

HERBERTIA



1944

Shub.

HERBERTIA

VOLUME 10

10TH. ANNIVERSARY EDITION

EDITED BY
HAMILTON P. TRAUB

SALINAS, CALIFORNIA
THE AMERICAN AMARYLLIS SOCIETY
1943

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AMERICAN AMARYLLIS SOCIETY

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Address correspondence and send membership dues to:

Mr. L. S. Hannibal, Executive Secretary,
Concord, California.

This volume contains a total of forty-one illustrations, twelve plates and twenty-nine [text] figures.

ERRATA

HERBERTIA, VOL. 10, 1943

- Cover; due to an error by the engraver, some copies of Vol. 10 were sent out with "1944" on cover; on these "1944" should be changed to "1943."
- Page 49; species no. 17, for "Gray" read "Grey, Hardy Bulbs."
- Page 52; 15th. line from bottom, for "family" read "finally."
- Page 53; 7th. line from top, for "1853" read "1753."
- Page 54; 2nd. line from top, for "distichously or spirally" read "not biflabellately."
- Pages 83, 87, and 88; Fig. 94, and Plates 245 and 246, for "*gen. nov.*" read "*comb. nov.*"
- Page 96, Fig. 96, for "*ovallaris*" read "*obvallaris*."
- Page 101, 3rd. line from bottom, for "*Beckhouse*" read "*Backhouse*."
- Page 116, 16th. line from top, for "*Lyconis*" read "*Lycoris*."
17th. line from top, for "*Stenbergia*" read "*Sternbergia*."
- Page 118, 16th. line from top, for "*volubil*" read "*volubile*."
- Page 131, title at top. after "DICHOGAMY AND INTERSPECIFIC STERILITY" add "IN ALSTROEMERIA."
- Page 194, 9th. line from bottom, for "Cpl." read "Sgt."
- Page 195, 22nd line from bottom, for "Uphoff" read "Uphof."
- Page 196, 29th. line from top, for "thirty-eight" read "forty-one"; for "18" read "12"; and for "20" read "29".
30th. line from top, for "225" read "205."

INTRODUCTION

MAJOR ALBERT PAM, O. B. E., F. L. S.

Corresponding Member for Great Britain

At the last flower show of the Royal Horticultural Society for the 1943 season, an old friend, who is a member of the Council of that Society and one of our most experienced horticulturists, said to me: "HERBERTIA is by far the best specialised botanical periodical published anywhere!" Coming from a sedulous reader of all gardening and botanical literature, this is praise indeed and the compliment was entirely unsolicited, as we had been speaking of a copy of Mrs. Bury's HEXANDRIAN PLANTS which came from the library of the late Arthington Worsley and was being offered by a well known bookseller. I fully share this appreciation of the journal of the American Amaryllis Society, and have therefore written this short review of the past nine issues of HERBERTIA in celebration of its 10th birthday with the 1943 number. It has progressed from strength to strength, and this is due only to the energy, devotion and skill of its Editor, Dr. Hamilton P. Traub, who has been responsible for its publication during the whole period since 1934. He has assembled articles to suit all tastes, from the purely scientific contributions of noted botanists, to the experiences of amateur gardeners, who have told of their first efforts in the cultivation of some particular species of the Amaryllidaceae. All lovers of this family of plants have been catered for, and in this respect HERBERTIA is quite unique—in no other horticultural periodical is the content so widespread or so varied.

In looking through the first nine numbers one finds that some of the contributions to systematic botany are outstanding and almost revolutionary, none more so than the article in Volume 5 by Professor J. C. Th. Uphof on "The History of Nomenclature—*Amaryllis* (Linn.) Herb, and *Hippeastrum* (Herb.)", in which the generic name *Hippeastrum* was discarded in favour of *Amaryllis*, and the plant known till then as *Amaryllis belladonna* reverted to *Callicore rosea*, the name proposed in 1829 by Link. This was indeed a shattering change for those who liked the century old names and regretted their disappearance, but so eminent a botanist as Sir William Wright-Smith, Regius Professor of Botany at Edinburgh, after a full study of the position, decided that the change was inevitable under the recognised rules of nomenclature. This article by Professor Uphof led to a revision by Dr. Traub, in the same number of HERBERTIA, of the tribes of the Amaryllidaceae, which introduced a number of changes necessitated by the rejection of the name *Hippeastrum*, and by his own researches into the classification of the family, and this revision is now accepted pending the appearance of the new work AMARYLLIDACEAE by Dr. Traub, which is looked forward to by all his friends as soon as the present war is over. Other important botanical articles have been contributed by Dr. H. Harold Hume on *Zephyranthes*; by Dr. A. B. Stout on *Hemerocallis*. It would be impossible in this short review to mention other noteworthy contributions of botanical interest.

Culture and reproduction have been so adequately dealt with in the first nine numbers of HERBERTIA that growers of Amaryllids need hardly seek further advice and help. Unfortunately, owing to different climatic and soil conditions, there is no guarantee that, even by following exactly the procedure recommended, the same results will be obtained. Members of the A. A. S. should, however, continue to give others the benefit of their experience in the future as they have done in the past, and the culture of the beautiful and interesting species of the Amaryllidaceae will thus become better known and more popular in every part of the world. Special praise should be given to the quality of the illustrations of plants and flowers in the past nine numbers—it has been consistently excellent and the printers deserve great credit for the beautiful reproductions.

On behalf of British, and I feel sure of all other members of the A. A. S., I want to thank the officers of that Society and especially Dr. Hamilton P. Traub and Mr. Wyndham Hayward for the pleasure HERBERTIA has given us all in the past, and to wish them and the A. A. S. all good luck and prosperity in the future.

*November 9, 1943,
Wormley Bury,
Broxbourne, Herts.*

PREFACE

It is safe to say that the members will enjoy the delightful article in this issue of HERBERTIA by Miss Elizabeth Lawrence on amaryllids in a Southern garden. She is the author of that outstanding book, "A Southern Garden" (1942). All who read these refreshing chapters will note that she has added to the sum total of gardening knowledge from her ample gardening experience, and has also made effective use of new information that appeared during the past decade in such periodicals as HERBERTIA. In recognition of her important contributions to the advancement of horticulture, particularly the amaryllids, the Society has awarded the Herbert Medal for 1943 to Miss Lawrence, who also favors us with a brief autobiography in this issue that is dedicated to her.

It is with the deepest regret, and a feeling of personal loss, that we record the death of Mr. Arthington Worsley, and Mr. Gordon Ainsley. Both were charter members of our Society and helped to build it up. In Memoriam notices appear elsewhere in this issue.

Mr. J. Marion Shull has again favored us with a beautiful cover design that adorns this 10th. Anniversary Edition. He is a member of the talented Shull family, and we are honored to include in this issue a charming autobiography. Mr. Shull also contributes important articles on the daylily.

We wish to call your attention to the excellent photographic portraits of amaryllids contributed to this issue by Mr. W. M. James. Your attention is directed particularly to the illustration of *Bomarea Lehmannii*. He is to be congratulated on the realistic appearance of the fruits. Mr. James, who is now chairman of the Trial Collections Committee, also favors us with fine articles on amaryllids.

Word has been received that the Victoria Medal of Honour (V. M. H.) has been awarded to our good friend Major Albert Pam, O. B. E., F. L. S., by the Royal Horticultural Society for his outstanding work on the Amaryllidaceae. All of the members will join the writer in congratulating Major Pam on the receipt of this signal honor.

The V. M. H. was founded in 1897 "in remembrance of Queen Victoria's 60th. Jubilee 'to enable the Council to confer conspicuous honour on those British Horticulturists resident in the United Kingdom whom it might from time to time consider deserving of special honour at the hands of the Society.' The Medal was originally restricted to 60 recipients, but as the Queen lived for long enough to have reigned for 63 years, the number was increased to 63 which it still is."

The load of the Society's secretarial office has constantly increased until it was no longer possible for one man to take care of all the details as an avocation, and this made it necessary to secure the services of an Executive Secretary to carry part of the load. Mr. Hayward, who has served as Secretary since 1933 will carry on but his duties will be lightened. The Executive Secretary will have charge of the membership roster and will take over other details. Mr. Hayward, as Secretary, will concentrate on matters of policy and such details as symposiums. We owe Mr. Hayward a debt of gratitude for his long term of unselfish service, and his resolve to give us the benefit of his past experience in guiding the Society. He will also serve as Chairman of the Exhibitions and Awards committee.

The Society is fortunate that Mr. L. S. Hannibal has agreed to serve as Executive Secretary. By profession he is "a chemical engineer in a fixed nitrogen fertilizer plant where technical design problems in agricultural ammonia are his chief concern." By avocation he is a keen gardener and is particularly an amaryllid enthusiast.

The Society was organized in 1933, and later a committee was appointed to consider the project of incorporating the association. In 1943, the Society was finally incorporated under the Laws of the State of California. Consequently the headquarters have been transferred to California. This consummation will not affect the functioning of the Society in any way since the officers, including the Florida group, will carry on actively as in the past.

* Dr. L. H. MacDaniels, Head of the Department of Floriculture, Cornell University, who has served as Chairman of the Daylily Jury and

Research Committee for the past three years, is on leave of absence in order to serve our country. He will be on a foreign mission until 1945. In his absence, Dr. Kenneth Post, Associate Professor of Floriculture, at Cornell, and now Acting Head of the Department, will serve as Acting Chairman of the Daylily Jury and the Research Committee.

Major Pam writes that Professor E. J. Salisbury, C. B. E., F. R. S. "has recently taken up the position of Director of the Royal Botanic Gardens, Kew. He is an eminent botanist, and has written some extremely interesting books, including one called 'The Living Garden,' which you may know."

The 10th. Anniversary Edition contains a wealth of amaryllid information. Dr. Uphof contributes a review of *Agapanthus* and *Tulbaghia* and Mr. Giridlian writes on the culture of members of these genera. Dr. Flory brings the valuable review of chromosomes of amaryllids up-to-date. Messrs. Powell, Reinelt, Reynolds and Berry contribute an interesting symposium on *Narcissus*. Mr. Hannibal presents a treatise on *Brunsvigia rosea* and hybrids and other articles on amaryllids. Dr. Stoutemeyer favors us with a review of the propagation of amaryllids. Due to space limitations it is not possible to mention the many other articles, including contributions on daylilies, *Haemanthus*, and other amaryllids.

The 1944 issue of HERBERTIA will be dedicated to the Onion Tribe, ALLIEAE. As a worth while contribution to the war effort, articles on the cytology, breeding and culture of the onion will be included. The excellent cover design, by Mr. J. Marion Shull, has already been received. It features the onion, *Allium Cepa*. Although the ALLIEAE will be singled out for attention in this issue, it should be noted that the other amaryllids will not be neglected. The regular quota of contributions from members on the many other amaryllids are again solicited. Kindly send in your articles soon so that 1944 HERBERTIA can be published by December, 1944. Most of the articles should reach the editor by August 15, if the book is to reach you by the date indicated.

It will interest the members to know that during the past decade a total of 368 illustrations have appeared in HERBERTIA. This is an average of thirty-six per year. The total number of printed pages of text for the ten year period is over two thousand.

December 15, 1943,
115 Carmel Avenue,
Salinas, California.

—Hamilton P. Traub

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J. Marion Shull

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ERRATA

HERBERTIA, VOL. 9, 1942

- Page 23; 9th. line from bottom, for "of Bostryx" read "or bostryx."
- Page 30; 17th. line from top, for "*Georgio*" read "*Gorgio*."
- Page 53; 2nd. line of text from top, for "EUMARAYLLIDEAE" read "EUAMARYLLIDEAE."
- Page 67; 24th line from top, insert "the" before "*Crinum species*."
- Page 70; species no. 1, lines 11 and 17, under "Notes," the reference to "Bot. Mag. t. 2121" is apparently an error. Major Pam (8-31-43) states that he believes that "Bot. Mag. t. 2121" represents *C. yuccae-florum*. See also the same error under species no. 13 (page 71) and species no. 130 (page 84); and 3rd. text line from bottom, page 67.
- Page 71; species no. 5; for "*C. sumatrana*" read "*C. sumatranum*." species no. 7; for "Bury Hexand. 64" read "Bury Hexand. t. 4." species no. 13. See note by Major Pam about "Bot. Mag. t. 2121" above for species no. 1, page 70.
- Page 72; 5th. line from top, delete "This species is related to *C. ammo-charoides*."
- Page 74; species no. 49, add "var. *confertum* Herb. Bot. Mag. t. 2522, and var. *blandum* Roem., Bot. Mag. t. 2531."
- Page 75; species no. 54, add "Bot. Mag. t. 7862."
- Page 77; species no. 75, delete "Plate" before the date "1842."
- Page 78; species no. 84, add "Bot. Mag. t. 7417." species no. 86; for "Lodd. Bot. Cab. Plate 668" read "Lodd. Bot. Cab. t. 688." See also note by Major Pam about "Bot. Mag. t. 2121" above for species no. 1, page 70.
- Page 81; species no. 105, for "Bot. Mag. t. 623" read Bot. Reg. t. 623." species no. 106, for Bot. Reg. Plate 9" read "Bot. Reg. 1844, Plate 9." species no. 109, for "Bot. Mag. Plate 6110" read "Bot. Mag. Plate 6113." species no. 111, add "Red. 347; Bury 42 ?; Bot. Reg. 546 ?; Bot. Mag. 661."
- Page 82; species no. 119, for "*C. Lugardal*" read "*C. Lugardae*."
- Page 83; species no. 126, for "*C. toxicarum*" read "*C. toxicarium*."
- Page 84; species no. 130. See note by Major Pam about "Bot. Mag. t. 2121" above for species no. 1, page 70.
- Page 88; 24th. line from top, for "of any later work" read "or any later work."
- Page 93; for "Genus STERBERGIA" read "Genus STERNBERGIA."
- Page 99; for "*Calostemma purpurea*" where it appears read "*Calostemma purpureum*."
- Page 122; 20th. line; for "*Tahiti Belle* (1924)" read "*Tahiti Belle* (1942)."
- Page 201; Figure 85, legend should read "*Crinodonna Howardii*; right, entire plant; left, close up of flower scape."
- Page 235; 16th. line, beginning with 3rd. word, read "Thirty-five illustrations—17 plates and 18 figures—."

NOTE TO MEMBERS AND LIBRARIANS

TITLE PAGES FOR BINDING HERBERTIA. Volumes 1 to 5, inclusive, consist of 925 pages, and Volumes 6 to 10, inclusive, of 1020 pages. It appears convenient to bind each set of five volumes of HERBERTIA into a single book on the basis indicated. At the end of the present volume will be found the title pages to be used for this purpose. The front covers should be retained when the volumes are bound in order to preserve the cover designs.

