tempted to say, I shall." My suggestion was that the soil, a natural deep humus and semi-shade provided conditions to their liking, as comparison with those grown in cultivated rows in open sunny fields showed short stems, smaller flowers and scant multiplication.

Last year, I had occasion and the courage to dig and separate these old clumps—not expecting them to flower the first year, but they did; and a visitor standing in front of them, asked "what lovely variety is this and so early?" She seemed surprised and said "My Victorias scarcely show a flower even after I moved them."

Perhaps, some growers in this section wait too late to dig daffodil bulbs, not before the Summer rains have induced new roots to form for next year's job, which will not of course repeat themselves, and the blossom sulks in the bulb and cannot show itself. Also digging too often does not produce vigorous and floriferous bulbs. They resent the yearly digging method necessary for the commercial success of the narcissi of the Paper White type. Every two or three years is quite often enough to dig commercially grown daffodils. All daffodils here are greatly increased in size by the method of cultivation in rows in fields, with the notable exception of *Victoria* and *Poeticus*. But while a whole field in flower is rather breath-taking, it is not nearly so lovely as naturalized masses in a setting of green grass and spring flowering trees and shrubs.

They love plenty of water when they are forming their flowers in the bulbs, and at blossom time—keep them growing as late as possible. They appreciate a cool mulch of leaves during our hot summers. We cannot produce the smooth, brown skin shiny bulbs, and ours are smaller, but with little attention, produce fine flowers in profusion.

The huge Western bulbs, as well as intensively grown cool climate Eastern ones, produce enormous flowers the first year, while the second season, blossoms are spare or often none at all. The third and fourth years bring flowers no larger than our acclimatized local ones, provided ours have had good treatment.

CRINODONNA HOWARDII

E. O. Orpet, *California*

There are few hybrid Amaryllids of American origin that are bigeneric in origin. One, produced by Fred Howard, has been recognised by the R. H. S. in London with a certificate and yet this plant is rarely seen in cultivation (See Fig. 85.). This is perhaps due to slow increase by division of the clumps. However, one may double the number each year.

The parents of this plant are *Callicore rosea,* seed parent, and *Crinum,* pollen parent. It is not stated which *Crinum* was used, but it is fair to assume that our most commonly seen, *Crinum Powelli* is the one. A similar hybrid had been produced by the reverse cross in Italy previously but it is not in cultivation in this country.

There are often twenty flowers to a stem, lasting at least a month in succession. The flowers are a beautiful pink color. The best feature of this hybrid is, that it is evergreen with beautiful foliage and also

Figure 85. Crinodonna Howardii; left, entire plant; right, close up of flower scape. Photo by E. O. Orpet, Santa Barbara, Calif.

each mature bulb will flower at least three times a year. It seems that it is only a matter of a "drink" after the flowers fade before another flower stem appears before the older one has dried off.

Mr. Fred Howard had a reputation for years past as a keen breeder of other garden plants, particularly roses. We have in mind however, that roses come, roses go, but his *Crinodonna Howardii* will outlive many of these, to commemorate his name.

HYBRID AMARYLLIS SYMPOSIUM

We are indebted to a number of Amaryllis enthusiasts for the following symposium, chiefly on hybrid Amaryllis. It is hoped that such a group of articles on hybrid Amaryllis can be included in each issue of HERBERTIA. Growers should take this as an invitation to send in contributions which should be received by July 1 if possible. —*Ed.*

BULLER'S HYBRID AMARYLLIS

WYNDHAM HAYWARD, *Florida*

For a number of years we have been in correspondence with Mr. A. C. Buller of Dwarsriviershoek, Stellenbosch, Cape Province, Union of South Africa, concerning *Amaryllis* and their breeding. Mr. Buller told us of his work covering a period of forty years or more in hybridizing choice types for the production of extra quality exhibition flowers.

Early in 1942 Mr. Buller sent to R. W. Wheeler, Treasurer of the American Amaryllis Society, a selection of Kodachrome color transparencies of a few of his best types of blooms, which said even more than Mr. Buller had professed as to the superb quality of his hybrids. A few of these kodachrome films have been printed in black and white, for reproduction in the current HERBERTIA, and all *Amaryllis* enthusiasts are referred to these pictures (Plates 237 & 238) for further enlightenment on what splendid work can be done with these bulbs in a far-off part of the world with years of conscientious application and selective care.

We pay tribute to Mr. Buller as a real plantsman, a talented hybridizer and a lover of the beautiful in *Amaryllis* flowers with the inspiration to carry through years of effort to achieve what seems to be near perfection in the quality of his flowers.

A FUTURE FOR AMARYLLIS

A. C. SPLINTER, *Florida*

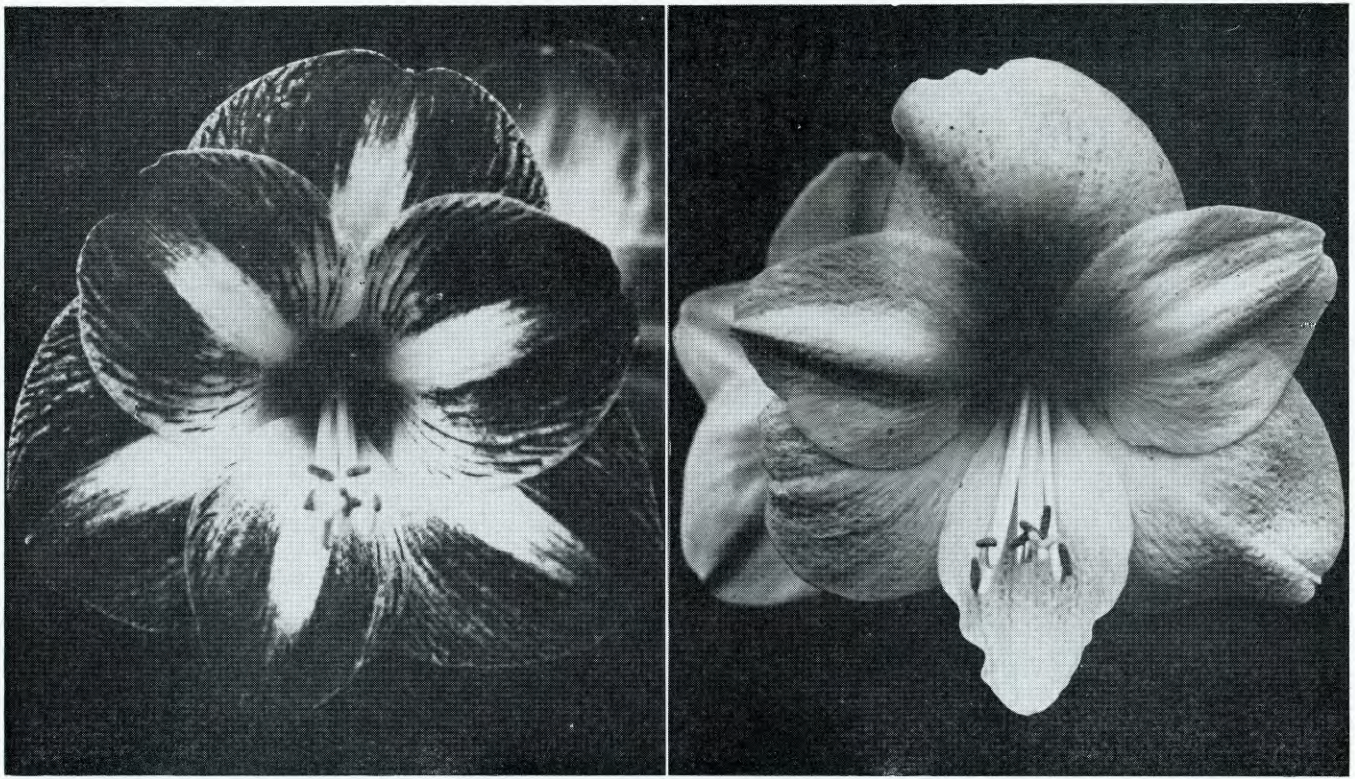
When we look at the present war we must assume, that regardless of how destructive it is and still is going to be, it will in the end undoubtedly open the door to another and greater era. Great changes have already taken place in many parts of the world including this country and more are yet to come, and they will affect most everything, our daily life, our schools and institutions, our industries, our agriculture and last but not least, the various branches of horticulture. However, these changes will not permanently retard anything in this country.

Especially two branches, the seed growers and even more so the bulb growers, will finally come into their own in the post war period, provided of course that they are not short-sighted and possess enough ability and energy to hold onto the rather enormous possibilities that are going to be offered. World War I did bring considerable changes and much could have been accomplished during the years that followed if the bulb growers had kept their eyes open and had taken advantage of

A. C. Buller, Union of South Africa

Buller Hybrid Amaryllis, left, No. 1, rich wine color; right, No. 2, rich, deep red-scarlet.

Plate 237



A. C. Buller, Union of South Africa

Buller Hybrid Amaryllis, right, No. 3, pastel cream with pink lavender blush; left, No. 4, light scarlet with white star.
Plate 238

the possibilities. But only a few were able to see the light, the majority went wailing along the old trail. World War II was required, and especially a war with Japan, to end (let us hope) the importation of cheap bulbs, the one high hurdle over which no home-grown bulbs were able to jump during all these many years.

The results should in this case be far reaching provided the bulb growers are at the end of the war sufficiently prepared to handle the situation. It will then for the first time become possible to establish a mighty industry entirely free from foreign competition, a competition which especially in the case of Japan, was for a long period of time so powerful that it could keep down any attempt to grow Easter Lily and other Lilium bulbs in the United States. Millions of dollars went out of this country for bulbs and a good many of these millions went to the Land of the Rising Sun, where they were certainly not used for peaceful purposes. That much and more we know now and let us hope we won't forget.

But let us also hope that the efforts to raise home-grown bulbs will not become one-sided and that all work is not going to be centered entirely on the raising of Easter Lily bulbs. That would be a great mistake as it would first give our enemy that welcome chance to switch over to all the types of bulbs which we would not grow and secondly would leave us still dependent upon other sources for such bulbs even if we would not buy them directly from Japan. Unfortunately, such one-sidedness has been characteristic of our efforts for a long time much to the detriment of types of bulbs which were grown in fairly large quantities in many parts of the United States in the past, and are still grown today but have for one reason or another never had the opportunity to dominate the market like the Easter Lily.

There is for instance, the hybrid Amaryllis, comprising many different types and an endless number of varieties of great beauty. The members of this class of bulbous plants including even the most modern hybrid types have never in all their history been given the chance they deserve but have for some unexplained reason been shunned by the greenhouse growers and even more so by the florists. The amaryllis, in spite of its long history has always been compelled to play a secondary role on the flower market and although there have been periods when it appeared that they were finally coming into their own, it never did really happen that they became a product annually demanded by the general public.