BOOK BINDING SERVICE. Members should turn their ten volumes of HERBERTIA over to their local bookbinders for binding. The above note about title pages should be brought to the attention of the bookbinders who perform the service.

INDEX VOLUMES. A detailed index to the material of the first ten volumes of HERBERTIA will be prepared, published and sold as a separate volume as soon as practicable. This will require a great amount of work and publication may be delayed.

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.

*Dedicated to
Elizabeth Lawrence
in appreciation of
her outstanding contributions
to our knowledge
of the use of amaryllids
in our gardens.*



Herbert Medalist — Elizabeth Lawrence

ELIZABETH LAWRENCE

AN AUTOBIOGRAPHY¹

When I was a little girl my mother took great pains to interest me in learning to know the birds and wild flowers and in planting a garden. I thought that roots and bulbs and seeds were as wonderful as flowers, and the Latin names on seed packages as full of enchantment as the counting-out rhymes that children chant in the spring. I remember the first time I planted seeds. My mother asked me if I knew the Parable of the Sower. I said I did not, and she took me into the house and read it to me. Once the relation between poetry and the soil is established in the mind, all growing things are endowed with more than material beauty.

When I was twelve we came to live in Raleigh, in a house with an already established garden. It was fall when we came, and there was not much in bloom—only some old-fashioned roses and chrysanthemums that the frost had not caught. But the first spring was like living my favorite book, *The Secret Garden*. Every day the leaves and flower buds of some plant that we did not know was there, would break through the cold earth. There were snowdrops under the hedge, and crocuses in the grass, and the garden pattern was picked out in daffodils. And under the eaves of the summerhouse a single fat white hyacinth bloomed. No other spring has ever been so beautiful, except the spring of the year I came home from college. That first spring in the South after four years in New York led me to choose gardening as a profession.

In the fall a course in Landscape Architecture (the first in the South) was started at the North Carolina State College, and I started with it, the only girl in the class. One morning a visitor came into the drafting room and stopped at my drawing table in passing, and said, "I know another Miss Lawrence who is a landscape architect. She knows as much about plant material as any one in the profession." I felt as if the mantle of the other Miss Lawrence had been thrown across my shoulders. I had never heard of her before, and I have never heard of her since, but because of her I felt a compulsion to study plants. I soon learned, however, that a knowledge of plant material for the South could not be got in the library, most of the literature of horticulture being for a different climate, and that I would have to grow the plants in my garden, and learn about them for myself.

My ancestors were people who lived to be very old, and it encourages me to think that I may have inherited their longevity, and that I have many years ahead to see bloom in my garden flowers that I have never seen in bloom before, and have only just heard of.

¹ Born Marietta, Georgia, May 27, 1904; B. A., Barnard College, 1926; B. S., North Carolina State College, 1930.

AMARYLLIDS IN A SOUTHERN GARDEN

ELIZABETH LAWRENCE, *Raleigh, North Carolina*

It has been a little more than ten years since I began to collect amaryllids, and to grow them in the garden—not that I thought, ten years ago, of collecting amaryllids. I thought only of seeing in bloom flowers new and strange. My mother had discovered Gordon Ainsley, and she and I would go through his little leaflet, especially the section headed “Miscellaneous Bulbs, Tubers and Rare Plants,” and make a painful choice of the ones we most wanted to try. Before many seasons had passed it became apparent that, on the whole, the bulbs most likely to grow and bloom for us belonged to the amaryllis family. It was then that Billy Hunt told me about the Amaryllis Society, and I pored over HERBERTIA, and began to acquire as many members of the *Amaryllidaceae* as I could. Not having a greenhouse, I limited myself to those which would grow out of doors, and I tried to be systematic about keeping a record of them. In this 10th. Anniversary Edition of HERBERTIA it seems appropriate to review ten years of experiment in a North Carolina garden.

Since the provenance of many of the most beautiful amaryllids is tropical or subtropical, growing them out of doors this far north is largely experimental, and many that survive do not bloom when they are grown so near their northern limit of hardiness. Here, during an average winter the lowest temperature is eight or ten degrees above zero. The weather bureau in Raleigh has recorded zero once in this century. That was in 1917.

I sometimes read that amaryllids which have failed with me grow where the temperatures are much lower than these. Perhaps some factor other than temperature is involved, or perhaps the amaryllids were given more protection. Mine go unmulched, and I cannot bear to plant them very deep—I always feel that they will never find their way out of the dark earth into the spring sunlight. But it may be that with deep planting and a generous coat of manure, some of those that have died would have lived, and some of those that merely existed would have bloomed.

*Crinum*s and *Crinodonna*. The first record I have of an order from Mr. Ainsley (spring 1932) is for *Brunsvigia rosea* (syn. *Callicore rosea*; *Amaryllis belladonna* Ait. et Herb. non Linn.), *Chlidanthus fragrans*, *Lycoris squamigera*, *Sternbergia lutea*, and the *Crinum* species *Kirkii*, *Powellii* (both the white and the pink forms), *erubescens*, *Bulbispermum* (syn. *C. longifolium*), and *Moorei*. The brunsvigia and the chlidanthus failed to bloom, though they sent up leaves each spring for a number of years, and the lycoris and sternbergia did not bloom for several seasons. But the crinums were an immediate success, and I wanted to grow as many sorts as I could.

The species that have proved garden worthy in North Carolina are *Crinum americanum*, *C. erubescens*, *C. Kirkii*, *C. Kunthianum*, *C. bulbispermum* (syn. *C. longifolium*), and *C. Moorei*. *C. americanum* grew for five years before blooming, but it has now bloomed for two

seasons. The season is late August and early September when its narrow-petalled, pure white flowers are particularly striking in the ragged end-of-the-summer borders. In these parts I think this may not be everyone's crinum for it seems choice as to situation, growing well in heavy clay in a low bed that gets the morning sun, and not surviving when transplanted to a different place. But it increases rapidly when it is once established, and I can even imagine that it might increase too much. One could never have enough of the delightful flowers, but the foliage might take up more space than one wanted to give it. A large clump has not yet produced more than two blooms a season. I was interested to hear from Mrs. Henry that she had bloomed this crinum in Pennsylvania, but that it had died the following winter. I imagine from its behavior here that it is not hardy very far north of us.

The species that have not survived our winters are *C. amabile* and *C. zeylanicum* from the Royal Palm nurseries; and *C. giganteum*, the "Christopher Lily" marked "species near *giganteum*," *C. scabrum*, a species from Burma, and one labelled "species near *amabile*," from Mr. Hayward. The species from Burma was always sickly, and did not bloom, and lived only a few months. *C. scabrum* bloomed in June and again in September, the fall bloom being especially large and handsome and long lasting. The second spring it failed to put in an appearance. This is not such a loss, as there are many good crinums of the milk-and-wine type, but I was distressed when the rare and lovely "species near *amabile*" proved tender. Planted late in March with *C. scabrum*, it did not bloom until mid-September, when the dark reddish purple buds opened into flowers striped amaranth purple and pure white. These flowers were comparatively small, and there were seven to an umbel. The second day all were open and all were fresh. On the borderline of hardiness is a very small crinum sent to me by Mr. Hayward as *C. giganteum hybridum* which has survived but has not bloomed.

Only one of the hybrids that I have tried has failed to be hardy. This is the most beautiful of all, the *Empress of India*. The first time I had no better sense than to set out at once the magnificent bulb (sixteen inches in circumference) that Mr. Hayward sent me in the fall. The second time I asked his advice, and kept the bulb in sand in the cellar until the end of March. After sunset on the fourth of September, the first long narrow bud began to open. We sat watching as if it were a night-blooming cereus. I do not think Balboa could have been more breathless when he first looked upon the Pacific, than the Lawrences when they first saw the fully expanded flowers (twelve inches across) of the *Empress of India*, milk-white, wine-striped, and heavily scented. This crinum blooms only at night. The flowers wilt as soon as the sun touches them in the morning, and do not revive, as some crinums do, with the cool of the next evening. Both the bulb that flowered and the one planted in the fall died before spring. I do not think it worth while to try the *Empress of India* again.

I think I might have better luck another time with the rose-colored form of *C. Powellii*, which lived through one or more winters, and bloomed once. Probably it will not prove as robust and free-flowering as the pink-flowered *Cecil Houdyshel* or the dazzling white *Powellii*.

White Queen, *Ellen Bosanquet*, and *Virginia Lee* are satisfactory for the garden though I have not had these long enough for them to become thoroughly established. The dark purple buds of *Ellen Bosanquet* open in the afternoon into flowers of the brilliant deep rose that Ridgway calls spinel red. They are shaped like the flowers of *C. Moorei*, and have the same vanilla fragrance. The plant is very large. *Virginia Lee* is a small crinum with flowers like those of *C. Moorei*, but paler.

Some of the most delightful crinums are those found in gardens. The late summer and fall blooming Milk-and-Wine Lily of the dooryards of eastern North Carolina is one of the best of all crinums. From a garden in Atlanta I brought home a very delicate and lovely one, pure white with pink filaments and a delicious and characteristic fragrance—something of vanilla and something of lemon. There are six flowers to the slender short scape. They open at night, and last through the next day. This one multiplies very fast, and blooms at intervals from the end of May to the end of October. From my great-aunt Rosalie's garden on Saint Simon's Island I brought the crinum—common in South Georgia—with fringe-like bunches of small white flowers on tall thick scapes, but this one did not live.

Crinodonna Howardii (*Amarcrinum Howardii*) seems to be as satisfactory in the garden as the crinums, and has come through two winters during which the lowest temperature was ten degrees above zero. It blooms in August and September. The delicate pink flowers are much like those of its parent *Brunsvigia rosea* (syn. *Callicore rosea*).

The season for crinums is a very long one. From April to October there are few days when no crinum is in bloom in my garden. *C. bulbispermum* (syn. *C. longifolium*) often begins to bloom in April, and our Milk-and-Wine Lily sometimes sends up a scape or two in November. The *White Queen* follows *C. bulbispermum* and *C. Kirkii*. *C. Kunthianum* and the white *Powellii* bloom in June and July. The last three are the most profuse bloomers, with twenty or more blooms to a clump, but the scapes come all at once. However each has repeated, on occasion, in the late summer or fall. *Cecil Houdyshel* sends up two or three scapes each summer month, and the Milk-and-Wine Lily and *C. americanum* begin to bloom before its flowering is over.

Lycoris and Nerine. Except for the Hurricane Lily, the species of *Lycoris* that I have grown have lived and bloomed, and bloomed regularly and freely. The only difficulty is that so few species are available. I long for *L. sanguinea*, *L. Sprengeri* (which Colonel Grey says should be about as hardy as *L. squamigera*), and the white form of *L. radiata*. Colonel Grey describes *L. aurea* as perhaps the least hardy member of the genus. With me the bulbs are hardy, but the foliage is made in the fall and is injured by the cold. The bulbs live on indefinitely, but there is no bloom.

Lycoris radiata is a dooryard flower in the eastern part of North Carolina, and though it is not generally considered hardy in the mountains, I had a report last fall of bloom in Asheville. Long ago I sent bulbs to Mrs. Wilson in Anne Arundel County, Maryland, and she wrote me that they died. Years later she went out one day in September and found them in bloom.

Bulbs which I had from Mr. Hayward as *L. squamigera* var. *purpurea*, from Mr. Houdyshel as *L. incarnata*, and from Dreer (I think it was Dreer) years ago as *Lycoris squamigera* itself, bloom well most seasons, and give increase. The flowers, to me, are the most delicate and lovely of all the amaryllids. They do not resemble the description which Colonel Grey quotes from the *Gartenwalt* of 1906, of "purple and carmine segments to Prussian-Blue at the tips," but are white with a wine-colored keel. The leaves appear at the end of January, a week later than those of the typical *L. squamigera*. When they come up they are edged with bright red.

Though I have tried a number of species over a period of years, no *Nerine* has ever bloomed for me. Once I thought one was going to, when a bulb sent from California as *Nerine undulata* produced a scape. As the days passed the opening flowers looked suspiciously like *Lycoris radiata*, and when in bloom proved to be a form of it.

That the nerines do not bloom here saddens but does not surprise me. In the first volume of HERBERTIA, the Honorable Henry McLaren writes of growing them out of doors in England, "They want to grow in winter and rest in summer, and the climate forbids this." Our climate forbids it too, and I have found it forbidding to other amaryllids from South Africa, and to South African plants in general. In a well-drained position in full sun, *N. Bowdeni*, *N. coruscans*, and *N. rosea crispa* (the last two, varieties of *N. sarniensis* according to Colonel Grey) have persisted for a number of years without bloom. Mr. Hayward sent me a fine bulb of *N. curvifolia* var. *Fothergilli* which, after a late summer planting, produced leaves in November but has made no sign of life since. *N. filifolia* refuses to grow too, though I have tried it more than once, and in different soils and exposures.

Brunsvigia rosea. Another Cape bulb that wants to grow in the winter and rest in the summer, and so does not accomodate itself to North Carolina, is the delightful pink lily that we used to call *Amaryllis belladonna* (Ait. et Herb. non Linn.) more recently *Callicore rosea*, but is now known as *Brunsvigia rosea*. It has bloomed in the garden only once though it has been tried a number of times. The bloom appeared in August from a bulb that had been planted in November. I have also tried the varieties *major* and *minor* and *rosea* and *Parkeri*. All persist. None bloom.

Amaryllis. The Barbados Lily, which we now know to be *Amaryllis belladonna* Linn., but which I planted as *Hippeastrum equestre*, fares no better. I think the bulbs Mr. Hayward sent me have finally disappeared, though they survived several winters. *Amaryllis rutilum* var. *fulgidum* behaved in the same way. And *A. Johnsonii*, though it grew and flowered in old gardens in these parts, has always been a shy bloomer with me, if it bloomed at all.

One amaryllis which does flourish here is the little Ox-blood Lily, *A. advena*. It multiplies steadily and blooms profusely. The number of sharp-pointed buds that push up out of the ground from late August to late October is unbelievable. This lily seems to grow in any soil or situation, but it responds especially to barnyard manure.

Hymenocallis and Pancratium. There are reports of *Hymenocallis* hardy as far north as Pennsylvania, and they should certainly be grown in the Middle South. The difficulty is in the confusion of the names. Even when you find one that grows and blooms, you cannot be sure what it is.

Two species are native to North Carolina. I do not know how the small, spring-blooming *H. rotata* of the coastal plain behaves in cultivation. I saw the flower at a country flower show early in May. A farmer's wife brought it in, either from her garden or from the woods. The summer-blooming *H. occidentalis*, from the mountains, grows in a damp part of the garden, and blooms at the end of August.

H. galvestonensis, the Gulf Coast Spider-Lily, is reported as failing to flower in cultivation, and I was about to confirm this report when I went out in the garden to cut iris, and found the long bud of the Spider-Lily almost ready to open. It opened on the sixth day of May, which is the earliest bloom on my records for *hymenocallis*. The wide flat cup and the narrow petals of the flower are very similar to those of *H. occidentalis*. The bulb had come from Mr. Houdyshel three years ago, and had been planted in full sun in poor but well-drained soil.

Spider-Lilies like *crinums* should be sought in gardens. Recently I found two delightful late summer *hymenocallis* in cultivation. Both were similar in general appearance to our summer-flowering native, *H. occidentalis*, but there were differences in length of tube, segments and cup. Last September Mrs. McMillan brought the flowers and leaves of one of these from an old garden in the southern part of the state. The other came from Atlanta and bloomed with me in July.

My sister came across another summer-flowering *hymenocallis* in a garden in Alexandria, Louisiana. "Mrs. Peters has the most beautiful white flower that looks as if it belongs to that family you talk about so much," she wrote in August. When she came home this year in June she brought me two of the bulbs. One of them bloomed after dark on July the sixteenth, and it seemed to me as I looked at it in the moon light, more beautiful than any *hymenocallis* I had seen. The perfectly proportioned flowers seem larger than those of any other native species, though they are not very much so by measurement. The delicately fluted cup is an inch and a quarter deep, the drooping segments, incurved and revolute at the tips, are three and a half inches long, and the greenish tube is three inches long. There are five pleasantly but not heavily scented flowers to an umbel. They are of good substance and withstand the heat of the day better than most. One leaf came up with the stout glaucous scape.

When I wrote Mrs. Dormon, who lives in Shreveport, about Mrs. Peters' Spider-Lily, she said that she thought it must be the same as an unidentified native species she had in her garden, and which she designates as "fall-blooming" to distinguish it from another native that blooms in the spring. I put two of the bulbs that she sent me in the ground at once, and wintered a third in a pot. One of those left outside put up one weak leaf late in the spring, but it soon died away. However, Mrs. Henry says she has found this Spider-Lily to be hardy in Pennsylvania. "I have grown *Hymenocallis* here for some years and

enjoy them immensely," she wrote Mrs. Dormon. "I have them growing on a southern slope—in fact, the warmest spot on my place—and give them no protection whatever in winter. You sent me two kinds several years ago—one marked 'spring blooming' and one marked 'fall blooming.' Only one of these has bloomed so far, and it blooms in August. The leaves are a glaucous bluish. It is a tall vigorous species and very beautiful."

Some of the exotic *Hymenocallis* species are hardy in North Carolina. One sent to me labelled "*Pancratium maritimum*" bloomed several successive years in late May or early June, occasionally repeating. I moved it to a damp shady place and it has not bloomed again, though it always makes a good clump of dark green foliage. The leaves are narrow and strap-shaped, and come before the flowers. The flowers are four to an umbel with very narrow segments, shallow cups, and very long green tubes. This *Hymenocallis* is similar to a narrow-leaved species which came from Mr. Houdyshel as a "Dwarf Spider Lily." It bloomed once in June, sending up a single scape, and did not bloom again for four years though it increased and produced shining foliage each spring. Then this year, the first of July, it suddenly bloomed again. Their erratic blooming habits are the only drawback I can discover to the use of spider-lilies in the garden.

Mr. Houdyshel's "Tropical Spider Lily" lived through three winters and bloomed two summers (in June and July), and then failed to come through when the thermometer dropped to six degrees above zero during the January that the weather bureau said was the coldest on record. I am trying it again, for the flowers are the most beautiful of any species that I have grown. There are twelve to an umbel, and they are very large and fragrant. The beautiful wide dark green leaves are like those of the ismene, and like them come up late in the spring and last until heavy frost. They are extremely decorative.

Ismene calathina is hardy out of doors in North Carolina, and blooms, but not well, for several years if left in the ground. However, it is not really satisfactory unless the bulbs are dug each year. The hybrid, *Sulphur Queen*, is a better garden subject because the bulbs do not split up. I have wanted very much to try out the newer *Ismene* hybrids but they have been expensive. Now that the prices have come down, I have got *Advance*. I put it in the most protected spot in the garden, at the foot of a low wall facing south. If it succeeds, I shall try the others.

The bulb in the trade as *Hymenocallis caribaea* has not proved hardy here after many trials, though it is said to be hardy to North Carolina and perhaps even farther north. It may be that deeper planting would have got results.

In North Carolina the sea-daffodil *Pancratium maritimum* survives in well-drained soil, but I have had bloom only once, though I have planted it many times. The bloom was from a spring-planted bulb, but even with spring planting it is not certain to flower. Since it is so very beautiful and the bulbs cost so little, I am still trying to prove it a satisfactory garden subject.

Zephyranthes, Cooperia, Habranthus, and Cyrtanthus. In this part of the country, everyone is familiar from childhood with the milk-white Atamasco Lilies that bloom in April in low-lying meadows. Although this is the only species native to North Carolina, a number of zephyranthes flourish in my garden. The most prolific and floriferous of these are the handsome pink *Z. grandiflora*, and the little white-flowered *Z. candida*. *Z. citrina* (from the Amaryllis Society) usually blooms once a month from July to October, but the bulbs do not increase. This is the best yellow-flowered species. *Z. pulchella* (also from the Society) is similar to *Z. citrina*, but not so adaptable to garden conditions. It bloomed only once, early in September. The other yellow-flowered Texas species, *Z. longifolia* (from Mr. Ainsley), lived for several years but never bloomed. Afterward I learned from Mr. Cory that it will bloom only in a highly calcareous soil, but I could not find it listed again. I doubt that the gardener would find the flower very different from that of *Habranthus texanus*, but once you have set your heart on seeing a little bulb in bloom it haunts you until you have been able to secure it, and at least proved that it will not bloom for you.

Z. Simpsonii, another of the species that the Society sent to members, is similar to *Z. Treatiae*, but neither as handsome nor as lasting. *Z. Treatiae*, said to be difficult of culture, is well established with me. However, it does not increase.

The Zephyr Lilies that have not lived through a winter, or bloomed even once, are *Z. bifolia* and *Z. macrosyphon*. *Z. tubispatha* came up for one or two springs before disappearing for good. *Z. rosea*, which I have planted many times and which is my favorite, sometimes lives through the winter, but it does not persist many seasons. It bloomed once at the end of the summer, and the little deep rose-colored lilies are the most exquisite little flowers that ever appeared in a garden. I am still trying to find the sheltered place and the proper soil to allow it to become established.

The hybrid, *Z. Ajax*, is not very robust here. I have had it longer than I can remember, but it increases little, and rarely produces more than one of its delicate pale flowers during a season. It blooms in the late summer or fall and is capricious, coming any time from August to October.

Of the three species of *Habranthus* available, *H. robustus* and *H. texanus* have long bloomed in my garden, and *H. brachyandrus* bloomed there last summer for the first time. I have read that *H. texanus* is difficult in culture, but it is most amenable with me. It blooms freely at intervals from early June to late September, and increases well. The flowers of *H. brachyandrus* are larger than those of any habranthus or zephyranthes that I have seen, and of such tropical beauty that I could not believe they would endure any amount of cold. But the new leaves began to put out very early in the spring after a very trying winter. Whether it will bloom the second season is another question.

Cooperias, like zephyranthes, flower at rainy intervals of spring and summer. Only *Z. pedunculata* blooms. *Z. Drummondii* has never been anything but a few slender rust-like leaves. According to descriptions

this is small loss, but you would always like to see for yourself. I keep wondering why it does not bloom, and what I could do to make it bloom.

Cyrtanthus is a genus that does not thrive in these parts, and I am not surprised, for the species come from South Africa. The bulbs seem to be fairly hardy, but they do not become established well enough to bloom with any satisfaction. *C. lutescens* (*C. ochroleucus*) was planted in April and bloomed in May, and then lingered on for several seasons without blooming at all. *C. parviflorus*, planted in October, skipped a season but bloomed the second spring. That was the last of *C. parviflorus*, and *C. Mackenii* and *C. angustifolius* never bloomed. These were all planted in a low place in clay soil with a mulch of cow manure. I put them there because that is the place where the Zephyr Lilies thrive, but it may be that in this climate they need more drainage.

Snowdrops and Snowflakes. I started growing Snowdrops on the theory that the species from Asia Minor would be better adapted than those from Europe to conditions in the South. But of those that I have grown, *Galanthus nivalis* var. *Schorlokii* has been by far the most satisfactory over a period of years. *G. Elwesii* persists, but does not bloom as well and does not bloom any earlier. *G. byzantinus* bloomed in mid-winter, but that effort was too much for it, I suppose, as it was never seen again. *G. latifolius* did nothing.

As to Snowflakes, as near as I can tell all of those in the trade as *Leucojum aestivum* are *L. aestivum*, and all of those in the trade as *L. vernum* are *L. aestivum*. I have never got *L. vernum* under its own name or any other, if it is, as described, a solitary flower. If this species is to be had in this country, I would like to know about it. Being particularly eager for fall flowers I also tried *L. autumnale*. So far it has not bloomed in the fall, or at any other time. In general I have not found bulbs from the Mediterranean satisfactory in North Carolina.

The Allieae. In this tribe I have made attempts at growing many brodiaeas, many more alliums, *Milla biflora*, *Pharium elegans* (syn. *Bessera elegans*), and *Leucocoryne ixioides*, the last three without success.

Mr. James doubts (HERBERTIA, 1936) whether the two Mexican bulbs will stand many degrees of frost, and thinks they should be dug, except in the milder climates. I suppose the climates in which they need not be dug are milder than this, for here they were not satisfactory even as summer bulbs. The milla was planted twice, once in the fall and again in the spring. The spring-planted bulb bloomed, but poorly. The pharium was planted in spring, but it did not bloom. Neither the milla nor the pharium lived through a winter, but I am trying them again this year in a more protected place.

Leucocoryne ixioides var. *odorata* fared no better, which was only to be expected as I set the bulb out in winter. I mean to give it another trial, though that is scarcely worth while for it is said to require the same culture as freesias, and they are too tender for us.

The alliums are too numerous to take up in detail. Most of them do well (some only too well), but there are a few that I have not been able to grow. The beautiful azure *Allium caeruleum* did not persist.

The somewhat tender *A. neapolitanum* seems to be hardy, but blooms so early that the flower buds are nearly always caught by the cold, and even when they are not caught they are inferior to those of other species. *A. karataviense* lives, but that is all. *A. Rosenbachianum* did nothing. *A. validum* was tried in vain a number of times. I cannot get enough moisture for it. *A. Moly*, which is the most attractive one that I have seen, with large bunches of daffodil-yellow flowers, refuses to grow at all. This I cannot understand, and I mean to keep trying.

Brodiaeas in North Carolina are not what they are in the West (Mrs. Rowntree says this is because I do not cultivate deep enough) but they make charming and fragile bloom in the shady rock garden. *B. ixioides*, *B. coccinea* (*Brevoortia Ida-Maia*) and the white flowered *B. Eastwoodii* did not persist, but most of the species do. The blue-dicks and a run-of-the-mine hybrid have bloomed in one place for more than ten years. The pale lavender-flowered *B. Bridgesii* is one of the prettiest, though the precocious flowers are often nipped by frost. *B. lactea* and *B. coronaria*, the harvest brodiaea, are the dependable sorts.

Other Amaryllids and Alstroemerias. After many years of trial I have given up hope of establishing alstroemerias, especially after discovering that they are susceptible to the bacterial wilt that is the curse of Southern gardens. I have had *A. aurantiaca*, and its variety *lutea*, and *A. chilensis*. Only *A. aurantiaca* bloomed. It bloomed in late June after having been planted in October, and when all of the gorgeous flowers were open, the whole plant turned yellow and died.

Ixiolirion tataricum, the one time I bloomed it, was a poor thing. Perhaps it should have been in a richer soil, or perhaps the bulbs were poor to begin with. At any rate I was not sorry when they disappeared, but I should like to try again with bulbs from another source.

I have had the delicate lily, *Chlidanthus fragrans*, many times and from many sources, and have planted it in various parts of the garden. Leaves appear season after season, but no blooms. It is said to be a satisfactory garden plant when taken up and dried off, but with me even large spring-planted bulbs fail to flower.

Sternbergia lutea has been in Southern gardens since the days of the Colonists. In mine, for some reason, it is chary of bloom, though I have had it for long years and the clumps are well established. Late in August or early in September there are always a few of the buttercup-yellow flowers, but never many. I cannot but think that the Amaryllis Family as a whole is somewhat temperamental.

Agapanthus africanus var. *Mooreanus* grew in a low border for a number of years and bloomed once, at the end of June, but not before it was well established. Later it disappeared. The flowers were a dull blue, and I hope that when I try it again I shall get a better form. *A. orientalis* (*A. umbellatus*) has not bloomed, but has come back after its third winter. It is said to bloom out of doors in Raleigh. I have a root from Mr. Hayward, and one from a garden in California.

Sprekelia formosissima is perfectly hardy with us, but capricious as to bloom. At least it is capricious with me. But a friend who saw it one of the two times it did flower said, "Oh, those little red lilies

used to bloom every spring in our old garden in Petersburg." I doubt whether she knew much about flowers, but I do not think that anyone could mistake the Jacobean-Lily.

Vallota speciosa (in the trade as *V. purpurea*) was planted one September at the foot of a retaining wall, and was never seen again. I should have planted it in the spring, and on top of the wall, and mixed sand with the heavy soil. If I can get hold of it again (it took me a number of years to procure the first bulb), I shall treat it better. Colonel Grey says that it is hardy with a little protection in the south and west of Great Britain, so long as it is not water-logged in winter.

Daffodils (*Narcissus*) and daylilies (*Hemerocallis*) flourish in the South, but these, of course, flourish everywhere. I would like to try more of the tender daffodils particularly of the tazetta and triandrus groups. Of daylilies I have had mostly the standard sorts, but I have been interested in several of Mr. Hayward's, particularly one with a small dark red flower.

Amaryllids in England and the United States. It is interesting to compare one's own results in growing amaryllids with those of gardeners in other places. I noted particularly Major Pam's remarks in HERBERTIA (1940, p. 41) on the hardiness of amaryllids in his English garden where the winters are more severe than those in Piedmont, North Carolina: "The past winter has been very cold indeed for this country, and record frosts have been recorded in many parts. In my gardens the lowest temperature was 2 degrees below zero Fahrenheit in the open, and it hovered around zero for several weeks. Yet the amaryllids grown in the open did not suffer, and I have had but few losses. It seems as if established plants can stand very much more cold than we had expected, and I think it may be worth while for some lovers of this family who live in the more northern States of the U. S. A. to try to grow in their gardens some species which were reputed to be tender. Among the plants which not only survived here but have flowered this year as freely as ever are,—*Amaryllis* (syn. *Hippeastrum*) *pratensis*, *Sprekelia formosissima*; *Amaryllis* (syn. *Hippeastrum*) *Ackermanni*; *Crinum Powellii*, *C. Moorei* and *C. longifolium*; *Alstroemeria Lig'u*, *A. aurantiaca*, *A. chilensis*; *Pancratium illyricum*, in addition of course to all the species generally considered hardy. The following are untouched by frost and will certainly flower freely in their proper season: *Callicore rosea* (syn. *Amaryllis belladonna*), *Nerine Bowdeni major*, *Hymenocallis festalis* (Mr. Worsley's hybrid), *Lycoris* spp., and several other alstroemerias such as *A. braziliensis*."