It is perhaps true that there have been at all times amaryllis fanciers and amaryllis enthusiasts who spent much time and money on this class of plants. Likewise there have been and still are today, large collections in existence in private and public gardens, but to the majority of the flower-growing establishments, amaryllis are still a class of plants not sufficiently appreciated. I have yet, after long years of traveling, to find an entire glass-house in a commercial undertaking reserved for the growing of amaryllis either as potplants or as cutflowers. And in cases where I really did find some there were never more than a few hundred at the most and then usually under conditions which were not at all suitable for the growing of perfect amaryllis.

Numerous reasons and excuses are offered as justification for the neglect of this beautiful bulbous plant. The major complaint made by the greenhouse growers is, that they can seldom if ever get a sufficient supply of a uniform type of bulbs. That is, even if the bulbs are uniform in size, they are not uniform in habit, color and size of flowers and what is worse a great many bulbs when forced under glass, will bring one or two flower-spikes but will not develop any foliage and on account of this are as a potplant unattractive to the average customer and even more so to the florist. He particularly has always claimed that an amaryllis is a difficult plant to sell, either as potplant or as cutflower. As potplant it requires too much "make-up" in order to appeal to the customer, and as cutflower it is too stiff, and in the case of the modern hybrids, the flowers are too large and heavy to fit to advantage into customary arrangements. Aside of that he claims that amaryllis flowers are a poor item for shipping.

However, even if granted that an amaryllis as a potplant needs a make-up, what other flowers do not need to be dressed up before they appeal to the customer? The florist who can prepare an Easter or Regal Lily for selling as a potplant, has certainly not a bit more trouble with an amaryllis, more likely he has less. And as far as the use of amaryllis in flower arrangements is concerned it can be said that new ideas usually have their foundation in the imagination of man and nowhere else and a florist is supposed to have imagination if nothing else. Shipping of amaryllis flowers is probably somewhat more difficult than shipping of chrysanthemums but it is certainly not as much as shipping orchid flowers, besides it has been demonstrated in the past that amaryllis flowers can be shipped over great distances and still arrive in perfect condition.

All in all it can safely be assumed that if the florist will finally discard his ungrounded prejudice towards amaryllis and will give this flower a more serious trial, he may yet come to the conclusion that it is a very worthwhile item especially if he realizes that his beloved "Japlilies" will never come back again. The greenhouse grower also can, if he is willing to make some efforts in that direction, help a great deal to make the amaryllis a popular flower in the future. His troubles and failures mentioned before are only superficial and can easily be eliminated as they have their foundation firstly in the buying of the cheap bulbs of certain strains and secondly in not providing the right growing conditions, etc.

The quality of all of these older strains of amaryllis was probably much better 40 years ago than what it is today. This is exclusively the fault of the bulb-growers who by failing continuously over a period of many years to obey the laws of hybridization and by failing even more, to select only the very best material for breeding and marketing, have brought their bulbs down to a very low level. On account of this they must, in order to stay in business, sell their bulbs at often extremely low prices leaving little or no profit. However, such growers deserve no sympathy because, aside of being a menace to themselves, they have by selling their worthless bulbs spoiled continuously the chances for

the amaryllis to become a popular flower in the market. Such growers must finally be taught by their own failure and misfortune that growing of amaryllis bulbs must, like roses, carnations, etc., constantly be kept on a high and modern level.

The old idea, to raise from a thousand seed a thousand bulbs and then regardless of quality, etc., sell these thousand bulbs at any price, must finally be eliminated. If not by common sense then by suffering the consequences which all bad business has in store for those who will not listen. There is absolutely no need to keep on growing those old and outworn strains as new and really magnificent strains of various types of amaryllis are, and in fact have been in existence for a number of years in this country and over-seas in England and the Netherlands. All that is needed now is to grow such modern types in great quantity. It is almost certain that once such new and modern amaryllis begin to dominate the markets and the flower-stores, a strong public demand will develop, especially if competent writers and growers, etc., will continue to disseminate in garden magazines and other publications advice on how to grow these bulbs successfully the year around.

In general the people all over this country, and particularly the members of the many garden clubs, have in the past, at flower-shows and special amaryllis shows, professed deep interest in this showy class of flowering bulbs and have always been eager to gather information in regard to culture, care, etc. However in my opinion, it is the average florist and greenhouse grower who above all others, can within a very short time bring about the greatest change by offering the public on all occasions from early winter till late spring, these new types of amaryllis not only as a substitute for but as something better in place of that which he could offer before. For instance, brilliant red amaryllis will undoubtedly sell at Christmas time, pure white would be perfect for Easter and for the many pink and other shades there are many occasions on hand between Christmas and Easter on which they could be used to the best advantage.

Since vegetative propagation has become a reality it is possible, in fact it has been so for several years, to multiply any desired shade or color in great quantity and in less time than was formerly needed when all bulbs were raised from seed or off-shoots. This method, practised first in Holland and now also in the United States, will undoubtedly within a few more years become a great blessing to the growers of amaryllis bulbs as it eliminates all the uncertainties which must be expected when the bulbs are grown from seed. Vegetative propagation gives absolute guarantee in regard to color of the flowers, vigor of the bulbs, habits and time of flowering and numerous other factors which after all are of great importance to the florist and greenhouse grower. Both it must be admitted cannot gamble with their crops but must have a product worth their time and efforts to make it salable and amaryllis growing has until very recently been undoubtedly a gamble. Therefore it is absolutely necessary for the modern bulb grower to become familiar with vegetative propagation. It will solve many old problems and is in fact the only solution fit to make amaryllis growing

in the future profitable to all who are either engaged in growing bulbs or in selling potplants and flowers. It is moreover the only chance to gain for this bulbous flower the recognition which it so rightfully deserves.

Thus in conclusion I say again, let us make use of our ability to plan and to contemplate in order to be well prepared and ready for the great possibilities after this war has been won.

Hybrid Amaryllis Culture near Miami, Florida

J. G. DuPuis, M. D., *Florida*

This project is located in Southeastern Florida at Miami, 367 miles south of Jacksonville. My Lily Garden is approximately 4½ miles west of the Atlantic Ocean on the edge of the Everglades.

The climate in this area prior to Everglades drainage was nearly semi-tropical, however, since the Everglades drainage, the surface water has been depleted from this area known as the Everglades Drainage District covering practically eleven counties in Southern Florida. The wonderful semi-tropical climate we enjoyed in this territory, prior to drainage of this vast area of reserve water, has changed greatly. Notwithstanding the climatic changes, we still have and enjoy a climate to which many thousands of people come annually to enjoy the even temperatures in the "Land of Sunshine and Palms."

The plot of soil in my garden in which I have been growing Hybrid Amaryllis since 1935 is of a grayish sandy loam with a rock foundation, and of an alkaline character.

My first purchase of foundation stock was Mead Hybrid Amaryllis, the same being purchased from a grower near Orlando, Florida. His entire output was purchased and consisted of very small to medium size blooming bulbs, about 3500 altogether.

Beds were about seven feet across and elevated to about 3½ to 4 inches. On top of this bed we planted the bulbs in rows about 18″ apart, and in the drill according to size of the bulbs 15″ for the large ones and 6″ apart for the smaller ones.

About a year later I had the privilege of selecting additional bulbs in person from a grower in Jacksonville, Florida, in the month of April, when the lilies were in bloom. I had the advantage of selecting individual bulbs of my choice as to color pattern of the flowers.

The bulbs were planted in like manner as the first. All of them grew rapidly and the first spring, the larger bulbs bloomed and there were many very pretty individual and rare patterns of flowers.

Having read somewhere an article that practically all Lily bulbs should be removed from the ground and given a resting period, I had all of my Amaryllis bulbs pulled up in the fall of the second year and put in the shade for a rest period. However, after about two months, the bulbs were shrinking rapidly and something had to be done quickly to preserve my foundation stock before they dried out. Therefore, the bulbs were promptly replanted and have not been removed for any subsequent rest periods for my observation is that Hybrid Amaryllis in

open field planting need no rest period as they grow practically the entire 12 months of the year in southeastern Florida. The rest period for my bulbs was a great shock to them and it took one or two years for the bulbs to overcome the setback they had received.

Hybrid Amaryllis require frequent applications of both chemical and organic fertilizers, also a broadcasting of well rotted stable fertilizer in the fall is a good practice. They need but little cultivation. To keep the grass and weeds removed is enough.

Now as to some of the pests, since every garden has some disadvantages. The plot of soil in which my Amaryllis were planted was and is now infested with nut grass, this implies naturally a hand picking job. However, this method has an advantage, while the nut grass is being hand picked, the same workers can kill the grasshoppers, also a black striped worm colored similar to a Zebra that comes in the spring of the year. If these three items, which are classed as pests, are not subdued vigorously in the spring months, the Hybrid Amaryllis will suffer both in growth and production of beautiful blooms. The grasshoppers and worms have robust appetites for both foliage and flowers.

There is one other pest that can be controlled by spray solution. If one plants Gladiolus nearby late in the spring, the thrip, which is bound to come as soon as the days grow hot early in spring, will infest the Amaryllis blooms and destroy their beauty. It is best not to plant Gladolius near the Amaryllis that will bloom in the hot days of springtime.

Nut grass remains dormant throughout most of the winter season and a plan has been worked out to control its growth and save the expense of hand picking during the summer months by planting a field pea which was originated in the Bahama Islands. It is a good vine, with free foliage and it makes a prolific covering that keeps the nut grass dormant throughout the hot summer months. This variety of pea has the capacity of fixing nitrogen from the air by means of root nodules. The shading of the soil is also an advantage in this section in the summer.

Two years ago, we separated many blooming size bulbs from each original bulb, from three to six bulbs, which were transplanted in rows as stated above, making a total of about 10,000 or more blooming size bulbs. Two years ago also I planted seeds and after the seedlings were three to four months old they were transplanted to the open field. A few of them bloomed this past spring at the age of 24 months.

Last spring I planted many thousands of seeds in June and practically all of them germinated. The seedlings were transplanted to open field and now the young plants and adult plants represent a total of many thousands of bulbs. The best results were secured in planting seeds in boxes of good mellow soil, with some humus, well drained. The seed were planted about one-eighth inch under the soil, tamped firmly, and covered with one thickness of burlap sack and kept moist by frequent sprinkling. As soon as the little plants come through the soil, the sack was removed and watering was continued at frequent intervals. Partial shade is good for the seedlings and transplanting to field should be done in October or November.

My bulbs have the advantage of overhead sprinkler irrigation and when the soil gets dry, we turn on the water in the evenings as the Amaryllis require plenty of moisture and fertilizer to do their best.

In the spring of the year, early in March and through April, May and June, the gorgeous blooms of Hybrid Amaryllis will gladden the heart of those fortunate enough to have them for companions. Arrayed in color, tint and patterns with their glorious smiles of indescribable beauty, and presenting a panorama by the tens of thousands of blooms, welcoming with a charm and smile of the beauties of nature, this is truly comradeship—really worth while and an inspiration to life itself.