HERBERT MEDAL AWARDS, 1937-1943

HAMILTON P. TRAUB

The William Herbert Medal, founded in memory of Dean William Herbert, and to commemorate the 100th. Anniversary of the publication of Herbert's *Amaryllidaceae*, 1837, was initiated in 1937 to be awarded to persons for outstanding achievement within the field of the American *Amaryllis* Society. The first award was fittingly made to the late

TABLE 1
THE HERBERT MEDAL AWARDS, 1937-1943, INCLUSIVE

Year of award	Recipient	Address	Outstanding Achievements
	* Henry Nehrling, 1853-1929	(Florida)	Pioneer breeder of hybrid Amaryllis and crinums in America.
	* Theodore L. Mead, 1852-1936	(Florida)	Origination of Mead strain of hybrid Amaryllis .
1937	Arthington Worsley	Isle of Wight, England	Introduction of amaryllid species; cross pollination of amaryllids.
1938	Ernst H. Krelage	Haarlem, Holland	Breeding of <i>Narcissi</i> and other amaryllids.
	Cecil*Houdyshel	La Verne, California	Introduction of amaryllids, and breeding of crinums.
	Major Albert Pam	Broxbourne, England	Introduction of amaryllid species.
	Pierre S. du Pont	Wilmington, Delaware	Origination of pink strain of hybrid Amaryllis .
	Jan de Graaff	Sandy, Oregon	Narcissus breeding.
1939	Dr. John Hutchinson	Kew, England	Phylogeny of <i>Amaryllidaceae</i> .
	Dr. A. B. Stout	New York City	Daylily Breeding.
	Sydney Percy Lancaster	Alipur, India	Origination of Cooperanthus and other hybrid Amaryllids .
	Carl Purdy	Ukiah, California	Introduction and culture of North American <i>Allieae</i> .
	Fred Howard	Montebello, California	Origination of Howard strain of hybrid Amaryllis and Crinodonna Howardii .
1940	Herbert William Pugsley	Allen's Green, England	Taxonomy of Narcissus .
1941	Wilfred MacDonald James	Ojai, California	<i>Nerine</i> breeding; introduction and culture of amaryllids.
1942	Prof. Dr. Abilio Fernandes	Coimbra, Portugal	Karyo-cytology of Narcissus .
1943	Miss Elizabeth Lawrence	Raleigh, North Carolina	Outstanding work on use of amaryllids in gardens.

* Medal awarded posthumously in 1943.

Arthington Worsley in 1937 in appreciation of his valuable contributions to the advancement of the *Amaryllids*. These were summarized in

his autobiography that appeared in *HERBERTIA* 1936 (Vol. 4, pp. 10-19). The Medal was illustrated in *HERBERTIA* 1938 (Vol. 5, Plate 98, p. 65).

The amaryllids had been neglected for so long that a number of awards were long overdue. To bring the awards up-to-date the Medal was presented to more than one person in 1938 and 1939.

The Class of 1938 included Ernst H. Krelage, for breeding *Narcissi* and other Amaryllids; Cecil Houdyshel, for introduction of Amaryllids and breeding *Crinums*; Major Albert Pam, for the introduction of Amaryllid species; Pierre S. du Pont, for the origination of a pink strain of hybrid *Amaryllis*; and Jan de Graaff, for *Narcissus* breeding.

The Class of 1939 included Dr. John Hutchinson, for original contributions to the phylogeny of the Amaryllids; Dr. A. B. Stout, for daylily breeding; Sydney Percy Lancaster, for the origination of *Cooper-anthes* and other hybrid Amaryllids; Carl Purdy, for the introduction and culture of North American Allieae, and Fred Howard, for the origination of the Howard Strain of hybrid *Amaryllis* and *Crinadonna Howardii*.

In 1940 the award went to Herbert William Pugsley for his thorough work on the taxonomy of *Narcissus* species. In 1941, the award was made to Wilfred MacDonald James for *Nerine* breeding and the introduction and culture of Amaryllids. In 1942, Dr. Abilio Fernandes of the University of Coimbra, Portugal, received the award for his outstanding contributions to the karyo-taxonomy of *Narcissus*. The current (1943) award of the medal has been made to Miss Elizabeth Lawrence. Her outstanding contributions on the use of Amaryllids in our gardens are summarized in that inspiring book, *A Southern Garden*, (University of North Carolina Press, 1942). The subject has been brought up-to-date in Miss Lawrence's article in this issue of *HERBERTIA*.

The two outstanding American pioneers in the field of the Society had passed to their reward before the Herbert Medal was founded. As fitting memorials to these pioneers, the Herbert Medal was awarded posthumously in 1943 to Henry Nehrling, 1853-1929, to whom the first Volume of *HERBERTIA* (1934) was dedicated; and to Theodore L. Mead, 1852-1936, whose autobiography appeared in the second Volume of *HERBERTIA* (1935).

FRANKLIN B. MEAD, 1875-1933

Through Mrs. Franklin B. Mead, Sr., of Fort Wayne, Indiana, we have secured the following biographical details about the late Franklin B. Mead, and also the photograph portrait, taken at the age of fifty years, and which is reproduced in Figure 88. Mr. Mead was the originator of the *Hyperion* Daylily, which represents a landmark in the breeding of this class of plants. *Hyperion* has been used to a large extent by many daylily breeders including Mr. Amos Perry in England.

"Franklin B. Mead was born August 27, 1875 at Greenfield, Ohio. He was educated at the University of Cincinnati and the University of Michigan. He entered the life insurance business which was his life's vocation.



Fig. 88. Franklin B. Mead

"Mr. Mead died very suddenly of an embolism in the prime of his life in 1933. His interests were many and varied and he lived a full life. His main hobby was concerned with iris breeding, and we called our place "Iris Crest." However, he was very proud of his daylily origination, *Hyperion*. In 1931 he received an Award of Merit for it from the Royal Horticultural Society after trial at Wisley. It was introduced to the trade by Wayside Gardens in 1925."

IN MEMORIAM—ARTHINGTON WORSLEY, 1861-1943

Arthington Worsley died at his home in the Isle of Wight on January 13th, 1943, and was laid to rest on January 18th in the village churchyard at Godshill, where many of his ancestors are buried. He had been in failing health for two years and was in his 82nd year when he died.

An autobiography was published in *HERBERTIA*, Volume 3, giving the story of Worsley's life and career—there is little that can usefully be added to this.

Arthington Worsley was more than a keen gardener—he was deeply interested in the scientific side of horticulture and was recognised as an expert on the *Amaryllidaceae*.

His death will be deplored by all his friends—he had a charming personality and had travelled in many parts of the world; he had read extensively and was a most pleasant companion, talking with knowledge on a great variety of subjects. The sympathy of all the members of the American *Amaryllis* Society will go to his widow and to his son in their great loss.—*Albert Pam*

IN MEMORIAM—GORDON AINSLEY, 1896-1942

We deeply regret to report the passing of Gordon Ainsley on September 12, 1942 at his home in the Los Gatos hills, near San Jose, California.

Mr. Ainsley was born August 2, 1896 in Campbell, California where his father owned one of the first independent fruit canneries in the Santa Clara Valley. He graduated from Campbell Grammar School with high honors, and then went to Montezuma School at Los Gatos where he endeared himself to Masters and boys alike, regardless of a heavy physical handicap which he carried through life without complaint. In 1923 he married Miss Alice Clark.

He was always a great lover of flowers even from childhood, and his garden, which later became his nursery, was located at the old family home at Campbell to the west of San Jose. We recall often seeing him working amongst the plants he cherished, or talking with a garden friend. His business, established in 1925, was an outgrowth of the hobby of bulb collecting, and in its day it was indeed remarkable in scope due to the number of rarities one could find there, especially among the *amaryllids*. Much of his material came from Barr, Sutton, and van Waveren, but many items came direct from the wilds of South America, South Africa, India and other foreign countries.

In his catalog of 1932, which marks the high point in his bulb business, we find over 65 *Amaryllids* listed among a thousand or so items. This included *Alstroemeria*, *Nerine*, *Cyrtanthus*, *Hymenocallis*, *Crinum*, *Zephranthes* and other genera, but he also had many unlisted items such as *Brunsvigia* and *Amaryllis* species that one still cannot find on the market. The Ainsley collection won the respect of all garden lovers.

Mr. Ainsley was one of the charter members of the American Amaryllis Society. He was a Vice-President of the Society from 1933 to 1935, and was active as the Southwest Regional representative on the Membership Committee until his death. We all owe him a deep debt of gratitude for his unselfish service.

During 1933, soon after the founding of HERBERTIA, he found his garden duties were becoming too strenuous for his limited physical strength. As a consequence much of the stock was turned over to a Southern California grower, and he retired to his Los Gatos home where he spent the last years of his life out in the sun amongst the flowers he loved. His new garden was built on a frost free knoll which overlooked the Santa Clara valley. There his closest friends could find him, ever cheerful, still very active, and as keenly interested as ever in garden topics. Much of his old bulb stock was gone, but many choice items remained. His work in breeding Tigridias and *Amaryllis* continued—may it still continue, for Gordon passed away quite suddenly due to a heart attack. His quiet passing was truly a reward for a lifetime of amazing courage and suffering.

Professor Rogers, one of his instructors at Montezuma School, pays him this tribute: "No young man of his class got more out of his work than Gordon did, and no one got better grades. His mind was alert and ever eager for new things. He endeared himself to us all by his sincerity, his industry and his keen sense of humor. He indeed had a high code of honor." —*L. S. Hannibal*

J. MARION SHULL—ARTIST—PLANT BREEDER

AN AUTOBIOGRAPHICAL SKETCH

The old question of the relative importance of heredity and environment will probably never be answered to the complete satisfaction of all. While lack of suitable environment may hamper and even thwart heredity, the best environment can accomplish little unless there is a fair foundation in heredity on which to build.

In my own case a career closely related in some way to the great outdoor world of plant life might have been forecast at an early age. Environment was stubbornly against my early desire to train as an artist, to become an illustrator and find my place in the rapidly growing field of magazine and book illustration made possible by the newly invented half-tone process of engraving, for I was born into a rural Ohio home, in a community wherein the prevailing attitude toward pictures was to class them as "graven images," forbidden by Holy Writ. Music, aside from congregational singing, was likewise a thing of evil, and all musical instruments were tabu—not a very promising atmosphere for a growing lad whose greatest hungers and hopes lay in these fields.

Now I'm not complaining. My Father and Mother were gifted people, gifted above the average of their time and place, but they were caught in an environment that had triumphed over heredity and forced them into conformity. In their children, six boys and two girls, all but one of whom grew to maturity and are still living, heredity remained strong and insistent and for the most part had its own ultimate triumph over environment. Perhaps it were better said that the children sought and found environment in relative harmony with their inner needs as determined by heredity.

Our Mother was a great lover of flowers at a time when flower catalogs were few and farm income low; when distribution of ornamentals was largely by friendly exchange, hand to hand, or later by way of the accommodating postal service; when the early catalogs of the pioneering James Vick of Rochester were cherished as works of literature and art to be preserved and handled with care.

At the age of six, a back number of this catalog bearing my birth date, 1872, was turned over to me by my Mother and became my then most prized possession. Its black and white wood-cuts were promptly embellished with purple ink home-made from the juice of pokeberries, or with other colors soaked from colored papers, and these became my first "Works of Art." They must have been fearful and wonderful, and no doubt resulted in such iris and daylilies as I have never seen since or been able to produce in my own breeding garden of later years.

The home became a veritable green-house in winter, shelves at all windows, and at one time housed some two hundred distinct items. And Mother insisted on knowing the correct names of all her plants, and the correct pronunciation of their names when speaking of them. In the garden she had very definitely the botanic garden idea which she expressed in the wish that she could have just one of everything the catalogs offered—and a gardening man to help take care of them.

In the last quarter of the Nineteenth Century there were certain advantages accruing to the large family in the country, not so much to the parents perhaps, but assuredly to the children. With the nearest neighbor a mile away, and with a tramp of two miles to the village post office and school, the family was perforce thrown pretty much on its own social resources. Such families work together, play together, and each member contributes something to all the others. My oldest brother, chief mathematician of the family, mapped the stars, experimented in drawing and with electricity, presently brought home the first formal text on botany, a simple little elementary work of no particular consequence in itself—but three younger brothers including myself, became interested in botany, built our careers within this field of the natural sciences, one in genetics, one in plant physiology, and myself as a botanical artist.

But in the first place I collected plant materials not as a botanist but as source materials for application to design. I amused myself, and incidentally earned some money, by conventionalizing leaf and other plant forms into designs for china painting, wood carving, other decorative work in general. Leaves of plants were pressed and dried and filed in a cabinet for preservation of leaf forms, but supplementing these were great numbers of careful pencil sketches of plant material in natural position or carriage, leaves and their arrangement on the stems, flowers and fruits in their varying stages of development. These were made in summer from the live material and stowed away for reference in winter when fresh material was not available. Thus my botany and my art grew up side by side from the very beginning.

One brother was poet and linguist, working out his thoughts as he plodded behind the plow, jotting them down on scraps of paper while the team rested at the end of a furrow, later making his career as a teacher of Language and Literature at Michigan University. He brought into the family many books—and I read them as well as my own, spending most of my own small earnings in drawing materials.

Youngest member of the family profited by all that had gone before, entered college early, interested himself in natural science but shied away from the botanical field to deal with the things that feed upon plants, fruit flies, sphids, thrips, teaching genetics in the Department of Zoology at Michigan University. So much for the family background but now to the main theme.

Brief sessions with an Art Class in Indiana, and again at the Art Students' League in New York, terminated all too soon by reason of deficiencies of wherewithal. A collapsible purse had all too frequently to be replenished by interim sessions of school teaching or other trial work, proof reading in Cleveland, commercial art in Memphis, but these oddments neither singly nor all together could quite suppress the scientific strain that ran through the whole family. The uncertainty whether I should be artist or scientist finally resolved itself by making me something of both.