The past year we have found very appreciative customers for many of our mature bulbs and have introduced the flowers, which cover several months in the Spring, to the cut flower trade. To our surprise they were joyously received by the public as the cut flowers remain fresh and beautiful from four to seven days when given usual care.

From my experience in growing Hybrid Amaryllis I have learned a little and enjoyed the work more than words express. When these beautiful flowers are in full bloom in the spring months a few moments' visit amongst them in the early morning has the tendency to start the day on a more cheerful note, especially to a Physician and Surgeon, since a great deal of his routine patronage and consultations are made up of pains and complaints.

My best reward for all the work and effort given to this project is to present these beautiful blooms to friends. To my mind a bouquet of these beautiful lilies conveys a message which is impossible to express in words.

To any one who may chance to read this article, I hereby extend a welcome invitation to visit my Garden when in full bloom to enjoy a picture of nature in color,—a panorama of myriads of beautiful Hybrid Amaryllis.

Amaryllids in Southern California

F. L. Bennetts, *California*

Observation of amaryllis growing in Southern California is a revealing experience, especially to an amateur. From growing a few bulbs in yard and pot, to go and see literally acres, planted to hundreds of thousands of bulbs, really gives one something to talk about. The two most extensive amaryllis plantings here are probably those of Rice Bulb Gardens of Downey, 500,000 bulbs; and Howard and Smith Inc. of Montebello, 200,000 bulbs. To see these same acres in mass bloom, during early spring, is to see amaryllis paradise unveiled. One certain conclusion reached by any observer would be that this bulb has certainly found a real home in the climate and soil of this section of the country.

Conversation and correspondence with the larger growers indicate that nearly all bulbs are in field plantings. Here the amaryllis is so hardy that even the seedlings are grown in the open and then transplanted to the fields from which they are ultimately dug for market.

These field plantings are usually in long rows, thirty inches apart and with six inches between bulbs. Power tools keep the soil in condition, and flooding or sprinkling supply moisture. Some form of irrigation is always necessary, because the growing season is the dry season in Southern California. Fertilizer is regularly applied, usually in organic form. From these large field plantings, selections are made for propagation; the general run is eventually sorted by color and sold in wholesale lots; white, reds, scarlet, orange, rose, fancy striped, etc. One grower, and perhaps others, follow the system of replanting bulbs by color classification as soon as they have bloomed.

Hybridizing is carried on quite extensively. Howard and Smith probably has the largest number of bulbs used exclusively for this purpose, between four and five thousand. These are kept in pots and flowered under glass. Records of crosses are kept, and the whole business followed through most systematically. It is a rare treat to walk between the long rows of benches at flowering time and see the great variety of size, shape and color represented in these selected bulbs. Under the controlled conditions possible with glass and heat, flowers attain a high degree of perfection. Blooming period in these houses is a perpetual amaryllis show. Other growers hybridize from segregated field plantings. Mr. Rice has a very large plot of selected bulbs which in blooming season is a marvel of color and perfection, successfully contending with the elements of sun and wind. He also has some plots in which he is growing and propagating named varieties. It is impressive to see scores of flowers, uniform in shape and color, massed in a single planting.

There seems to be little tendency to grow named varieties. Cecil Houdyshel lists several strains of amaryllis, and the following named varieties: *Lady Helen* (Capsicum red, self colored), *Sibyl Houdyshel* (pure white with narrow pink line on border flushed and lined pink in throat, fragrant), *McCann's Double* (twenty or more petals, shades of red). Among the collection in the Rice Gardens are the following: *Java* (purple, white throat), *Lady Helen*, and *W. N. Campbell* (very large white with vivid scarlet blotches). The writer has a small collection, several hundred young bulbs representing a number of strains. Two of the most valued named varieties in this collection are *McCann's Double,* and *Ruby Supreme.*

One of the most interesting and complete collections of amaryllids in this section, if not in the country, is that of Cecil Houdyshel. On the outskirts of the picturesque little town of La Verne, Mr. Houdyshel has ten acres under cultivation. More than forty years of experience guides the management of that wonder farm, in which hundreds of thousands of bulbs of all kinds are at home.

The entire planting is irrigated by overhead sprinkling systems, all of which are controlled by centrally located valves. Cultivation is done with a small tractor, a wheel hoe and other hand tools. An onion planter is used for some bulbs and a seed planter, hand operated, for planting small seeds. Fertilizer is applied with a Planet Junior. Mr. Houdyshel says that he digs bulbs the hard way, "by the gopher method" (at this point in the discussion he put in an urgent plea for the invention of a real bulb digger).

A. B. Lytel, Santa Barbara, Calif.

Blue Amaryllis, A. procera in California

Plate 239

The estimated number of bulbs growing on this unique farm is several million, representing at least 1000 varieties. Among the many families represented, there are approximately 500,000 bulbs in the Amaryllis Family alone. Of amaryllid species and hybrids there are about 500. This would not include variations in mixed lots, but would include varieties under observation but not yet introduced. In his planting there are 20,000 hybrid amaryllis, no two of which are just alike.

In the total collection there are many rare sorts or species of bulbs, too many to list. As an example, in one genus, *Haemanthus;* there are these: *coccineus, albiflorus, puniceus, katherinae,* and *carneus.* Of the latter species, Lt. Colonel Grey says in his "Hardy Bulbs," "I doubt if anyone has this now."

Mr. Houdyshel has given many years to hybridization. Hybridizing crinums is his specialty and of his best known originations these are outstanding: *Cecil Houdyshel, Virginia Lee* and *Gordon Wayne.* He is also hybridizing *Callicore rosea, Amaryllis, Haemanthus,* daylilies and others.

In the estimation of the writer, one of the outstanding services, to the bulb growing enterprise, is the unique catalog published by Mr. Houdyshel. This listing groups bulbs according to families to which they belong, which is a decided improvement on the usual alphabetical arrangement. The descriptive material is excellent. Cultural notes are numerous and specific, written by one who has spent most of a life time growing the bulbs about which he writes. In spite of the fact that many families of bulbs are offered, there is to be found here one of the most complete listings of amaryllids in this country.

In collecting notes for this contribution to Herbertia, the writer has been much impressed by this fact: quantity production has not destroyed the quality of enthusiasm that these large growers have for the bulbs. Years of growing and extensive plantings have not dulled the ardor of their first love. Their willingness to share experience and enthusiasm with an amateur has been much appreciated, and has made possible whatever information and interest this article may convey.

The Blue Amaryllis in California

A. B. Lytel, *California*

In August, 1939, Las Positas Nursery received from Brazil bulbs of this beautiful Amaryllid *(Amaryllis Procera).* They were planted in a bed raised about five inches from the ground, made of decomposed granite shale, with full exposure, getting all the morning sun and part shade in the afternoon. One bulb flowered for the first time this year,—the first bud appeared fully developed about the twelfth of August, and opened wide about two days later (See Plate 239.). There are four wide-open flowers still in good condition after five days, and new buds are appearing on other bulbs. In all there are nineteen fully grown bulbs and we have fourteen offsets showing good growth.

The flowers measure 6 inches in length with a diameter of five inches, their color is a violet blue, with ruffled pointed petals, and a

white throat, self-spotted rather far back from the edges of the petals in the fashion of some Gloxinias. The stems are twelve inches long from bulb to flower, with leaves averaging sixteen inches in length, and some one and a half inches wide. The flowers are far more beautiful than any we have seen pictured,—probably because they have gone through their full growth cycles in their present surroundings instead of being latent in immature bulbs which had a long journey between collecting and flowering.

SPREKELIA IN SOUTHERN CALIFORNIA

THOMAS W. WHITAKER,
La Jolla, California

This beautiful crimson amaryllid from Mexico, commonly known as the Orchid Amaryllid or Jacobean-Lily deserves to be more widely planted in Southern California gardens, especially in the coastal area from Los Angeles southward. This area is practically frost free and seems to offer an ideal environment for *Sprekelia.*

Sprekelia thrives in the lighter soil types which are well drained, and the plants respond readily to light fertilization. Plants of this species are very vigorous, and multiply rapidly by the production of small bulblets at the base of the mother bulb. These can be taken up and separated at almost any time of the year.

The foliage is evergreen, and the dark-green, strap-shaped leaves may reach a length of two feet or more. Except for a period in the late Fall the plants are in bloom almost continuously. To convey some idea of the size of the flowers, I am recording a few measurements; in each case the figures represent an average of ten flowers measured,—*Scape*—10 to 12 inches long from the base to apex of the ovary. *Spread of flower*—7 inches in diameter. *Length of 2-parted spathe*—2½ inches from the base of the ovary to the tip.

Sprekelia will add a bright, colorful, and interesting spot to any garden. In addition, the blooms are excellent as cut flowers (See Fig. 86.). The long scape makes some attractive arrangements possible, and they deteriorate very slowly.

THE DEPENDABLE ALLIUMS

BERNARD HARKNESS, *Wisconsin*

Grow alliums and see the world can be used for a gardener's slogan. Africa and Australia alone are absent; Asia, Europe, North America are well represented and South America sends cousins, the genus Northoscordum. One may have in their garden *Allium giganteum* from the Oasis of Merv in Turkestan, *Allium atropurpureum* from Hungary eastwards to Persia, *Allium cyaneum* from the banks of the Te-Tung in Kansu, China, and thus take in spirit a safe and sane journey right at home to many of the most alluring names on the map of the world.

I began my allium journeys in the summer of 1932 when I collected seed of two alliums in the garden of Mrs. Fannie Heath at Grand Forks, North Dakota. Mrs. Heath, until her death in 1931, was prominent in introducing the prairie plants to gardens. One from her garden was *Allium stellatum* which, every year I have had it, has come into flower by September fifteenth in my garden where it has added a welcome bit of rose-pink brightness (Plate 240). Furthermore, it is a plant that stays with one the whole season through and its flattened light green

Fig. 86. Sprekelia formosissima as a cut flower. Photo by Dr. Thomas W. Whitaker, La Jolla, Calif.

leaves make graceful fountains of foliage some fifteen inches high. The other was *A. sibiricum*, a cosmopolitan species ranging from Maine to Alaska and through boreal Asia and Europe. From this I now have rosy-lavender and light pink flowering forms. They make generous clumps with abundant bloom in late May. Its foliage is round and succulent like chives to which it is closely related.

My next allium came by seed from Europe, its home. *Allium pulchellum* of all this huge genus that I have seen, is the one I should choose to call "the beautiful." It sends out a sprangle of cool lavender-lilac

Bernard Harkness, Baraboo, Wisc.

Allium stellatum

Plate 240

flowers in an umbel, flower stems of various-lengths, in July. Indeed, July is the month of bloom for several of the showiest of the alliums. *Allium flavum* is closely related to *A. pulchellum* but bursts its brassy yellow flowers from a prominent sheath on eighteen inch stems. I like very much a dwarf form known as *A. flavum minor* which grows only to six or eight inches and seems to increase in clumps more readily. The flowers of this yellow allium are sweetly fragrant, although odor is a subject an allium enthusiast seldom dwells upon. Another European species that I have had under the name of *Allium bulgaricum* is, I believe, properly *Allium rotundum*. It has a globose head of flowers like a small teasel of a deep wine-red on two foot, round stems with smallish leaves. It has been much admired in the garden.

I admit to being partial toward alliums but where, I ask, can such an interesting variety be found within a genus of easy culture and hardy in Northern gardens. There are alpines from the Western mountains including one named for Pike's Peak that blossoms early in May. There are equally dainty species from Asia that hang out little blue bells late in summer from grassy tufts of leaves. There is the bold, broad-leaved species from Turkestan, *Allium karataviense,* with large round heads of flowers. There is the beautiful June-flowering *Allium caeruleum*. Its flowers are sky-blue and there is an ample round ball of them on tall stems for all to see. For some time a plant has been distributed in this country as *Allium tibeticum*, but the botanists have stoutly maintained that the name belonged to a grassy blue flowered Asian species whereas no name seemed available for this excellent foot high plant flowering in June, reddish-purple on slightly winged stems. Recently it has been named *Allium Farreri* in honor of the well known plant explorer, Reginald Farrer. There is *Allium cernuum* that ranges widely over North America in many forms. One of the best I have seen came to me from a mountain range in New Mexico. Its flowers are a delicate pale pink of waxy texture; a twist in the flower stem makes the flowers nod, a characteristic of *A. cernuum*. This New Mexican form flowers in August.

In cultivation in our gardens alliums seem unusually tractable. In my small garden in central New York I grew the western alpine sorts in a lean gravelly soil, the others in a perennial border of rather heavy clay loam enriched with barnyard manure. I have given *Allium validum* a partially shaded spot on the north side of a shed where moisture is retained longer but that seems a small concession for a plant of wet mountain meadows of northern California and Oregon. There back of a group of Christmas roses its lush foliage and rosy-pink flowers in August are very pleasing.

In most allium collections there is an abundance of medium tall, twelve to fifteen inches high, early summer flowering, fleshy-stemmed varieties of dull pink or lilac flowers. One of the showiest of these I have tentatively labelled *"Allium angulosum"* from its twisted flower stem. It came in a seed packet as *Allium ammephilum*. These are the hardest to distinguish botanically and possibly have the least interest for the gardener.

When Regel published from the St. Petersburg, now Leningrad, Russia, Botanic Gardens in 1875 his monograph of the genus, he described 256 species. Since then many Asian and North American species have been added. Readers of Louise Beebe Wilder's, *Adventures With Hardy Bulbs,* know that she grew and enjoyed many species of allium in her garden. Lately we have had from England in Vol. 3 of Charles Henry Grey's, *Hardy Bulbs,* a splendid critical study of over one hundred species. My gardening experience has encompassed not more than fifty species hence I am looking forward to many more years of collecting alliums.

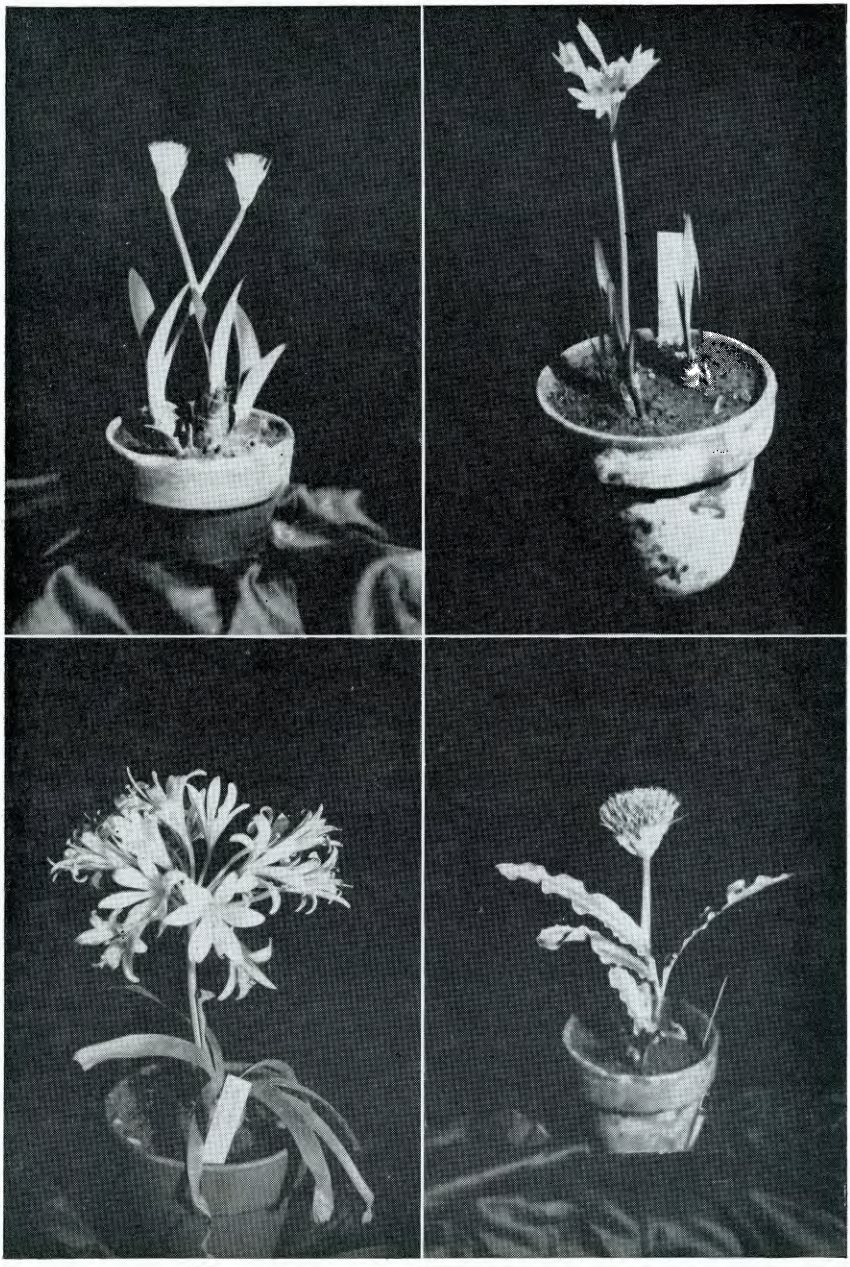
ZEPHYRANTHES INSULARUM

MARGARET WALMSLEY, *Florida*

The gardener, who remains in Florida during the summer season, knows the delights of many fine plants, denied to those acquainted only with the winter bloom. To my mind the honors are about divided between the large and small of it—Crinums and Zephyranthes. The latter are known as Wind, Rain or Fairy Lilies—now classed in various genera, including the Texas Rain Lilies—*Cooperia.* The long months of the warm season are truly enriched by the recurring masses of color of the many species of these garden jewels.

Everyone knows the giant of the group, *Zephyranthes grandiflora,* which comes again and again with its cheerful, rosy majenta flowers, from early April until cold weather puts it to sleep. A close companion is a delightful small white flowered Rain Lily, beginning in April and flowering with the greatest profusion, even without rain to spur it on, flowering on into the fall. This species is one of the real treasures of the group, for it fills a need supplied by no other. For as long as I have had a garden in Florida, which was begun in 1927, I have had this white Rain Lily. I cannot be sure whence it came to me, originally, although it seems that it was sent to me by my Mother from Southern Indiana, where she had obtained it from Dreers possibly as *Z. alba.* But it might have come with a few plants from Key West, when I was given the lovely *Key West* Hybrid *Amaryllis* (which I saw years later in one of Dr. Hume's illustrated bulb talks). All these years I have found this *Zephyranthes* the most profuse grower, seeder, and producer of bulblets. It seeds all over the borders, often coming up in the lawn, where it blooms, regardless of the lawn-mower. I have kept a group of it in a wire basket with a *Campyloneuron* and *Phlebodium aureum,* where it grows, blooms and multiplies as though it were an epiphyte, too.

One of my friends, a devoted bulb grower, has many of them making masses of white. We compared notes repeatedly. We wrote to Mr. Wyndham Hayward and others. Mrs. B. V. Collany sent some bulbs in flower to Dr. Hume, while I was impatiently waiting for another flowering. Dr. Hume identified it as *Zephyranthes insularum,* about which he wrote an excellent article in 1939 HERBERTIA. It is a real satisfaction to finally have a permanent name for the little waif.



Perry Coppens, New Jersey

South African Amaryllids—Haemanthus, albiflos, upper left; Anoiganthus breviflorus, upper right; Cybistetes longifolia, lower left; Haemanthus puniceus, lower right.

Plate 241

We bulb lovers get a real delight and help from HERBERTIA and feel grateful for that labor of love, so well done and so much needed. In our Garden Club, here, Dr. Hume has given us several illustrated talks on bulbs (and other subjects in other years). This stimulus has introduced many to the delights of bulb growing.

SOUTH AFRICAN AMARYLLIDS

PERRY COPPENS, *New Jersey*

In the summer of 1939 I received a shipment of bulbs from South Africa which included *Cybistetes longifolia, Ammocharis coccinea,* and *A. cornaica.* I was particularly interested in the *Cybistetes.* No flowers were secured during the first two seasons, but in August 1941, *Cybistetes longifolia* flowered. The plant was taken indoors while in bud. The scape was about six inches high and there were about eighteen flowers to the umbel. The flowers opened white, but after about the third day, they turned to a beautiful rose color and were very fragrant. (Plate 241)

I secured seeds of *Anoiganthus breviflorus* from South Africa and after three years of careful attention four fine bulbs were raised which flowered for the first time last year (Plate 241). This is apparently closely related to *Cyrtanthus.* The mature bulbs are about one to one and a fourth inches in diameter, the leaves are heavier than those of *Cyrtanthus* I have seen. The flowers appear with the leaves and are a beautiful golden yellow, 1 inch wide and quite open. This fine subject is well worth the trouble of raising it. I sent one of the bulbs to a Society member in California and have wondered how it made out. Last year the plants did not set seeds but I hope to secure some this season.

The Blood Lilies or *Haemanthus* have become more popular in recent years. Of the half dozen now for sale in this country, I think *H. multiflorus* and *H. Katherinae* are the best. The color of the flowers of the various species varies from brick red to red and scarlet. The umbels of *H. multiflorus* form a perfect ball, those of *H. Katherinae* are less spherical, and most of the others are of the paint brush type. Some, like *H. coccineus* (Plate 241) and *H. natalense,* flower before the leaves appear; others, like *H. Katherinae,* with the leaves. *Haemanthus albiflos* (Plate 241) as the name indicates, is pure white. It is an interesting curiosity. To flower well, *Haemanthus* need a pronounced rest period. A good soil with decayed manure and a little grit suits them perfectly.