When the position of Botanical Artist for the Smithsonian Institution became vacant in 1903 through the death of Walpole I looked eagerly toward filling his place, but I was 800 long miles away and completely unknown to the Powers That Be. Contact by correspondence



J. Marion Shull

was cheering and encouraging but nothing came of it, and the vacancy remained unfilled. Then it dawned on me that for these very rare and highly specialized positions appointment is not a matter of favoritism, of "pull" in the slangage of politics, but it is a matter of personal contact, personal acquaintance, of being personally known to those with whom you will have to work.

Having reached this conclusion I deliberately set about mastering another profession merely to get on the ground. Space here is not sufficient to go into detail as to how I arrived at this decision but I became a stenographer and typist and promptly received appointment in Government Service with the Post Office Department where I served just a year and seven days in that capacity and then went into the Forest Service as a member of its scientific staff to make illustrations for "The Forest Trees of the Pacific Slope" for Sudworth, Dendrologist for the Forest Service at that time.

Less than two years later I transferred to the Bureau of Plant Industry where ultimately I had made over 1700 scientific drawings in color in an exceedingly wide range of subjects. (Incidentally, the Smithsonian vacancy never was filled!)

Doing outside piece-work for the Forest Service while still preparing for stenography and typing, and before my formal admission to its scientific staff, had made a settled home seem practicable, as well as desirable, so I took on the responsibilities of the head of a household December 20, 1906, and returned to Washington January 1 following. By July 1, 1908, the present home in the Chevy Chase suburb of Washington was completed and occupied and once again there was garden land to use as I saw fit.

The Ohio home contributed of its garden wealth toward the new home in Maryland. Among these gifts were about a dozen *Iris* varieties, for my Mother had accumulated, even in that small number, probably more varieties of *Iris* than existed in any other rural home in the county. To these I added a few new ones from Farr of Wyomissing, leading American *Iris* grower of that period. They offered fascinating opportunities to a genetics-conscious lover of plant life in general, and that resulted in definite breeding operations by 1914, and from that time on the vegetable garden retreated ingloriously as the breeding of *Iris* advanced. Several new and interesting colors in *Iris* had resulted and had been given names because of local requests for distribution, notably a yellow that was quite distinctive at the time, which had been named Virginia Moore. This, by the way, partly by merit and partly by sheer luck, was the first *Iris* to receive the award of Honorable Mention by the American *Iris* Society which had been organized early in the year 1920.

In 1921 there appeared a brilliant seedling of *Iris trojana* by Lent A. Williamson which on its first appearance was seen toward the morning sun. It was so glowing that presently it received the name of Morning Splendor and was so registered. It again illustrated how merit and luck may work hand in hand to win success. Being a late variety its two bloom stems in 1922 appeared just at the time of the annual meeting of the *Iris* Society held that year in New York. By careful handling a

stem was taken to the show and as a result received exceptional and wide publicity that ultimately carried it to far places indeed. The margins of my small home garden had suddenly expanded till parts of it lay in England and France and even far-away Australia and New Zealand.

Always keenly alive to the facts of heredity I followed eagerly the genetics research of my younger brother, George, at the Station for Experimental Evolution of the Carnegie Institute at Cold Spring Harbor. It was about 1927 when I made my first crosses with daylilies and obtained a very interesting individual from *Hemerocallis serotina* (*Thunbergii*) by *H. fulva Europa* so extremely divergent from either parent that its hybridity cried aloud for recognition. Tempted by such small knowledge of genetics as I had acquired, largely by association, it was little wonder that the daylilies took on added interest. As could be expected the further use of this hybrid has led to a wide range of variation, a variation however, far beyond my expectations, both in color and form, colors from pale lemon yellow to deep orange; indescribably light pastels to deep Van Dyke reds, or even blackish purples, novel even if not beautiful. And in form there seems almost no limit to the variation.

In an autobiographical sketch one must of necessity stop at the end of the paper—not at the end of a career or a life. I shall close this sketch with a confession—that I am not digging up my Daylilies and Iris to grow vegetables in these trying days of war and shortages. The time will come when we shall be in desperate need of every civilizing influence that can be kept alive to after times. So I shall continue so long as strength is given me to labor in my garden for the loveliness that should outlive this all absorbing present ugliness of war.

JOHN VERTREES WATKINS

A BIOGRAPHICAL SKETCH

John V. Watkins, well known to Southern gardeners for his many worthwhile contributions to gardening literature, resigned on December first as Assistant Professor of Horticulture at the University of Florida to become associated with a large greenhouse establishment in Pennsylvania. At a 250,000 foot greenhouse in the southeastern section of that State, Prof. Watkins will have charge of the orchid department and will work in propagation.

A native of eastern Pennsylvania, Prof. Watkins was trained at the University of Pittsburgh, Harvard, Cornell and at the University of Florida. At the latter institution he was instructor in Floriculture and Landscape Planning and had complete charge of the greenhouses and gardens. In addition, much time was given to selective breeding and flowering studies in *Hemerocallis*. Many of the findings from these studies were published in *HERBERTIA*. The growing of a large demonstration garden of annuals, flowering, and disease resistance studies in garden chrysanthemums also received attention in season.

Prof. Watkins is the author of five University Bulletins, the most popular of which are "Propagation of Ornamental Plants" and "Orchids in Florida." Scores of gardening articles were written and radio talks given by Prof. Watkins, and he has been southern authority for several gardening guides and "how" books of national circulation. He has served as consulting planner on many beautification projects in his home city and for several buildings of the University system, and has participated in many garden symposiums and short courses.

Although it has been necessary to dispose of most of the daylilies that grew in the garden at his home, it is hoped that it may be possible for him to acquire a new group of plants after settling permanently in Pennsylvania.—B. Y. T.

A DECADE WITH AMARYLLIDS

W. M. JAMES, *California*

Ten years ago the American Amaryllis Society was organized in Florida. The activities of the Society were to be recorded in a year book. Today this Society is still functioning, the annual is known as HERBERTIA (See Plate 244.) and is received by members of the Society all over the world, even though war has curtailed such activities somewhat.

Much progress has been made in the general knowledge of the Amaryllids and many new kinds have been introduced during the last ten years. It is now easy and profitable for the florist to have early *Narcissus* flowers because we have learned that the flowering time of these bulbs is controlled by manipulation of storage temperatures. And many choice kinds of Amaryllids will be available in larger quantities because we have learned to propagate these bulbs by cutting them. Some errors in nomenclature have been corrected. Others are in the process of correction. I wonder how many of those who will read this realize how much time and work is necessary to complete a gigantic task of this nature.

One development I do not understand. In most parts of the United States the daylily (*Hemerocallis*) has become very popular. Because of this interest many new hybrids have been developed and a great deal of data on its cultural requirements and habits collected. Why is this plant almost unknown in Southern California?

My personal experiences with Amaryllids during this past decade have been very interesting and have provided a great deal of pleasure. At Las Positas Nursery we gradually extended our correspondence in an effort to increase the collection of bulbous plants. It is quite a thrill to watch plants or seeds, received from a far corner of the earth, develop until finally they bloom. In the past, as part of my vocation, an effort was made to find methods of propagating the more promising plants in commercial quantities. In the future, as an avocation, I hope to learn some of the "whys and wherefores."

Illustrative of propagation difficulties in the past decade is a comment by the editor on page 181 of the 1942 HERBERTIA which I have



Plate 244

Herbertia covers, 1934 to 1942, inclusive

found to be correct. As soon as the first pod in an umbel shows signs of ripening, the whole stem can be picked and all the pods will mature and produce good seed if placed in a warm airy place. Dr. Traub suggests a paper bag, but in Santa Barbara the pods would mildew badly and not mature properly in this type of container. I used trays with wire bottoms and used the same kind as a cover. On a hot, dry day a breaking *Alstroemeria* pod will throw seed as far as ten feet. I learned to use this method with many kinds of plants—such as *Brodiaea*, *Leucocoryne*, *Amaryllis*, *Nerine*, etc., etc. And the germination seems to be just as good as that from seeds fully matured on the plant. After a certain point there is apparently enough moisture and nourishment in the stem and pods to mature the seeds.

During unfavorable weather I have cut flowers of some plants, pollinated them and matured seeds with the stem in water in the house. Sometimes extra light and heat must be provided. Some of the *Nerines* are especially adaptable to this method. The hollow stems *Amaryllis* have a tendency to rot before the seed matures.

And so on. I would not attempt to review all the happenings and progress in *Amaryllids* for the past ten years. This is very nicely recorded in the first ten issues of *HERBERTIA* (See Plate 244; first nine volumes) In each edition of *HERBERTIA* there were comments and articles by new writers. In the next ten years I hope the Society will receive many new members who will express themselves in *HERBERTIA*. That is the logical way to acquire data and information which we are all anxious to receive.

HERBERTIA COVER DESIGNS

HAMILTON P. TRAUB

The series of cover designs for *HERBERTIA* was begun in 1937 with the unique impressionistic design of the *Amaryllis* Family by the renowned artist, Col. Edward Steichen. This was an appropriate cover for the issue commemorating the 100th. Anniversary of Herbert's *Amaryllidaceae*. For the 1938 issue, dedicated to the Netherlands, Henrik Willem van Loon had planned to provide the cover but on account of sickness he could not carry out his plan. In this emergency, the design was made by the writer. It is based on the plate of *Amaryllis vittata* in Trattinick's *Thesaurus Botanicus*. The design on the reverse side of the Herbert Medal is from the same source.

The cover for the South African Edition in 1939 was appropriately executed by the South African artist, Cythna Letty. It features *Cyrtanthus Tuckii* var. *transvaalensis*. Mrs. Wilhelmina F. Greene, a noted Florida artist, created the design for the 1940 issue. It portrays the Blue *Amaryllis* that had flowered in Florida in that year.

Beginning in 1941, a notable series of cover designs was begun by the eminent artist and horticulturist, J. Marion Shull. Up to the present four of these have been executed—three have been published. For the Daylily issue, 1941, Mr. Shull portrayed the Genus *Hemerocallis* as exemplified in the hybrid clone *La Tulipe*. *Alstroemeria Ligtu* was featured on the cover of the *Alstroemerid* Edition, 1942, and *Ixiolirion tataricum* adorns the cover of the present 10th. Anniversary Edition. The

original was produced in June 1943 from sketches made from plants in the garden of Dr. J. S. Cooley, Beltsville, Maryland. The fourth design in this series based on the onion, *Allium Cepa*, will be reproduced on the cover of the Allieae Edition, Volume 11, 1944.

The members will be interested to know that there is a plan back of these cover designs. The amaryllids are excellent subjects for use as a basis to enrich the artistic tradition of the world. In this group the general theme of the umbellate inflorescence with spathes unites the members but in many other details there is very great diversity. It is the purpose to sponsor designs for all of the Tribes of the Amaryllidaceae. When a sufficient number of such designs are available, they will be gathered together into a portfolio for use in decorative art.

TABLE I

Herbertia cover designs, 1937 to 1943; and contemplated future cover designs.

I. FAMILIES

Family	Representative Species	Artist	Year
ALSTROEMERIACEAE	<i>Alstroemeria Ligtu</i>	J. Marion Shull	1942
AMARYLLIDACEAE	Impressionistic design	Col. Edward Steichen	1937

II. AMARYLLID TRIBES

Tribe	Representative species	Artist	Year
HEMEROCALLISEAE	Hybrid <i>Hemerocallis</i> clone <i>La Tulipe</i>	J. Marion Shull	1941
AGAPANTHEAE	<i>Agapanthus africanus</i>		1945
ALLIEAE	<i>Allium Cepa</i>	J. Marion Shull	1944
GILLIESIEAE	<i>Miersia chilensis</i>		1946
IXIOLIRIEAE	<i>Ixiolirion tataricum</i>	J. Marion Shull	1943
BRUNSVIGIEAE	<i>Brunsvigia rosea</i>		1947
CYRTANTHEAE	<i>Cyrtanthus Tuckii</i> var. <i>transvaalensis</i>	Cythna Letty	1939
HAEMANTHEAE	<i>Haemanthus multiflorus</i>		1948
AMARYLLISEAE	<i>Amaryllis vittata</i> <i>Worsleya procera</i>	Hamilton P. Traub Mrs. Wilhelmina F. Greene	1938 1940
ZEPHYRANTHEAE	<i>Zephyranthes grandiflora</i>		1949
GALANTHEAE	<i>Galanthus nivalis</i>		1950
NARCISSEAE	<i>Narcissus poeticus</i>		1953
EUSTEPHIEAE	<i>Phaedranassa Carmioli</i>		1952
EUCHARIDEAE	<i>Hymenocallis Florida</i>		1951

The designs that have already appeared and also those that are contemplated for the next decade are listed in Table I. It is the object to include at least one design for each Tribe of the Amaryllidaceae. Although species are indicated in Table I, the future plans are not rigid and changes in the subjects may be made in case that should seem desirable.

1. REGIONAL ACTIVITY AND EXHIBITIONS

MID-WEST GARDEN CLUB OF THE AIR

DARRELL S. CRAWFORD, *Kansas*

Unique in the history of Garden Clubs is one that requires only the turning of a radio dial for attendance daily for thirty minutes, Tuesday through Saturday. Our leader is the talented Mrs. Helen Field Fischer. The Mid-West Garden Club of the Air is conducted over Station KFNF, Shenandoah, Iowa.

“Dues” are only the faithful attention and eagerness for greater knowledge of plant science and particularly gardening, in any or all its branches. “Flower Shows” are the flower pictures vividly drawn by word in each letter of garden scenes or discoveries that listening members send to the leader, Mrs. Helen Field Fischer, to read on the air. When problems of culture or identification arise it is possible to have an answer in forty-eight hours after the broadcast anywhere from Missouri, Iowa, Minnesota, North Dakota, South Dakota, Nebraska or Kansas.

This great privilege of intimate sharing of gardening experience can only be appreciated by flower enthusiasts who are isolated and who would have to spend lonely periods of research or disappointing trial and error were it not for this modern garden club that takes advantage of the latest inventions to reach its members.

Since the beginning of the Club in 1923 Mrs. Fischer has been giving the daily gardening talks which have transformed the gardens and also the outlook of thousands in the great American Midland.

Members who visit Shenandoah's famous gardens are invariably invited to address the local garden club. Shenandoah's gardeners are so well known from radio letters that we know them by their given names.

It is indeed a pleasure to open important garden magazines and see articles by members of our Club of the Air. The capacity to write such articles was developed and encouraged by writing of gardening matters in radio letters for our family of gardeners.

Distinguished visitors have enjoyed the informality of the Radio Garden Club and have appreciated the showers of friendly letters they received after their broadcasts. In our homes by radio we have thus enjoyed visits with Alfred Hottes, author and garden editor; Elizabeth Werry, of Wallace's Farmer; Arthur Rapp, Iowa expert on growing wild flowers; Mrs. Dorothy Biddle, on flower arrangements; Ernest Thompson Seton, and Ralph Hubbard, authorities on Indian Lore; Mrs. Viola Wilson, who tames humming birds, and a host of others.