EVERGREEN HEMEROCALLIS IN CENTRAL IOWA

FLEETA BROWNELL WOODROFFE, *Garden Editor*
The Des Moines Register And Tribune
Des Moines, Iowa

These notes are for northern gardeners eager to grow the newer evergreen and semi-evergreen hemerocallis varieties of which such tantalizing reports are coming from Florida and other southern points.

They are based on experience over the last 20 years with a good collection of hemerocallis in our admittedly difficult climate where temperatures both soar and dive alarmingly. Here part of our difficulties are due to the uncertainty as to whether we'll have rains in the fall—early or late. Plentiful late rains after a long dry spell in late summer too often cause even supposedly deciduous varieties to start into growth only to be caught by a sudden severe freeze. Some years, even *H. fulva Europa* has behaved with us like a semi-evergreen variety.

But, by now we've developed a system which brings such touchy but indispensable early mid-season kinds as *Queen of May,* the so-called *Queen Mary, H. aurantiaca major* and *Sir Michael Foster* through without loss of a single fan.

The fall care goes like this: (1) We cover early—after frost but before hard freezes are expected, with bur oak leaves or slough hay, using enough to fill in among the hemerocallis foliage and take it about out of sight.

(2) Then over this go 3 or 4 open sheets of newspaper.

(3) A basket or square of burlap is laid on top to keep the paper in place and for the good-looks of the garden.

In the spring about the time they start into growth we cut straight across each fan of hemerocallis leaves one to two inches above the soil. This cutting is most important because these stubs of leaves separate as the cut ends dry, and the tops, injured by winter temperatures ranging down to 20 and more degrees below zero, do not stick together.

Before we started shearing them early, they did stick badly. And in spite of repeated strippings of the watery frozen foliage, the tops of the still-green stumps of leaves pasted down on themselves as they dried. Often the new foliage and flower stems, too, were badly distorted as they pushed up against these tightly sealed caps, and were quite spoiled in looks for the entire season.

Other summer varieties not completely deciduous with us here, such as *E. A. Bowles, Iris Perry, Glorianna, Star of Gold* and *Golden West,* to mention some of the better known varieties, thrive under the same care—early covering that keeps the tops dry over winter, and clipping short in the spring.

The past two seasons in particular have given this plan of protection a thorough tryout. When we uncovered in the spring of 1940 after an "easy" winter most of these plants showed a good 8 inches of strong green growth. That fall with no frost earlier to slow up growth, they were badly hit, before they were covered, by the Armistice Day storm when the temperature tobogganed to zero with no snow. We did, though, cover as usual after the storm.

And all of these plants with their terribly frozen and watery tops were sheared off close to the soil in the spring of 1941, and they came on without distortion of their foliage to give us very satisfactory bloom.

Newspapers serve admirably for this sort of winter covering at no cost, and do not tear, when protected by basket or burlap, any easier than tough and expensive wrapping paper. From now on, we'll probably be using more of them because we can send them off to the waste-paper baler for use in the Victory Campaign just as well in the spring after they've done their bit in the garden.

DAYLILY WINTER FOLIAGE CHARACTER IN NORTHERN FLORIDA

JOHN V. WATKINS,
Assistant Professor, Horticulture, University of Florida

In HERBERTIA, volume 7, an article by this writer presented a rather extensive list which designated those clones which are evergreen, those which are deciduous in northern Florida. It is generally agreed that the evergreen character is of great value in the Peninsular State where winter gardening is the rule. Most of us who are interested in breeding *Hemerocallis* for the Lower South have this evergreen character continually in mind. When two clones are nearly comparable for garden purposes, the one which produces new leaves without interruption is to be preferred over the one which loses its leaves in the autumn and does not get new ones for a period of perhaps, five months.

In late January 1942 the plants were carefully scored for foliage effect and the results are recorded on the next page. The winter of 1941-42 was quite typical for Gainesville as temperatures in the middle twenties were recorded several times.

Of the 27 clones listed in the accompanying table, it is seen that 14 are designated as "F". These Daylilies are fully evergreen and have excellent mounds of bright green foliage which are of great merit in our winter gardens. The 13 varieties classed as 'S" are completely deciduous, and produce no garden effect during the winter months.

The following list includes clones that have been under observation since the publication of the original article.

Table 1

Further observations on foliage behavior of daylilies in Gainesville, Florida

S Afterglow*	F Marcelle	F Star of Gold
S Amulet*	F Marconi	S Sunkist*
F Baronet	S Marcus*	F Swan
F B. H. Farr	S Moonstone*	F Sybil
S Bicolor*	F Osceola 2	F Taruga
S Charmaine*	S Persian Princess*	S Theron
S Dominion*	S Port*	F William Pelham
S Highland Chieftan*	F Red Bird	F Wolof
F Majestic	F Senator Andrews	S Zara*

Symbols used in the table "F"—full garden value throughout the winter in peninsular Florida; "S"—very short buds that stand perhaps "1" above the earth; no garden value; and (*)—completely deciduous, no garden value during the winter.

7. HARVESTING, STORAGE AND FORCING

HARVESTING, STORAGE AND FORCIN OF ALSTROEMERIDS

HARRY L. STINSON, *Wa*

The actual harvesting or digging of t 'tubers'' will be greatly facilitated if special attention is given to t preparation of the beds some months before the ''tubers'' or seeds are to be that later the actual work of digging will will be easy for the digger. Due to the fa far into the ground and are quite brittle w turgid, it is almost im-

Fig. 87. Digging Alstroemeria chilensis pl are allowed to grow one season and are then top and bottom shown by broken line, is to get under them. Photo by Harry L. Sti

possible to extract them from the ground w the soil is positively free from grass sods, foreign obstructions. The beds should be they will receive ample moisture and yet be we rains, in full sun or if in the warmer part receive enough shade to prevent them beco ence has shown that the alstroemerias pref a so and moist. The soil should be well worked a depth of eighteen (18) to twenty-four (24) inches and made excee friable and mellow by

the addition of peat moss, leaf mold, or well decomposed barnyard fertilizer. Let me emphasize again that the soil must be so friable that it will not pack firmly about the "tubers" but will crumble away easily with the least effort and allow the "tubers" to be withdrawn without damage (Fig. 87).

For my part I much prefer to plant the smallest sized seedling "tubers" sometime late in September or early October. The reason for the "smaller" tubers is that they seem to start growth quicker and make a more convenient sized "tuber" to market. The larger size "tubers" require more care and time to dig and the difference in market value does not seem to justify the extra labor involved, and the flowers are not greatly superior. The smaller sized "tubers" will make a cluster of three to four "tubers," each about three to five inches in length, a size very satisfactory to dig, handle, and market, and give equally good results to the purchaser.

The digging of the "tubers" should not be delayed long after the blooming period is over and the sterile tops have matured and died down, or at least have lost their green color. Immediately after blooming the plants seem to be dormant for about a month to six weeks before they again start making root growth. "Tubers" intended for the market should be dug at that time, which I do by making a trench at the end of the bed and then inserting the shovel under them, removing the supporting soil so that they topple over gently and expose the "tubers." These are then carefully removed and laid in flats and allowed to dry for a few days in a cool, dry, and well-ventilated place. After a few days they may be packed in alternate layers of dry peat moss and stored in a well-ventilated place until needed. "Tubers" treated in this manner have been stored until December without apparent injury and have been planted and grew as well as those planted earlier except that they were somewhat later in blooming.

Several attempts have been made to induce earlier flowering in the hardy species, *A. aurantiaca* and *A. chilensis,* but so far these attempts have not been as successful as desired. Mature "tubers" have been planted in six inch pots and placed in an open coldframe where they were subjected to outdoor conditions until December when the frame was covered with glass and gentle heat given to encourage a good healthy growth. The results were most gratifying but there has been no evidence of flowering stems. The treated plants however bloomed about two weeks earlier than those left out in the field. Possibly a lengthened day might give the desired results, but this factor has not been checked. "Tubers" of *A. Ligtu.* variety *angustifolia,* (from Constable's Gardens, Tunbridge Wells, England), were established in five gallon cans and placed in a coldframe which was covered with glass about the first of October and kept above the freezing point all during the winter. This treatment induced them to bloom about a month earlier than *A. chilensis* under similar treatment. Whether *A. Ligtu.* var. *angustifolia,* (I am not too sure of this name being correct), is more easily forced than other species not included in the experiment, I do not know at this time.

While the hardier species do not respond readily to forcing, the semi-hardy species *A. pulchra* will bloom from four to five weeks earlier if given a warmer situation than the controls in an unheated coldframe. Likewise the tender species *A. pelegrina* and its variety *alba,* in a warmer situation, will bloom from a month to six weeks ahead of those held in a coldframe just above the freezing point.

The latter alstroemerias and the bomareas coming from the warmer parts of the Andes and Brazil must be kept in a warm greenhouse free from frost. The bomareas tend to be evergreen and being inhabitants of the wooded areas do not seem to mind our sunless days as much as the outdoor alstroemerias and possibly for this reason bloom more or less intermittently throughout the year regardless of the season.

8. SOCIETY'S PROGRESS *

SECRETARY'S MAILBAG

This year we have bloomed for the first time a new strain of hybrid *Hemerocallis,* the bicolors of Clint McDade, a confirmed plant enthusiast and capable hybridizer of Chattanooga, Tenn. Mr. McDade informs us he derives these bicolor types from the offspring of a single fulvous type seedling. His named varieties include *Gayety, Charity, Charm, Cheerfulness, Vanity* and *Sunbeam,* in his "Bright Morning Series," lovely plants with delightful names; then he has *Queen Bess, Martie Everest, Jean, Dorris Doe, Vestal, Mermaid, Star of Tennessee* and *Swan Song.*

The secretary calls your special attention to the fine photographs of A. C. Buller's hybrid *Amaryllis,* which are included as illustrations in this Herbertia. They represent years of work by Mr. Buller, a sincere plant enthusiast and hybridizer. It goes to show, that given the opportunity, the fundamental material and the will to achieve, what can be done toward horticultural perfection and sheer beauty of flowers in a far corner of the world.

Dr. J. C. Th. Uphof, world famous botanist, has taken a position with the United States Department of Agriculture in the work of the Office of War Economics and the Bureau of Standards. He was formerly connected with Rollins College Winter Park, Florida, and has contributed important articles to Herbertia especially on *Amaryllis* nomenclature.

R. H. Gore of Ft. Lauderdale, formerly executive secretary of the Society, has been elected the first official Florida representative on the board of trustees of the American Orchid Society. Mr. Gore, a former governor of Porto Rico, once planned to have an "Amaryllis Room" in a hotel he owns at Ft. Lauderdale.

Prof. Dr. A. Fernandes, of the Instituto Botanico of the University of Coimbra, Portugal, is not as well known in America for his cytological, and systematic researches into the *Narcissus* group as might be, and it is hoped that the award of the 1942 Herbert Medal to this distinguished European plant scientist will help to draw attention to his work, most of which has appeared in the French language.

Arthington Worsley, dean of the Amaryllid fraternity of England, sends us further notes on his difficulties with gardening on the Isle of Wight, owing to labor shortage, lack of materials, and his own infirmities of age. For a time he was invalided, but latest reports are more hopeful and state that he is able to be around and work a little among his plants again. Mr. Worsley is in his early 80's.

* The material in this section was prepared by Mr. Wyndham Hayward, the never tiring Secretary of the Society. We all owe him a very great debt of gratitude for all that he has accomplished for the advancement of the amaryllids.
—Hamilton P. Traub

From Australia, Fred M. Danks, another true plantsman and outstanding poppy breeder, writes concerning the success of his idea of increasing stocks of nerines by raising seedlings. He reports that just lately he "gathered a nice crop of *Nerine* seeds and am keen to see what colors show." A friend, he says, gained a really outstanding range of color types from the first batch. Mr. Danks is endeavoring to arrange for some Australian authorities to write on the Amaryllid history and activities of the far Southern continent, and adds "Everyone here is behind MacArthur."

Miss Charlotte M. Hoak, roadside beautification chairman of the California Garden Clubs, Inc., writes that her first introduction to the Amaryllis Family was some bulbs of *Vallota speciosa,* which her father grew to perfection. She states that *Vallota* seems variable in its growing adaptability around Southern California, doing well in parts of Los Angeles, Glendale and Hollywood, but not seeming to thrive in South Pasadena. We have noted the same variability in Florida with certain bulbs. We hope to be able to get Miss Hoak to write some of her Amaryllid gardening experiences for Herbertia in the future.

Sir Henry J. Lynch, of Rio de Janeiro writes:

All your yearbooks are exceedingly interesting and help me in making a more intelligent study of these plants. There are many varieties in my neighborhood, and I hope to make a comprehensive collection of our native bulbs here. After some difficulty I have succeeded in obtaining a number of the Blue Amaryllis, (A. procera), "Empress of Brazil, and I have them under special observation. The Blue Amaryllis thrives within a relatively short distance of my place, which is situated behind the Organ Mts., and when in bloom their color is visible even to the marked eye but they are always situated in difficult surroundings and it is not easy to find men willing to fetch them. The mature bulbs are heavy and cumbersome which adds to the danger of gathering them.

That must be about as near *Amaryllis* heaven as may be . . . in our opinion, to have a villa with a view of distant Blue Amaryllis in bloom across the valley. Lucky Sir Henry.

We sent a plant of the daylily *"Duchess of Windsor"* to the Duchess herself in the Bahamas last spring, and were pleased to have a note from the Duchess' secretary that the royal lady had "planted it herself."

Swapping bulbs with Mr. George H. Hamor of the Dominican Republic, a transplanted Yankee in the tropics, is a fruitful and pleasing affair, as Mr. Hamor has found colonies of two rare and interesting *Zephyranthes, Z. bifolia (syn. Habranthus cardinalis)* and *Z. plumieri.* This last is a new white species, not yet well known or thoroughly studied. However for best results, the swapping has to be done by air mail in these times of troublous shipping, and that costs 20c an ounce.

Mr. George Gilmer, daylily fan of Charlottesville, Va., states that he takes up and moves his older clumps of daylilies any time of year when he can get to it. Choice new ones, for which he wishes to assure

maximum growth, he moves in early spring or late fall. This seems to correspond with our own experience with daylilies in Florida as well.

The Dade County Gardeners Association, with headquarters in the Miami area, has prepared interesting papers for the horticultural enlightenment of garden lovers on various phases of tropical and subtropical plant life, but of special interest to AAS readers are two on *Amaryllis* and *Hemerocallis* in South Florida, which were from the pen of W. A. Geiger, Society member in Miami Beach.

We have heard of two new and interesting *Hemerocallis* test plantings this year, one sponsored by the Botany Department of the University of Chicago at Lake Geneva, Wis., where Professor Kraus has already accumulated more than 600 so-called named varieties of daylilies, and the other at Swarthmore, in charge of Philadelphia's eminent John C. Wister, landscape architect and plantsman extraordinary. Mr. Wister is an old friend of Dr. A. B. Stout, and recently received the Hoyt horticultural award at Swarthmore.

Dr. L. H. Bailey, dean of the American horticultural fraternity, has a few kind words to say about HERBERTIA, Vol. 8, 1941: "I went through it carefully with much interest and thought it a particularly good number. I trust you will continue to find satisfaction in this important work."

An interesting account of the American Amaryllis Society and its work and publications appeared in "The Stamen," for August, 1942, the official publication of the Men's Garden Club of Pittsburgh. Ray Birch is editor of this enterprising sheet for male garden lovers.

In the July 1942 issue of the *National Horticultural Magazine* appears an interesting article on E. K. Ball's experiences in collecting plants in Latin America, with Amaryllids coming in for important treatment. William Lanier Hunt touches on Alstroemerias, and *Zephyranthes* in an article, "Fine Bulbs for Fall Planting," in "*Home Gardening,*" for September 1942.

The following note from Major Albert Pam in England speaks for itself:

London, 28th August, 1942.

In the last issue of HERBERTIA *you asked any reader who had witnessed the Festival of Amancaes near Lima to send you a report about this. I have never seen this festival, but your note did remind me of an amusing experience which I had regarding this locality. Some 30 years ago I went to Lima for the opening of the newly constructed railway line from Lima to Ancon, as I was a director of the Company which had constructed this line. A special train was provided for me and we were going over this new railway for a celebration which had been arranged at Ancon when looking out of the window I saw some flowers alongside the railway line and immediately jumped up and pulled the communication cord to stop the train. This was the first time and the last that*

I have ever stopped a train in this way, but as it was my own train it did not matter so much. I jumped out on the line, followed by the officials of the railway who could not make out what I was doing. I pointed out to them the beautiful flowers of Ismene Amancaes and told them to bring some shovels to dig up as many bulbs as possible. This worried them a great deal, as they said that we should be late for the celebrations at Ancon if we wasted any time on the way, and so they promised that they would mark the spot and stop the train on the way back to enable me to dig up the bulbs. Later that day on our return to Lima the train was stopped at the spot where thousands of these Ismene were growing within a few yards of the railway, and with the help of the engine driver's shovels I was soon able to collect a good number of these bulbs, some of which are still growing in my glass houses and flower regularly every year.

"The Georgia Magazine," a Sunday supplement of the Macon, (Ga.) *Telegraph and News*, contained an interesting illustrated article on the gardens of Mr. and Mrs. William Wood in that city. Mr. Wood is a Hemerocallis fancier and also is famous for his plantings of iris. He is an inveterate hybridizer and is specializing in daylily crosses and breeding. His collection of named daylily varieties includes more than 150 varieties.

SECRETARY'S MESSAGE

The 1942 HERBERTIA comes off the presses under the stress of War, under all the disadvantages that this can mean to the peaceful pursuit of horticulture, and your Society takes pride in what is now offered to you in spite of these many and varied difficulties.

Your officers have assumed many new duties in their personal lives and public activities, connected with war work, and consequently the time and attention given to the affairs of the American Amaryllis Society have come hard and in less regular sequence. However, the love of bulbs and bulb gardening (including with this also *Hemerocallis* and *Alstroemeria)* has carried the organization through to new successes.

Never has mankind felt the necessity more, than now, to turn, where this may be possible for the individual, to the "lift," the recreation, of a bit of garden work or plant discussion, or the reading of some interesting article on favorite plants and bulbs. If the reading of this yearbook gives the members and friends of the Society even a part of the refreshing stimulation and helpful build-up of "morale" that it has given the officers and contributors who have shared in its production, it will have served some worthwhile purpose in the busy world of total war.

The Society is also proud that it was able to continue its uninterrupted series of National Amaryllis shows with the holding of its 9th annual exhibition at Orlando, Florida, in the Spring of 1942. The show was viewed by thousands attending a "pioneer celebration" of Central Florida, of which the Amaryllis show was a featured event. The best cooperation of community and growers, including garden clubs, chamber of commerce and city officials, was provided in arranging the show.

Your Editor, Dr. Hamilton P. Traub, has been moved to California, in the passing year, to help with the Emergency Guayule Rubber Project at Salinas Calif., far removed—some 2500 miles—from the printer and society headquarters, but has met this new problem with undiminished energy and resourcefulness. In his new location he has already purchased a home and is starting a new collection of Amaryllids and their near relations.

From our numerous California members we hear he has been spreading the good word of Amaryllid enthusiasm up and down the Pacific Coast, in what little time he has to spare from his scientific research for the United States Department of Agriculture. This new location should afford him interesting opportunities for the comparison of Amaryllid cultures in the two great centers of outdoor sub-tropical gardening, following his several years of residence in Florida where he developed an extensive collection of many genera and began his important work of hybridizing experiments with *Amaryllis*, *Hemerocallis*, etc.

From England Major Albert Pam sends us his usual interesting and informative reports on the much-reduced activity in Amaryllid growing there. The vital spark of enthusiasm still burns bright in the British Isles, and while we all put aside many things we would like to do with our bulbs and plants in these times of trial, may an early peace bring on a new and greater revival of interest in Amaryllid culture than ever before.

October 23, 1942 WYNDHAM HAYWARD,
Lakemont Gardens, *Secretary.*
Winter Park, Florida

REPORT OF TRIAL COLLECTIONS COMMITTEE

The Trial Collections Committee reports only a few additions to the Society's stock of interesting new and rare Amaryllids for 1942. This situation is one of the results of the War and little outlook for improvement is seen for the duration. Members are still urged to remember the Society with interesting and unusual seeds and bulbs of any plants in its field not commonly grown in the United States when they have them to spare, or come upon them in their travels.

A-307—*Zephyranthes Pulmieri* (?) bulbs from George H. Hamor, Dominican Republic.

A-308—Bulbs of *Zephyranthes bifolia*, color variations, from same contributor.

A-309—Bulbs of *Zephyranthes insularum*, from several gardens on East and West coasts of Florida (cultivated bulbs).

A-310—Seeds of choice *Clivia* hybrids, from Major Albert Pam, England.

A-311—Seeds of *Cyrtanthus Tuckii* var. *transvaalemsis;* collected by J. P. Botha, in open grass country, Athole Pasture Research Station, Ermelo, Transvaal, South Africa; and sent to the Society by Dr. R. A. Dyer, Principal Botanist, Division of Plant Industry, Dept. of Agric., Pretoria; 12-26-41.

—W. HAYWARD,
Chairman.

NOTICE OF 1943 NOMINATIONS

To the members of the American Amaryllis Society:

As approved by Article 5, Section 1, of the By-Laws of the American Amaryllis Society, which specifies that the secretary shall send to all voting members not less than 90 days before the date of the annual election, a list of the offices to be filled and the names of those whose terms expire, this information is hereby incorporated in the data below, and same will take the place of a mailed notice to the members to this effect for the 1943 election:—

President	Mr. E. G. Duckworth
Vice-Presidents	Mr. T. H. Everett
	Mr. E. A. McIlhenny
	Mr. Fred H. Howard
Secretary	Mr. Wyndham Hayward
Treasurer	Mr. R. W. Wheeler
Director-at-large for 3 years	Mr. W. M. James

Article 7, Section 1 of the Constitution, provides that any voting member may submit to the Secretary, not less than sixty days before the annual meeting, nominations for officers and directors. These shall be submitted to a nominating committee, who shall select the candidates for the final ballot.