From the thousands of garden questions sent to Mrs. Fischer—200,000 letters during the first ten years of the Club—it was clear that a popular book on plant science was needed. Mrs. Fischer, in collaboration with her daughter, Mrs. Gretchen Harshbarger, landscape architect and illustrator, produced such a book,—*Flower Family Album*. It contains examples of the species and cultivated forms of each plant family

represented among cultivated flowers. As a text it has been used for our radio plant science lessons, and it is now also available in hundreds of clubs, schools and libraries. It is important to note that members were fascinated to discover that petunias and potatoes were close relatives. Such stimulation has encouraged members to further study and research.

One member, in spite of a severe physical handicap, Mr. Howard Bowlin, of Missouri, has developed an extensive perennial and rose garden. He has shared by air, letters from England, written by a well known member of the Royal Horticultural Society. This gentleman entertained a brother of Howard Bowlin in the armed forces on leave, discovered their mutual interest. His letters about English gardens, in spite of the war, show that gardeners are the same the world over.

Whenever members have seeds of unusual plants these are announced by the Leader, Mrs. Fischer, giving the name and address of the member offering to share his good fortune. The seeds are then furnished at the nominal club rate of ten cents per packet. In this way many new items have been tested and distributed over a wide territory in the American Midland. The writer was happy to supply several items and suggested that ten cent War Stamps be used for seeds and this suggestion was quickly adopted.

The great interest in the daylily, *Hemerocallis*, here has been in great measure due to the untiring efforts of Mrs. Fischer, who made many new clones available by special arrangements in collections to gardeners of our Club. No other flower responds so well in the hot, dry summers of the Midland, and gives abundant flowers over so long a period.

All of this reflects the spirit and generous heart of a pioneer in radio and farm improvement, Mr. Henry Field, who gives free use of his radio Station KFNF for a neighborly, friendly Garden Club.

2. DESCRIPTION, CLASSIFICATION AND PHYLOGENY

REVIEW OF AGAPANTHUS AND TULBAGHIA

J. C. TH. UPHOF, *Washington, D. C.*

Repeatedly we encounter plants or groups of plants that can not be easily classified, due to the fact that they have characters common to more than one genus, sub-family or even family. This may be confusing from a systematic or taxonomic standpoint, but from a phylogenetic and evolutionary viewpoint, however, this is extremely interesting. We encounter such instances among the *Amaryllidaceae* and *Liliaceae*. Here we find a number of borderline genera that were once grouped among the *Liliaceae* but have now been transferred to the *Amaryllidaceae*. Two such genera will be taken up in some detail,—namely *Agapanthus* and *Tulbaghia*.

1. THE GENUS AGAPANTHUS

Some readers may be surprised to find *Agapanthus* grouped with the *Amaryllidaceae*, since it was formerly classed with the *Liliaceae*. Hutchison, in his Families of Flowering Plants¹, states that "The old distinction between the *Liliaceae* and *Amaryllidaceae*—'stamens 6, ovary superior'—in the one, and 'stamens 6, ovary inferior' in the other, was too simple, and separated genera which are otherwise very closely related. I have therefore, taken a somewhat drastic step in including in the *Amaryllidaceae*, certain groups formerly placed in the *Liliaceae*." Hutchinson believes that the umbellate flower cluster with its bracts are of more importance than the differences between a superior and inferior ovary. He considers the tribe *Agapantheae* the most primitive one in the *Amaryllidaceae* and considers it a link between the two families. The underground part of *Agapanthus* is rhizomatous, while the rootstock of the others are corms or bulbs.

The relationship between the two families has been discussed by Krause (*Liliaceae*, in *Die Natürlichen Pflanzenfamilien* 2 ed. Vol. 15 a:238-239, 1930) and by Pax and Hoffman, who describe the *Amaryllidaceae* in the same volume. The latter point out that the *Amaryllidoideae*, a subfamily of the *Amaryllidaceae*, closely approach the *Liliaceae*; and that the *Agavoideae*, among the *Amaryllidaceae*, show resemblance to the *Dracaenoideae* among the *Liliaceae*. The relationship of some of the genera from an embryological standpoint, will be considered later.

The genus *Agapanthus* was at first supposed to be monotypic. Later on more species were added, and the total number of species admitted is now nine. While the genus was still in its monotypic stage, it was observed by many collectors that the supposedly single species, *Agapanthus umbellatus*, was characterized by deciduous and evergreen forms. Differences were also observed in the inflorescences, and in the shape of the flowers. Some had more erect, others had drooping flowers. It was

¹ Hutchison, J. Families of Flowering Plants. II. Monocotyledons. pp. 129-132. 1934.

therefore natural that the careful observer suspected that this was a heteromorphic group. *Agapanthus umbellatus*, L'Herit., therefore required thorough investigation. It is of interest to note some of the highlights in the history of the nomenclature of this plant.

Linnaeus described it under the name of *Crinum africanum*. In his *Species Plantarum*² he gives the native country as "Aethiopia." He cites the beautiful illustration of Commelin³. About 14 years previously we find that Breynius, in his *Prodomus*⁴, mentions the plant under the name of *Hyacinthus africanus*. The first mention of this species was by Hermann in his *Cataloge* published in 1687⁵, and one of the first illustrations is to be found in Plukenet's *Almagestum*⁶. He reports the plant as flowering at Hamton Court not far from London. Also an earlier illustration from Seba in his *Thesaurus* is worthy of note⁷. The plant is also described in the well known work of Miller⁸.

In 1788 L'Heritier established the genus of *Agapanthus*⁹, and described *A. umbellatus* as the only species. Leighton¹⁰ points out that this name was only given to the small *Agapanthus*¹⁰. The author notes that "The first clear indication of the inclusion of a second species under this is found in Redouté's *Liliaceae*¹¹. He recognizes two different forms in this species, but does not consider the second sufficiently distinct to warrant giving it specific rank. Redouté's figure represents *A. orientalis*, a larger plant which is found in the southern and eastern part of South Africa. The distribution of the latter species is from Krysna eastwards along the coastal region to Natal and Zululand and thus it is unlikely that it was introduced to Europe before *A. africanus* (L.) Hoffmz. Subsequently attempts were made to relegate the true *A. africanus* to the rank of a variety, but it should be noted that in Loddiges Botanical Cabinet¹² it is given specific rank.

Let us now consider this genus from the standpoint of relationship to other genera. Stenar¹³, on the basis of an embryological study, concluded that the *Agapanthieae* are more closely related to the *Allieae* than was at first supposed, and that both could be united into one group. He believes that *Agapanthus* and *Tulbaghia* are South African *Allieae*, the former with a rhizomatous rootstock. *Agapanthus* is phylogenetically the older of the two genera. *Tulbaghia* although showing relationship to *Agapanthus* is considered a derived form. The embryo is of the *Scilla*-type with hemianatropous ovules which shows relationship with

2 Linnaeus, Carolus. *Species Plantarum*. ed 1. 1:292, Holmiae, 1753.

3 Commelin, Johanni. *Horti Medici Amstelodamensis. Rariorum*. t. 67. Amstelodami, 1697.

4 Breynius, Jacobus. *Prodomi fasculi rariorum plantarum gendani*. 1739.

5 Hermann, Paul. *Horti Academici Lugduni-Batavi. Lugduni Batavorum*, 1687.

6 Plukenet, Leonard. *Almagestum Botanici Mantissa*. London, 1696.

7 Seba, Albert. *Locupletissimi Rerum Naturalium Thesauri*. 133, t. 19 fig. 4, Amsterdam, 1697.

8 Miller, Phillip. *The Gardeners Dictionary*. 140 t. 210, London 1733.

9 L'Heritier de Brutelle, C. L. *Sertum Anglicum*, Paris 1788.

10 Leighton, Frances M. Some changes in Nomenclature in: *Journ. of South Afr. Bot.* 5:55-58, 1939.

11 Leighton, Frances M. A Brief Review of the Genus *Agapanthus*. *Herbertia*. 6:105-106, 1939.

12 Redouté, P. J. *Les Liliacées*. t. 403. Paris 1802-1816.

13 Loddiges, Conrad. *Botanical Cabinet. Agapanthus minor* 1:t.42, 1817.

14 Stenar, Helge. *Zur Embryologie der Agapanthus-Gruppe*. *Botaniska Notiser*. 520-530, 1933.

Nothoscordum and *Allium*. Furthermore *Tulbaghia* species possess the same odor as species of *Allium*. On the following pages an attempt is made to give a description of the known species of *Agapanthus*. It is to be regretted that some of the original descriptions are inadequate.

Genus AGAPANTHUS L'Heritier

Herbaceous, perennial plants. Rootstock relatively short and usually stout; roots fibrous or fleshy. Leaves deciduous or persistent, succulent, often 2-ranked; linear to sword-shaped or almost strap-shaped. Inflorescence an umbel; base of the pedicels surrounded by deciduous or persistent spathe-valves which are membranous or green. Perianth funnel-shaped to campanulate, composed of 6 united members, formed into 2 cycles. Stamens 6, inserted at the throat of the tube of the perianth. Anthers small, oblong, intrors. Filaments filiform. Style filiform; stigma very small. Ovary 3-celled, narrow, sessile containing numerous ovules. Fruit a capsule, coriaceous, 3-valved, oblong. Seeds flat.

DESCRIPTION OF SPECIES

1. *AGAPANTHUS AFRICANUS*, (L.) Hoffmzg., Verzeichn. Pflanzen 35, 1824; Leightor. Journ. South Afr. Bot. 5:55-58, 1939; *A. africanus*, (L.) Dur. and Schinz., Consp. Flor. Agric. 5:354, 1893; *Crinum africanum*, L., Species Plantarum ed. 1 1:292, 1753; *Tulbaghia Heisteri*, Fabric., Enum. Plant. Helmstad. 1763; *Mauchlia linearis*, Thunb., Nov. Gen. 3: 1781; Thunb., Prod. Plant. Capensis. 60, 1794; *M. africana*, Dahl., Observ. Bot. Syst. Gen. 1787; *Agapanthus umbellatus*, L'Her., Sertium Anglic. 17, 1788; Aiton Hortus Kewansis ed. 1 414, 1789; Willd. Spec. Plant. 2 pt. 1:47, 1799; Redout Lil. 1:6, 1802; Roem. et Schult. 7 Pt. 2:997, 1830. (9n part); Kunth. Enum. Plant. 4:478, 1843; Engl. und Prantl. Nat. Pflanzenfam. led. 2 pt. 5:54, 1888; Pax and Hoffm. 2 ed. 15 a: 1930; *A. umbelliferus*, Poir, Enc. Method. Bot. Suppl. 1:155, 1810; *A. minor*, Lodd., Bot. Cab. 42, 1817.

Description.—Herbaceous, evergreen. Rhizome is stout, roots are thick and rather fibrous. From 8 to 18 leaves to each plant; two ranked, erect to suberect, 24 cm. long and 0.9 to 1.2 cm. wide, somewhat leathery, apex obtuse to subacute. Valves of the spathe are deciduous. Peduncles are erect, 24 to 50 cm. long. Flowers 12 to 30 cm. long, pedicels 1.5 to 4.5 cm. in length. Bracts thread-like. Perianth 2.5 to 3.5 cm. long, deep blue to blue-violet. Outer segments 0.5 to 0.6 cm., inner segments 0.7 to 1 cm. broad, and 1.5 to 2.20 cm. long. Stamens are shorter than the perianth and are as long as the pistil.

Distribution.—Cape Peninsula : Clearing, Kirstenbosch; Esterhuysen nr.697—Kal Bay Mt. Walley Dod. nr.758.—Stellenbosch; Banhoek, Martley, Bolus Herb. nr.22380. Paarl: Robert Vlei, Pillans nr. 6791.—Caledon: Kleinmond, Fuller nr.109.—Mangklip, Pillans nr. 8330.—Riversdale: Ferguson Nat. Bot. Gard. 807/ 35. Langeberg Muir nr.1344.

A. africanus is the type species of the genus. The studies of Miss Leighton have shown that *A. africanus* (L.) Hoffmzg. is the valid name and that *A. umbellatus* L'Her. is a synonym. L'Heritier who founded the genus in his Sertum Anglicum (1788), according to Miss Leighton, "gave the epithet *umbellatus* to the species, but from his citation it is certain that he was describing the small *Agapanthus* only."

2. *AGAPANTHUS WALSHII*, L. Bolus, Novitates Africanæ. Annals Bolus Herbarium. 3:14, 1920.

Description.—Herbaceous plant, deciduous, 60 to 70 cm. high. Leaves linear, acute, subcoriaceous, about 19 cm. long and 1 cm. wide. Scape about 15- to 20-flowered. Spathe deciduous. Flowers pendulous. Perianth 3 to 5.4 cm. long; segments 1.4 to 1.5 cm. long. Tube longer than the segments. Segments somewhat spreading. Fruit unknown.

Distribution.—Occurs in Cape Province; Southern Region; Caledon Div. near Steenbras Railway Station, alt. about 600 meters. Flowers from December until January. Bolus Herbarium nr.15675. This species has been named after Mr. A. Walsh.

This species differs from *A. africanus* (L.) Hoffmzg. (Syn. *A. umbellatus* L'Her.) especially in the perianth-tube which is two to three times longer than the segments.

3. *AGAPANTHUS PENDULUS*, L. Bolus, Novitates Africanæ. Annals Bolus Herbarium. 3:80, 1920.

Description.—Herbaceous, leaves deciduous, obtuse or subacute, about 36 cm. long and 3.5 cm. wide. Scape many-flowered, flowers drooping, about 40 to 45 cm. long. Pedicels 2.5 cm. long or longer. Perianth 2.5 to 3.4 cm. long. Tube longer than the segments. Segments not or very little spreading. Filaments straight. Pollen greenish. Ovary cylindrical, about 1 cm. long; style 2 cm. long. Capsule acute, three-angled.

Distribution.—This species has been reported from Transvaal: Lydenburg. It is apparently related to *A. Walshii*, L. Bolus.

4. *AGAPANTHUS ORIENTALIS*, Leighton, Some Changes in Nomenclature II. Journ. South Afr. Bot. 5:57, 1939; *A. umbellatus* Red. Liliaceæ 403, 1813; *A. umbellatus* var. *maximus* Edw. Bot. Reg. 7, 1843.

Description.—Rhizome stout, developing fibrous and rather thick roots. Leaves succulent, arcuate, about 70 cm. long and 5.5 cm. wide, 10 in number. Peduncle erect, terete, 60 cm. or more in length. Valves of the spathe deciduous. Up to 110 pedicels which have a spreading habit. Bracts large and narrow to thread-like. Perianth 4.5 to 5.5 cm. long; tube 1.5 to 2 cm.; segments spreading 2.7 to 3.5 cm. in length. Color of the perianth blue. Filaments sometimes longer than perianth. Pistil 4 cm. in length, ovary [1 cm. and style 3 cm. in length].

This species is closely related to *A. multiflorus* Willd., in fact Miss Leighton suggests that upon a more careful investigation both may be identical.

Distribution.—Pondoland: Port St. Johns Pillans nr.7198. Type species in the Bolus Herbarium. Kentari: Pegler nr.629. Humansdorp: Diep River, Herlaquin Bolus nr. 2491.

According to Miss Leighton this species is the one that is commonly grown in gardens (HERBERTIA 1939). There is an excellent color plate of this species in Edwards' Botanical Register 29:7, 1843 under the name of *Agapanthus umbellatus* var. *maximus*.

5. *AGAPANTHUS CAULESCENS*, Sprenger, Gartenflora 50:21-22 pl. 1487, 1901; Bull. Soc. Tosc. Ort. 42, 1902.

Description.—Rhizomes relatively stout. Root fibrous. Leaves ensiforme, toward the middle channelled, rounded at the apex. The flowers blue, at first erect, later on drooping. Deep blue streak in middle of perianth-segments. Pollen more or less white. Style white and persistent on young fruit. Capsule three-angled.

Distribution.—This species is reported native to Transvaal. Carl Sprenger grew it at his Villa de Biase, Vomero near Naples. He received the seeds from his friend Dietrich who collected them at a considerable elevation on the Drakenberg. The plant flowered for him for the first time in 1900.

6. *AGAPANTHUS INAPERTUS*, Beauverd, Bull. Soc. Geneve. Ser. II. 2:179, 194, 1910; Worsley Journ. Royal Hort. Soc. 39:363-365, 1913; Sealy, Curtis' Bot. Mag. t.9621, 1942; *A. Weillighii*, Hort. Gard. Chron. Ser. III. 54:125, 1913.

Description.—Rhizomes stout, creeping, roots thick and fleshy. Height of inflorescence about 75 cm. Leaves 5 to 8,— 24 to 55 cm. long, and 1.5 to 2.5 cm. wide, deciduous, stiff, glaucous, slightly to deeply channelled, erect, apex rounded to obtuse. Scape 50 to 65 cm. or more in length. Spathe-valves deciduous, membranous, broadly ovate, pointed, 2.8 cm. long and 2.4 cm. broad. Up to 100 flowers in an umbel. Pedicels 3 cm. long. Flower buds somewhat erect. Opened flowers drooping. Perianth tubular, 3 cm. long and 2 cm. wide. Tube 1.6 cm. long, deep blue near the tube and lighter in color along the free lobes of the perianth. Stamens shorter than the limb, somewhat exerted. Filaments attached to perianth at the base. Anthers about 2mm. long. Pollen variously described as yellow or gray. Ovary 8 to 10 mm. long.

Distribution.—Beauverd received material for the description of the plant from Shilouwana, Western Transvaal through the aid of the missionary H. Junod. It

is also reported that Worsley received a specimen from C. G. van Tubergen in Haarlem, Netherlands. It has been reported that this specimen was originally sent by Max Leichtlin from Baden-Baden in about 1898, bearing the name of *A. Weiligbii*. Worsley is of the opinion that Leichtlin received an earlier importation of this species than did Beauverd in 1910.

Judging from descriptions and illustrations, this plant produces on each scape an unusually large number of flowers.

7. *AGAPANTHUS HOLLANDII*, Leighton, Plants, New and Noteworthy, South Afr. Gardening and Country Life. 24:71, 1934.

Description.—Herbaceous, deciduous. Spathe either persistent or more or less withered or deciduous, membranous. Flowers pendulous; tube longer than segments. Stigma included. Perianth-segments more or less spreading toward the apex.

Distribution.—*A. Hollandii* is probably related to *A. inapertus* of which it may be a variety or subspecies.

8. *AGAPANTHUS LONGISPATHUS*, Leighton, Plants, New and Noteworthy, South Afr. Gardening and Country Life. 24:71, 1934.

Description.—A very short description is available of this plant which can not be considered complete: plant herbaceous, deciduous; Spathe green and persistent during flowering.

Distribution.—Native to Cape Province.

9. *AGAPANTHUS CAMPANULATUS*, Leighton, Plants, New or Noteworthy, South Afr. Gardening and Country Life. 24:71, 1934.

Description.—Herbaceous, deciduous. Spathe deciduous or if persistent more or less withered and membranous. Flowers ascending or spreading; tube as long or shorter than the segments. Perianth campanulate, segments slightly undulate.

Distribution.—This species has been collected in Natal together with *A. Hollandii*, Leighton.

2. THE GENUS TULBAGHIA

Linnaeus has given this group of plants the name of *Tulbaghia* in honor to Tulbagh, a Dutch governor at the Cape of Good Hope who died in 1771. Sometimes the name of the genus is spelled *Tulbagia*, but the first name is the correct one. *Tulbaghia* is an African genus. Most of the species are found in the southern half of the continent, especially toward the Cape of Good Hope. For a long time only two species were known to science. Willdenow who edited the fourth edition of Linnaeus' *Species Plantarum*¹⁴ mentions *T. alliacea* and *T. cepacea*, both reported from the Cape. He called the former "*knoblauchartige Tulbaghie*" and the latter was named "*zwiebelartige Tulbaghie*," indicating that the scent of garlic and onion were noticed. In 1871 Baker recognized 7 species.¹⁵ He divided this genus into two subgenera, e.g. *EUTULBAGHIA*: [*T. capensis*, *T. alliacea*, *T. acutiloba*, *T. Dregeana* and *T. hypoxidea*] and *OMENTARIA*: [*T. cepacea* and *T. violacea*.] At present 24 species are known.

Although many species of *Tulbaghia* are very attractive, they are very seldom cultivated. The neglect is not deserved. Some species have been described and illustrated as colored plates. On Plate 806 of Curtis's *Botanical Magazine* (1805) we notice *T. alliacea*. Of this species it is stated that it is not uncommon in low sandy places in Cape Province, where it flowers in July. The Colonists called it "*Wilde Knoblook*" (Wild Garlic) and it was used by them, when stewed in milk, for disorders of the breast. Another colored illustration represents *T. Ludwigiana*, on plate 3547 of the same *Journal* published in 1837. *T.*

violacea was illustrated the same year,—plate 3555. One of the latest colored illustrations was contributed by Verdoorn, *T. fragrans*, Verdoorn, plate 438, Flowering Plants of South Africa (1931).

Different species of *Tulbaghia* show a number of interesting characteristics. The flower is very interesting. There is the corona, sometimes called a secondary corolla, which is somewhat similar to the corona in *Narcissus*. The six stamens are also peculiar; they are sessile and have very short anthers. Three stamens are usually much longer and are inserted on the corona, and the other three are found lower down in the flower and are attached to the corolla tube. These characteristics are well illustrated in longisection of the flowers of *T. Ludwigiana* and *T. fragrans* in the above mentioned colored plates.

The inflorescence is umbellate. Though small their bright color, sweet scent and excretion of nectar attracts numerous insects belonging to different species. Burchell in the account of his Travels (1810-1815), mentions fields of *T. alliacea*, smelling strongly of garlic when crushed, but the flowers giving out sweet scent toward the evening.

The habitat of *Tulbaghia* species ranges from dry grassy hillsides to swamps. Species are found from sea level to a height of 8000 feet.

Genus TULBAGHIA Linn.

Herbaceous, perennial plants. Bulbs relatively small, round to oval, producing a scent similar to *Allium* species. Leaves 3 to 10 to each bulb, deciduous, linear to lanceolate, sometimes ensiform, not seldom grooved, glabrous. Inflorescence a 5- to 40-flowered umbel. Spath-valves 2, usually membranous. Flowers small, brightly colored. Perianth gamophyllous, hypercrateriform; tube oblong or cylindrical; segments oblong to lanceolate. Throat of the flower surrounded by a corolla-like corona which may be entire and annular or may be composed of three processes that are distinct and placed opposite the inner segments. Stamens 6, sessile or with very short filaments of which three are usually inserted on the lobes of the corona and the remaining three are found lower down on the corolla tube. Ovary sessile, often 6-grooved, 3-celled, ovules many in a cell; style short, about 2 mm. long, columnar; stigma small, more or less capitate. Fruit a capsule, 3-valved. Seeds blackish, compressed, oblong; albumen fleshy. Testa loose.

Subgenus I. EUTULBAGHIA Baker

1. TULBAGHIA CAPENSIS, Jacq. Ejus. Hort. Bot. Vind. 2:t.115, 1770-1776; Linn. Mant. Plant. Alt. 223, 177; Baker. Journ. Linn. Soc. 11:370, 1871; *T. alliacea*, Gawl., Bot. Mag. t.806, 1805; Kunth. Enum. Plant. 4:481, 1833. (non. Linn. fil.).

Description.—Corm globose; roots fleshy. Outer leaves membranous, short, leaves 8 to 12, linear, 30 to 35 cm. long, 8 to 12 mm. wide, fleshy. Scape 32 to 60 cm. long. Umbel carries 6 to 8 flowers. Spathe-valves lanceolate, membranous, small. Pedicels 1.8 to 2.5 cm. long. Perigone 8 mm. long, purplish-green. Perigone-segments reaching half the length of the tube, lanceolate. Lobes of the corona

14. Willdenow, C. L., Linnaeus, Species Plantarum, ed. 4 2: 33-34, Berolini, 1799.
15. Baker, J. G. A Revision of the Genera and Species of Herbaceous Capsular Gamophyllous Liliaceae. Journ. Linn. Soc. Botany. 11:369-372, 1871.

deeply cleft, lanceolate, of about the same length as the perigone-segments, purplish-brown. The higher stamens opposite the staminods.

Baker distinguished *T. capensis* var. *gracilis*, a form that is less robust, its leaves being about 7 to 10 cm. long and 3 to 4 mm. wide.

Distribution.—Native to South Africa. No special locality is given. The var. *gracilis* has been reported from Little Namaqualand; Hardeveld, 600 to 1000 meters. Zeyher nr.4268.

2. TULBAGHIA SIMMLERI, Beauverd, Un nouveau Tulbaghia du Transvaal. Bull. Herbar Boissier. 2 Ser. 8:988, 1908.

Description.—Bulb ovate, tunicate. Leaves lorate-lanceolate. Corona ureolate crenate-trilobate, flowers light pink. Tube cylindric, short. This species is related to *T. Dregeana* and *T. natalensis*. It differs from the former by its pink colored flowers and its much larger leaves.

Distribution.—Native to Transvaal. No special locality is given.

3. TULBAGHIA DREGEANA, Kunth., Enum. Plant. 4:484, 1833; Baker, Journ. Linn. Soc. 11:371, 1871.

Description.—Outer leaves membranous, brown, 2.5 to 3.5 cm. long. Leaves linear, 7.5 to 15 cm. long, relatively firm. Scape 30 cm. long, slender. Umbel carries 4 to 8 flowers. Spathe-valves lanceolate. Pedicels 6 mm. to 2.5 cm. long. Perigone 6 to 8 mm. long, greenish. Segments 1 to 2 mm. long, lanceolate. Corona ring-shaped, brownish, crenate, shorter than the lobes of the perigone. The three longest stamens reach to throat of corona.

Distribution.—Native to Little Namaqualand; near Lily Fontein and Ezels Fontein, Drege nr.2658.

4. TULBAGHIA LUDWIGIANA, Harvey, Bot. Mag. t.3547, 1837; *Tulbaghia alliacea* var. *Ludwigiana*, Baker, Thiselton-Dyer, Flora Capensis 6:405, 1896-1897.

Description.—Leaves 15 to 20 cm. long, 2.5 cm. wide, bright green, glabrous, ensiform-ligulate, more or less acute, rigid, glabrous. Scape erect, narrow, glabrous, 60 cm. or more in height. Umbel of 6 to 8 flowers or more. Spathe-valves membranous, ovate, acute; pedicels 2.5 to 5 cm. long, slender, filiform. Tube 15 mm. long, greenish-purple or green with purplish streaks. Segments of perigone ovate, obtuse, as long as tube. Corona thick, fleshy, yellow, shorter than the segments forming a crown at the mouth of the tube. Filaments adnate to the tube of the perigone. Ovary glabrous, oval, with resinous glands or dots, 6-grooved. Ovules many. Style cylindrical, erect. Stigma subcapitate, truncate.

According to Harvey bulbs of this species were sent to the Ludwigburg Garden, Cape of Good Hope from the borders of Cafferland by Mr. Zier in 1834. This species has a strong scent resembling that of onions. Baker considers this plant a variety of *T. alliacea* L. to which it is apparently related.

5. TULBAGHIA CAMPANULATA, N. E. Brown, Diagnoses Africanæ XIII. Bull. Misc. Inf. Kew. nr.175: 136, 1901.

Description.—Corm not described. Leaves 20 to 30 cm. long, 3 to 4.5 mm. wide, obtuse, glabrous. Scape 25 to 30 cm. long and 2 to 2.5 mm. thick, glabrous. Spathe-valves ovate-lanceolate, acuminate, 5 to 10 mm. long. Umbel 5 to 7-flowered. Pedicels 5 to 8 mm. long, glabrous. Perigone-tube 4 mm. long and 3.5 mm. in diameter, bell-shaped. Segments 3 mm. long, about 2.5 mm. wide, oblong, acute. Corona large, 3 mm. long, crenulate or shortly trilobed, orange-red.

This species is related to *T. Ludwigiana*, Harv. It is a native to Cape Colony, Queenstown Division, in the mountains near Queenstown at 1200 to 1300 meter elevation. Galpin nr.1660.

6. TULBAGHIA ACUTILOBA, Harv., Thes. Cap. t. 180. 1854-1863; Baker, Journ. Linn. Soc. 11:371, 1871.

Description.—Roots with several fleshy fibers, corm surrounded by brown membranous scales, ampullaeform. Leaves 4 to 6, linear, more or less firm, 10 to 15 cm. long and 2 to 4 mm. wide. Scape 1.5 to 3 cm. long, slender, terete. Umbel composed of 2 to 6 flowers. Spathe-valves lanceolate, green. Pedicels 0.6 to 2.5 cm. long. Perigone 8 mm. long; tube oblong, greenish. Segments as long as tube, lanceolate. Corona ring-shaped, 30 mm. long, crenate, dark purple. Longest stamens reaching entrance of corona.

Distribution.—Native to South Africa. Table Mountain, Ecklon nr.94. Stock-stroom Div. Katberg, 1000 to 1300 meter, Drege, nr.1516. Near Somerset East, 1000

meters. MacOwen nr. 1582. Tembuland; near Gatberg, 133 meter, Baur nr.736. Natal; near Burban, Wood nr.43. Inan, Wood nr.173, and numerous other localities.