The Annual Meeting of the Society in 1943 will be held on the second Wednesday in April, as provided by Article 10, Section 1, of the Constitution, this being April 14, 1943. Therefore the names of nominees must be submitted by the voting members to the Secretary before February 17, 1943.

WYNDHAM HAYWARD,
Secretary.

October 1, 1942.
Winter Park, Florida.

The Secretary would like to take this opportunity of calling to the attention of members again the desirability of adding new members and enlarging the field of the Society by bringing it to the attention of horticulturists and garden lovers everywhere. The 1942 Year Book, we hope, will be considered a notable example of the Society's constant efforts to bring together the latest research, the newest accurate and useful information and interesting illustrations concerning the important Amaryllis family. The income of your Society is used solely for the publishing of its Year Book, the holding of Amaryllis exhibitions, and generally supporting the other worthy aims of the organization.

OFFICERS AND DIRECTORS of the AMERICAN AMARYLLIS SOCIETY

1942-43

PRESIDENT—Mr. E. G. Duckworth, *Orlando, Florida*
VICE PRESIDENTS—Mr. T. H. Everett, *New York, N. Y.*
Mr. E. A. McIlhenny, *Avery Island, La.*
Mr. Fred H. Howard, *Montebello, Calif.*
SECRETARY—Mr. Wyndham Hayward, *Winter Park, Florida*
TREASURER—Mr. R. W. Wheeler, *Orlando, Florida*
DIRECTORS-AT-LARGE—Term expiring in 1943,
Mr. W. M. James, *Santa Barbara, Calif.*
Term expiring in 1944, Mr. Jan de Graaff, *Sandy, Ore.*
Term expiring in 1945, Dr. H. P. Traub, *Salinas, Calif.*

EDITOR, HERBERTIA

Dr. Hamilton P. Traub

FELLOWS OF THE SOCIETY

Mr. A. Worsley
Miss Ida Luyten
Prof. Ferdinand Pax
Dr. J. Hutchinson
Mr. Ernst H. Krelage

WILLIAM HERBERT MEDALISTS

Mr. A. Worsley, *Eng.*
Mr. Ernst H. Krelage, *Holland*
Mr. Cecil Houdyshel, *Calif.*
Maj. Albert Pam, *Eng.*
Mr. Pierre S. du Pont, *Del.*
Mr. Jan de Graaff, *Oregon*
Mr. Fred Howard, *Calif.*
Mr. Percy Lancaster, *India*
Dr. J. Hutchinson, *Eng.*
Mr. Carl Purdy, *Calif.*
Dr. A. B. Stout, *N. Y.*
Mr. H. W. Pugsley, *Eng.*
Mr. W. M. James, *Calif.*
Prof. Dr. A. Fernandes, *Portugal*

CORRESPONDING MEMBERS

Antilles—Dr. H. C. Gray, *Atkins Institution, Cienfuegos, Cuba*
Argentina—Sr. Jose F. Molfino, *Buenos Aires*
Australia—Mr. Fred M. Danks, *Canterbury, Victoria*
Brazil—Sr. Joao Dierberger, *Sao Paulo*
Canada—Mr. John S. Lotan, *Hull, Quebec*
Central America—Mr. Alan Kelso, *Punto Arenas, Costa Rica*
England—Major Albert Pam, *Broxbourne, Herts.*
Holland—Mr. Ernst H. Krelage, *Haarlem*
India—Mr. Syney Percy-Lancaster, *Alipur, Calcutta*
Kenya Colony, East Africa—The Lady Muriel Jex-Blake, *Nairobi*
Union of South Africa—Mr. R. A. Dyer, *Pretoria*
Venezuela—Dr. H. Pittier, *Caracas.*

STANDING COMMITTEES

MEMBERSHIP ..... *Chairman*
Southwest: Mr. Gordon Ainsley, *Calif.*
South Midland: Mr. J. L. Gebert, *La.*
Southeast: Mrs. John H. Churchwell, *Fla.*
Northwest: Mr. H. L. Stinson, *Wash.*
North Midland: Mr. Robert Schreiner, *Minn.*
Northeast: Mr. Robert Wyman, *N. Y.*
Hawaii: J. Montague Cook, Jr., *Honolulu*
Canada: Mr. John S. Lotan, *Quebec*

FINANCE AND AUDITING—Mr. E. G. Duckworth, *Chairman*
Mr. Wyndham Hayward
Dr. Hamilton P. Traub

PUBLICATIONS—Dr. Hamilton P. Traub, *Chairman*
Mr. T. A. Weston
Mr. R. W. Wheeler

EXHIBITIONS AND AWARDS ..... *Chairman*
Southwest: Mr. Fred H. Howard, *Calif.*
South Midland: Mr. E. A. McIlhenny, *La.*
Southeast: Mr. R. W. Wheeler, *Fla.*
Northwest: Mr. W. L. Fulmer, *Wash.*
North Midland: Mr. C. W. Davison, *Wisc.*
Northeast: Mr. Arno Nehrling, *Mass.*
Hawaii: J. Montague Cook, Jr., *Honolulu*
Canada: Mr. J. B. Pettit, *Ontario*

TRIAL COLLECTIONS—Mr. Wyndham Hayward, *Florida, Chairman*
Southwest: Mr. W. M. James, *Calif.*
South Midland: Dr. W. S. Flory, *Tex.*
Southeast: Mr. A. T. Coith, *Fla.*
Northwest: Mr. H. L. Stinson, *Wash.*
North Midland: Mr. D. A. Humphrey, *Minn.*
Northeast: Mr. Pierre S. du Pont, *Del.*
Hawaii: Dr. J. H. Beaumont, *Honolulu*
Canada: Mr. A. E. Challis, *Ontario*

RESEARCH—Dr. L. H. MacDaniels, *Chairman*
Mr. W. M. James;
Dr. Hamilton P. Traub;
Mr. Jan de Graaff;

SPECIAL COMMITTEES

NOMENCLATURE AND DESCRIPTION—Dr. Hamilton P. Traub, *Chairman*
Mr. W. M. James
Mr. T. A. Weston

HEMEROCALLIS (DAYLILY)—Mr. Elmer A. Claar, *Chairman, Wilmette, Ill.*
Mr. Robert Schreiner, *Minnesota*
Mr. J. Marion Shull, *Maryland*
Dr. Hamilton P. Traub, *California*
Prof. H. B. Dorner, *Illinois*
Dr. J. S. Cooley, *Maryland*
Dr. V. T. Stoutemyer, *Maryland*
Mr. David F. Hall, *Illinois*
Mr. Wyndham Hayward, *Florida*
Mr. Donald B. Milliken, *California*

[Additional members to be appointed later; members of the Hemerocallis Jury are ex-officio members.]

HEMEROCALLIS JURY FOR EVALUATING DAYLILIES—Dr. L. H. MacDaniels, *Chairman, Cornell University, Ithaca, N. Y.*

Those in charge of Official Cooperating Trial Gardens are ex-officio members of the Daylily Jury.

[Reports from official trial gardens, indicated below, should be made directly to Dr. MacDaniels, Chairman, by July 1 in order to be included in annual summary for Herbertia.]

OFFICIAL COOPERATIVE DAYLILY TRIAL GARDENS

Prof. John V. Watkins, in charge of Daylily Trial Garden, College of Agriculture, University of Florida, Gainesville, Fla.

Dr. Paul L. Sandahl, Supt., in charge of Daylily Trial Garden, Dept. of Parks & Public Property, City of Des Moines, Iowa.

Prof. Ira S. Nelson, in charge of Daylily Trial Garden, Dept. of Horticulture, Southwestern Louisiana Institute, Lafayette, La.

Dr. Raymond C. Allen, in charge of Daylily Trial Garden, Dept. of Floriculture, Cornell University, Ithaca, N. Y.

Dr. Walter S. Flory, in charge of Daylily Trial Garden, Division of Horticulture, Texas Agric. Expt. Sta., College Station, Texas.

Mr. Chas. E. Hammersley, 714 Majestic Building, Milwaukee, Wisc., in charge of Daylily Trial Garden, Milwaukee City and County Parks.

Note.—Introducers of new daylily clones should send plants directly to the Trial Gardens for testing.

ALSTROEMERID—Mr. H. L. Stinson, *Chairman, Seattle, Wash.*
Mr. W. M. James, *California*
Mr. L. S. Hannibal, *California*
Mr. John F. Ruckman, *Pennsylvania*

CALLICOREAE—Mr. L. S. Hannibal, *Chairman, Concord, Calif.*
Mr. Arthington Worsley, *England*
Mr. W. M. James, *California*

ALLIDEAE—Bernard Harkness, Chairman, *Baraboo, Wisc.*

PUBLICATIONS OF THE AMERICAN AMARYLLIS SOCIETY

A complete file of HERBERTIA, the year book of the American Amaryllis Society, is indispensable to all who are interested in Amaryllids. A limited number of copies of the following are still available:—

Volume 1 (1934). Containing the biography of Henry Nehrling, and many valuable articles on amaryllids; with a portrait of Henry Nehrling and 16 other illustrations; a total of 101 pages.

Volume 2 (1935). Containing the autobiography of Theodore L. Mead, and many excellent articles on varieties, breeding, propagation, and culture of amaryllids; with portraits of Theodore L. Mead and David Griffith and 18 other illustrations; a total of 151 pages.

Volume 3 (1936). Containing the autobiography of Arthington Worsley, and important articles on description, genetics and breeding, physiology of reproduction, and amaryllid culture; with 3 portraits of Arthington Worsley, one color plate and 30 other illustrations; a total of 151 pages.

Volume 4 (1937). Containing the biography of William Herbert; the reprint of Herbert's essay, on Crosses and Hybrid Intermixtures in Vegetables; Dr. Darlington's essay, The Early Hybridizers and the Origins of Genetics, and many important articles on description; cytology, genetics and breeding; physiology of reproduction, and amaryllid culture; with two portraits, forty-four other plates and three figures; a total of 280 pages.

Volume 5 (1938). Containing the autobiography of Ernst H. Krelage; the history of amaryllid culture in Holland by Ernst H. Krelage, Dr. Uphoff's important article in which the name *Hippeastrum* is rejected; a revision of the tribes of the Amaryllidaceae; and the species of Amaryllis; outstanding articles on forcing amaryllids by Dr. Grainger and Prof. Dr. van Slogteren; and many other articles on description, cytology, genetics and breeding; physiology of reproduction, and amaryllid culture; with 33 plates and 2 figures; a total of 218 pages.

Volume 6 (1939). Dedicated to the Union of South Africa, and containing articles on South African amaryllids, including the history of botanical exploration for amaryllids in South Africa, the distribution of South African amaryllids in relation to rainfall, and a review of the Genus *Agapanthus* by Frances M. Leighton; a review of the Genus *Cyrtanthus*, with many excellent line drawings, by Dr. R. A. Dyer; other articles—*Zephyranthes* of the West Indies by Dr. Hume; the Tribe *Gilliesieae* by Dr. Hutchinson; rating of daylilies for garden value by Mr. Kelso; daffodil articles by Jan de Graaff, and many other items on description, cytology, breeding, propagation, and amaryllid culture; with 44 plates and 10 figures; a total of 258 pages.

Volume 7 (1940). Dedicated to Latin America, and featuring articles on Latin American amaryllids; biographies of Drs. Philippi and Holmberg; report by Dr. Goodspeed on the amaryllids collected by the Univ. of Calif., Second Andean Expedition; reports on the flowering of the "Blue Amaryllis," *A. procera;* and many other important articles on the description, propagation, breeding, culture, harvesting and storage of amaryllids. Of special interest are the important articles on the

description, breeding and culture of daylilies by noted authorities. With 45 illustrations—30 plates and 15 figures—and a total of 242 pages.

Volume 8 (1941). Daylily Edition. The first extensive symposium on the daylily, containing biographies of George Yeld, Amos Perry, Hans Sass, and Paul Cook, and important articles on daylily evaluation, breeding, propagation and culture. Also important articles on *Narcissus* and other amaryllids. Thirty-eight illustrations—27 plates and 11 figures—and a total of 185 pages.

Volume 9 (1942). Alstroemerid Edition. Dedicated to Harry L. Stinson, the outstanding authority on this plant group, who contributes a summary of his work on Alstromerid taxonomy, breeding, propagation and culture. This volume contains the autobiography of Prof. Dr. Abilio Fernandes, the Check-List of Amaryllids by Major Pam, and a review of the species of *Crinum* by Dr. Uphof, and also many important articles on daylilies, *Narcissus*, *Cyrtanthus*, hybrid *Amaryllis*, *Ixiolirion* and other amaryllids. Thirty-two illustrations—18 plates and 14 figures—and a total of 243 pages.

The prices of the above described volumes are based on the available supply:

Volume 1, 1934, very scarce, $3.75 each, postpaid.
Volume 2, 1935, very scarce, $3.75 each, postpaid.
Volume 3, 1936, $3.75 each, postpaid.
Volume 4, 1937, (double number), $4.25 each, postpaid.
Volume 5, 1938, $3.25 each postpaid.
Volume 6, 1939, $3.25 each, postpaid.
Volume 7, 1940, $3.25 each, postpaid.
Volume 8, 1941, $3.25 each, postpaid.
Volume 9, 1942, $3.25 each, postpaid.

Herbertia in sets postpaid to members:

Vols. 1, 2 & 3	—$10.00
Vols. 1, 2, 3 & 4	—$13.00
Vols. 1, 2, 3, 4 & 5	—$16.00
Vols. 1, 2, 3, 4, 5 & 6	—$18.50
Vols. 1, 2, 3, 4, 5, 6 & 7	—$21.00
Vols, 1, 2, 3, 4, 5, 6, 7 & 8	—$23.50
Vols. 1, 2, 3, 4, 5, 6, 7, 8 & 9	—$26.00

Make checks payable to the American Amaryllis Society, and send orders to the Secretary,

Mr. Wyndham Hayward,
Winter Park, Florida.

DATA CARD FOR HEMEROCALLIS

When describing daylily clones, all breeders and growers are requested to use the Official Data Card for Hemerocallis, devised by the eminent artist and horticulturist, J. Marion Shull, and fully described in HERBERTIA, Vol. 7, 1940. These cards should not only be used in describing new clones but also for the description of all older clones grown in the various climatic regions.

These cards are available at present in the 3 inch by 5 inch size at the nominal price of $1.00 per hundred, to pay for printing, handling and postage. Send orders to—

Wyndham Hayward, Secretary,
Winter Park, Florida

THE BUYERS' GUIDE

Make a Garden for Relaxation

Arcadia, California,
August 11, 1942

Dear George:

In these days of struggle and turmoil it is inevitable that some of us should receive more than our share of grief and privation. Believe me, George, when I say that my sympathies are with you. I would do anything to help you regain the physical strength and moral courage that was yours before Pearl Harbor. Forgive me if I appear to presume to advise my elder, but I have been thinking a lot lately and observing a few things which I want to pass on to you for what they might be worth.

George, it is doing you no good confining yourself to your room and brooding, reading, playing solitaire, reading and brooding. What is more important, it is not doing the rest of us any good. This is no time for inactivity. Each one of us has a duty to perform towards mankind and that duty cannot be performed unless we are mentally and physically fit. Unfortunately, I am neither a physician who can heal your body nor a clergyman who can uplift you spiritually. I am only a plain dirt (and often dirty) gardener, but I see the light in my own humble way.

Take down the Good Book, George, and open it at the very beginning of the second chapter, and here is what you will find,—"And the Lord God PLANTED A GARDEN eastward in Eden; and there He put the man whom He had formed." It seems to me that the Lord knew what he was doing when he put man into a garden instead of a house or cave or some such place.

I know a woman in Los Angeles who, like yourself, lost her son at Pearl Harbor. She became a total wreck and nearly lost her mind. One day, in sheer desperation, she went out into the garden. That was the turning point. She discovered the supreme joy of growing flowers. She became interested in collecting and breeding just one kind of flower, but that was enough to give her a renewed interest in life. Today she is well and active, and revenging Pearl Harbor by helping in the war effort; something she could not have done had she kept to her room. It is not hard to understand the change that was brought about in her attitude either. You have been a father. You know the joy of bringing up a child in good health, watching it develop day by day, court and get married. I am sure you never forgot the happiness that you felt that day when they came to visit you and brought with them their own child. You remember, don't you? Well, George, you feel a similar happiness every time that a plant that you yourself have grown bursts out into bloom.

You need not take my word for it. Just look about you and you will find that the most contented people are those who work with the soil. That is because they are healthy in body and mind. You will find that a great majority of clergymen are interested in gardening. The physicians go for it in a big way, and they ought to know what is good for them. Here in Los Angeles there is a very large and active garden club that is composed of physicians exclusively.

So as a friend who is truly interested in your well-being I am taking the liberty to suggest that you get out into your back yard and plant flowers. I know you will say that you know next to nothing about them. But remember that once you get started you will learn. Send for all kinds of catalogs. The dealers are most happy to send them to you. You will find them instructive and interesting. You need not grow all the kinds of flowers under the sun. That is impossible. Just confine yourself to one family, say amaryllids, or even to one genus like Amaryllis, Crinum, or Narcissus. You will find that you will have plenty of fun collecting all of the wild forms and many of the named hybrid varieties. Try cross breeding these as they flower and raising seedlings from these crosses. Before you know it you will have an entirely different outlook on life. You will never forget Pearl Harbor, but more important, you will be in shape to do your part in defeating the "Axis."

As ever your friend,
J. N. Giridlian.

DuPUIS BULB GARDEN

6043 N. E. 2nd Avenue, Miami, Florida

PRICE LIST

HYBRID AMARYLLIS, Large bulbs, all blooming size, description of flowers are of my individual garden interpretation.

No. 1. Medium flower, delicate crimson. (Prolific).
No. 2. Medium robust flower, margin of petals deep crimson half to one inch border, white and crimson stripe to center.
No. 3. Medium to robust flower, almost white, a very few crimson stripes.
No. 4. Robust flower, white and crimson stripe almost uniform from near border of petals to center of flower.
No. 5. Robust flower, golden orange, occasional whitish mottled specks irregularly distributed.
No. 6. Very robust flower, solid crimson, slightly greenish white center.
No. 7. Medium flower, velvety red petals, white line in center of petals receding to center, (rare).
No. 8. Robust flower, velvety red (exquisite).
No. 9. Robust flower, petals solid red, sprinkled or freckled with white dots, submerged whitish stripes.
No. 10. Robust flower, velvety orchid red, slightly sprinkled white greenish center, (rare and lovely).
No. 11. Robust flower, dainty peach orchid with tendency of white receding to center of flower, (very rare).
No. 12. Medium to robust. Bright red with greenish to white center.

PRICES OF INDIVIDUALS No. 1 to 12

Single Bulbs, $1.25 each
Half dozen bulbs, $6.00. Dozen bulbs, $10.00
(Quantity limited)

MIXED COLORS — FIELD RUN

In filling mixed color orders, your order will contain several varieties and patterns of color, all blooming size bulbs, and flowers from these bulbs will be beautiful and lovely.

Blooming size bulbs
6″-8″ cirm.—per hundred $17.50
Large size bulbs
8″-9″ cirm.—per hundred 22.50
Jumbo size bulbs
10″-14″ cirm.—per hundred 27.50
(Fifty at the hundred rate, all quotations F.O.B. Miami, Florida)

TERMS: Remit with Order, by Post Office or Express Money Order, Draft or Registered Letter. (All orders accepted subject to prior sale).

ORDERS WILL BE BOOKED upon receipt of 25% of total amount of order, and shipped promptly upon receipt of full amount of order during the regular fall and winter shipping season, unless otherwise requested.

We grow all of our own bulbs and have a large stock to select from. Instructions for planting and metehod of culture will be supplied upon special request.

DuPUIS BULB GARDEN

6043 N. E. 2nd Avenue, Miami, Florida

J. G. DuPUIS, M.D., Owner

Cecil Houdyshel

La Verne, California

BULB GROWER — ORIGINATOR

Retail — Wholesale

We issue the following catalogs: **Spring Catalog,** on Jan, 15. **Fall Catalog** on Aug. 15. **Iris Price List** about May. **Wholesale Bulletin** and **Garden Club Bulletin** are available any time to those who identify themseves as entitled to them.

Our **Catalogs** are "Economy Style," few illustrations, condensed. Bulbs are listed according to botanical relationships, approximately grouped. Full culture information for all are included. It must be good because hundreds have told us about plants saved or helped. Many large libraries request it as reference.

Our collection is among the largest and numbers more than 1000 species and horticultural varieties tho only 500 to 600 are offered in catalogs. Amaryllids have been our hobby for 44 years. We love them and want more of them. We buy or exchange for rarities or surplus bulbs.

Foreign Collectors: Please send your lists of seeds and bulbs.

Specials: Haemanthus Katherinae, $7.50 each for strong healthy bulbs. H. puniceus, $3.50. H. multiflorus $4.00 to $6.00. Select Strains, Amaryllis hybrids, 75c or 3 for $2.00. Jumbo sizes, $1.50 and $2.50 each. Diener's Posthumous hybrids, $1.50 ea. Jumbo, $2.50

Please send your name for our Mailing List.