Baker distinguishes two varieties: *T. acutiloba* var. *Curta*, Baker, with shorter perigone-segments, not more than 2 mm. long; *T. acutiloba* var. *major*, Baker, which is more robust than the type. Peduncles about 45 cm. long, leaves 30 cm. long or more, numerous.

7. *TULBAGHIA LEUCANTHA*, Baker, Dyer Flora Capensis. 6: 404-405, 1896-1897.

Description.—Corm globose. Roots long and fibrous. Leaves 5 to 7, linear, glabrous, 12.5 to 15 cm. long and 2 to 6 mm. wide. Scape slender, often longer than the leaves. Flowers in groups of 3 to 6 in each scape; pedicels 1.2 to 2 cm. long. Perigone 8 mm. long, whitish, segments linear; tube oblong, almost as long as the segments. Corona crenate, about as long as the lobes of the perigone.

Distribution.—Native to the Kalahari Region: Transvaal, Bosch Veldt, between Kleinsmit and Kamel Poort. Rehmann nr.4892. Eastern Region: Griqualand East; Zuurberg, at an elevation of 1200 meters, Mac Owan and Bolus Herbarium. Norm Aust. Afr. 1208. Tyson. Natal: Umzinyate Falls, Wood nr. 1200 near Tugula River, Wood nr.4408.

8. *TULBAGHIA KARASBERGENSIS*, Glover, Flow. Plants and Ferns collected on the Great Karasberg. Ann. Bolus Herb. 1:104, 1915.

Description.—Corm globose. Neck membranous, 2 to 3 cm. long. Leaves 4 to 7, lanceolate, obtuse, glabrous, 13 to 24 cm. long and 3 to 5 mm. wide. Peduncles slender, 20 to 25 cm. long. Umbel carries 7 to 12 flowers. Spathe-valves ovate, acuminate, membranous. Pedicels about 3.5 cm. long. Perigone green, tube 6 to 7 mm. long. Perigone-segments linear-lanceolate, acuminate, 8 to 10 mm. long. Corona round, yellow, 3 mm. wide. Capsule oval-oblong, 1 cm. long, 6 mm. in diameter.

Distribution.—Native to Central and Eastern Karasberg, Krai Klufft. Of frequent occurrence between stones not far above the bed of the stream. nr.8192. Naradus Sued nr.8234. *T. karasbergensis* approaches in many characteristics those of *T. acutiloba*. It differs by its larger and differently shaped corm. Also the perigone segments are more acuminate.

9. *TULBAGHIA GALPINII*, Schlechter, Decades plantarum novarum auto-africanum. Journ. Bot. 35: 282-283, 1897.

Description.—Corm unknown. Plant small, reaching a height of 10 to 15 cm. Leaves 5 to 6, erect, linear, obtuse, base dilated, glabrous. Scape slender, glabrous. Spathe-valves narrow, membranous. Pedicels filiform, 0.3 to 0.8 cm. long. Perigone purple. Tube ovoid, 5 to 6 mm. long and 3 mm. wide. Segments linear-lanceolate, acute. Anthers ovate. Ovary sub-globose, glabrous. Style 1 to 1.5 mm. long. Stigma sub-capitate.

Distribution.—This species has been described from Andriesberg at an elevation of 2000 meters. E. A. Galpin nr.2179.

This species differs from *T. violacea* in the distinctly narrowed perigone-tube, ovoid toward apex, and in the more purplish flowers. It resembles *T. acutiloba* but differs from it in the separate corona-scales.

10. *TULBAGHIA DIETERLENI*, Phillips, Flora of the Leribe Plateau and Environs, Ann. South Afr. Mus. 16:300-301, 1933.

Description.—Corm with many thick, fleshy roots. Leaves 5 to 7 and 10 to 18 cm. long, 1 to 1.5 cm. wide, linear, obtuse; leaf-sheath membranous, glabrous. Peduncle 20 to 35 cm. long, 2 to 3 mm. thick, terete, narrower toward the top. Spathe-valves 1.5 cm. long, 4 to 4.5 mm. wide, glabrous, ovate, long, acuminate, membranous. Flowers 4 to 6 to each inflorescence. Pedicels 6 to 25 mm. long, terete, glabrous. Perigone-tube 5 mm. long, bell-shaped, glabrous, segments 5 mm. long and 3 mm. wide, oblong, obtuse, 3-veined, glabrous. Corona entire, 3 mm. long, with an undulating margin. Stamens sessile, the upper reaching to outside of corona; anthers 2 mm. long and 1.5 mm. wide, oblong. Ovary 1.5 mm. long, 2 mm. wide, suborbiculate in outline. Style 5 mm. long and 1 mm. wide. Stigma about 1.75 mm. broad, capitate.

Distribution.—Leribe, December, A. Dieterlen, 361. The distribution of this species is endemic. In Sensuto the plant is called "Sefotha-Sefotha" which means scent from a distance. Plants are cooked with *Pisosperma capense*. The infusion is drunk to rid the body of an imagined snake which has been brought by the witchcraft of an enemy. Some natives use the herb to increase the strength of to-

ballo. The scent of garlic in this species is very strong and it is therefore not used as food as in the case of *T. acutiloba*.

T. Dieterlenii is very closely related to *T. acutiloba*, Harv., from which it differs mainly by the obtuse lobes of the perigone.

11. *TULBAGHIA HYPOXIDA*, Smith, Rees. Cyclop. 1819. Baker, Jour. Linn. Soc. 11:370, 1871.

Description.—Leaves linear, 25 to 30 cm. long and 4 to 6 mm. wide. Scape 30 cm. long. Umbel carries 6 to 8 flowers. Pedicels 1.2 to 2.5 cm. long. Perigone 1.2 cm. long. Segments as long as the tube, linear. Corona subentire, not more than a quarter of the length of the perigone-segments, annular in shape.

Distribution.—This species is native to South Africa. No special locality is being given. The type specimen is in the Smithian Herbarium.

12. *TULBAGHIA ALLIACEA*, Linn. fil. Ejus. Suppl. Plant. 193, 1794; Thunb., Prodr. Plant. Cap. 60, 1794; Thunb., Flor. Cap. edit. Schult. 306, 1823; Baker, Journ. Linn. Soc. 11:371, 1871; *T. AFFINIS*, Link., Enum. Plant. 1:310, 1821; Roem. et. Schult., Syst. Veg. 7:994, 1833-1850; *T. BRACHYSTEMMA*, Kunth., Enum. Plant. 4:483, 1833-1850.

Description.—Corm globose with fleshy root-fibers. Outer leaves brown, membranous. About 6 to 8 leaves, erect fleshy, 15 to 45 cm. long, 4 to 8 mm. wide. Scape terete, 30 to 30 cm. long, fragile. Umbel carrying 6 to 10 flowers. Pedicels 2.5 to 5 cm. long. Spathe-valves membranous, ovate to ovate-lanceolate. Perigone 8 mm. long, greenish. Segments half as long as the tube, lanceolate. Corona ring-shaped, shorter than the segments of the perigone, purplish-brown to yellow. Upper stamens reach as far as the corona. Capsule ovoid, 1.2 cm. long.

Distribution.—Native to South Africa. Malmesbury Div.; Groene Kloof, 100 meter, Bolus nr. 4347. Cape Div.; Muizenberg, 330 meter, Bolus nr. 4649. Albany Div. Cooper nr. 3279. Stockstroom Div.; Katberg, 1000 to 1300 meter. King Williamstown Div.; Keiskamma, Transvaal Hills near Pretoria, 1300 meter; McLea Herb. Bolus nr. 3091. Natal, Sanderson nr. 429. Inanda, Wood nr. 257.

Baker remarks that the plants have usually a strong scent of onions, but in a plant grown by a Mr. Elwes this scent was entirely wanting.

13. *TULBAGHIA CAMERONI*, Baker, Description of New and Little Known Liliacea, Journ. of Bot. 16:321, 1878.

Description.—Corms and leaves unknown. Scape 15 cm. long, slender. Spathe-valves lanceolate, membranous, 2.5 cm. long. Umbels composed of 3 to 4 flowers; pedicels 1.2 cm. long, filiform. Perigone whitish, 1.3 cm. long; tube 6 mm. long, oblong. Lobes of perigone lanceolate, white and red-brown. Corona bell-shaped, sub-entire, 2 mm. deep to the base of the inner segments, 4 mm. to the base of the outer ones. Ovary sub-globose, 4 mm. long. Style not exerted from the corona.

Distribution.—Is reported to occur along the banks of Lake Tanganyika. Baker stated: "Now Cameron has found this species far within the tropical limits, and Dr. Welwitsch another in Angola."

14. *TULBAGHIA HOCKII*, De Wild., Decades Nov. Spec. flor. Katang, viii-xi. in Fedde Rep. Spec. Nov. Reg. 11:545-547, 1912.

Description.—Corm fibrillous. Neck membranous. Leaves 3 to 4, linear, 13 to 14 cm. long, 5 mm. wide. Apex rounded off, glabrous. Scape 25 to 27 cm. long, slender. Spathe-valves 1.5 cm. long. Umbel 7 to 12-flowered. Pedicels slender, about 28 mm. long. Perigone 7 to 9 mm. long. Segments lanceolate, as long as the tube. Corona cylindrical, margins irregularly dentate.

Distribution.—Native to the Upper-Katanga. Elizabethville. Nov. 1911. (Ad. Hock). This species is said to be related to *T. CAMERONI*.

Subgenus 2. OMENTARIA Baker

15. *TULBAGHIA VIOLACEA*, Harvey, Bot. Mag. t. 3555, 1837; Kunth Enum. Pl. 4:485, Baker, Journ. Linn. Soc. 11:372, 1871; Thiselton-Dyer, Flor. Cap. 6:407, 1896-1897.

Description.—Rudimentary basal leaves brown. Leaves 4 to 7, bright green, 15 to 20 cm. long and 6 to 7 mm. wide, linear-ensiform, somewhat grooved, obtuse, glabrous, coriaceous. Scape 30 cm. long or more, erect, slender, glabrous, narrow.

Umbel composed of 7 to 9 flowers. Spathe-valves membranous, wrinkled, purple tinted, acute. Flowers more or less erect, purple. Peduncles as long as perigone tube, slender. Outside of the perigone salver-shaped; tube 1.8 cm., perigone-segments linear, obtuse, as long as tube. Inner segments, short, oblong, obtuse or emarginate, sometimes bifid. Stamens clearly in two cycles; filaments adnate to the tube. Ovary ovate, short, 3-celled, six-furrowed. Ovules many. Style short, cylindrical, more or less angled, one-third as long as tube. Stigma obtuse.

Distribution—Coast Region: Post Elizabeth, E. S. C. A. Herb. nr. 262. Albany Div.; Bothas Hill, Mac Owan nr. 914. King Williamstown Div.; Keiskamma Hoek, Cooper nr. 544. Central Region: Albert Div.; by the Orange River, Burke. Eastern Region: Kaffrarian Mountains Mrs. Barbar nr. 41.

Baker in Thiselton-Dyer, Flora Capensis recognised two varieties e. g.—

T. violacea var. *minor*, Baker, peduncle 10 to 12.5 cm. long; umbel 3 to 6-flowered; pedicels very short, perigone-segments lanceolate, more than half as long as tube.

T. violacea var. *obtusata*, Baker, segments of the perigone-limb oblong, obtuse, 3 to 4 mm. broad. Syn. *T. cepacea* var. *robustior*, Kunth., Enum. Pl. 4:484.

16. TULBAGHIA NATALENSIS, Baker, Gard. Chron. 3 Ser. 9:668, 1891; in Thiselton-Dyer, Flora Capensis. 6:405, 1896-1897.

Description—Leaves 6 to 8, bright green, linear, 15 to 30 cm. long and 8 mm. wide, appearing during flowering time. Scape terete, 30 cm. long or more. Umbel composed of 6 to 10 flowers; spathe-valves lanceolate, 2.5 cm. long. Pedicels 6 to 12 mm. long. Perigone white. Tube bell-shaped, 3 to 4 mm. long. Segments obovate-cuneate, longer than the tube. Corona greenish-white, longer than the perigone-segments, slightly crenate, or deeply lobed. Anthers reaching to about half way to the corona.

Distribution—Native to Natal. A plant was received at Kew by Mr. J. M. Wood from the Natal Botanic Garden.

In general habit this species seems to approach closely that of *T. violacea*, Harv. The segments of the perigone are, however, longer than the tube.

17. TULBAGHIA FRAGRANS, Verdoorn, Flow. Plants of South Africa. 11: pl. 438, 1931; *T. pulchella*, Barnes non Avé-Lallemant, South Afr. Gard. & Country Life. 20: 185. illus. 1930; *T. Daviesii*, Gray. 1938.

Description—Corm ovoid, 5 to 6 cm. long and 3 to 3.5 cm. broad. The neck of corm 10 cm. long. Leaves 5 to 7, loriate, flaccid, 25 to 30 cm. long and 2 cm. broad. Scape 50 to 60 cm. long, smooth, compressed, 1.1 cm. wide, purplish green. Spathe-valves membranous, 1.5 cm. long. Flowers 30 to 40, sweet scented. Pedicels 2 cm. long. Perigone-tube 8 to 10 mm. long, segments 6 to 8 mm. long, mauve. Corona of similar color. Stamens sessile, three attached to the long corona-tube and the other three to the tube of the corolla. Ovary 3 mm. long, 6-grooved. Style 2 to 2.5 mm. long. Stigma small, capitate.

Distribution—Native to Transvaal; Lydenburg District, on the farm Dientje below the Treur and the Blyde Rivers. National Herbarium Pretoria Calliers nr. 8894.

Notes.—Dr. R. A. Dyer (HERBERTIA 6:8, 1939) states that this species "has been cultivated under the name *T. fragrans* and in [other gardens] as *T. pulchella*, but the former is the first valid name for the species." He also points out that this attractive species "has a very pleasant perfume instead of the strong garlic smell usually associated with species of this genus." In order to complete the record, the description by Barnes is also given:

TULBAGHIA PULCHELLA, Barnes non Avé-Lallemant, Plants New and Noteworthy, South Afr. Gard. and Country Life. 20:185, illus. 1930.

Corm oblong, surrounded by two or more fleshy, glabrous leaves. Neck membranous. Leaves 10 to 12, glabrous, more or less glaucous, 30 to 35 cm. long, strap-shaped. Leaves appear in the spring and are present during flowering. Scape about 40 cm. long, glabrous, glaucous. Umbel 20 to 30-flowered. Spathe-valves lanceolate, membranous. Pedicels about 4 cm. long, green. Perigone bright lilac, 1.4 cm. long, tube 7 to 8 mm. long, oval. Perigone-segments ovate-lanceolate, obtuse, 3 to 4 mm. long. Corona ring-shaped, lilac, 3 mm. long, two-cleft. Stamens above the corona. Style 2 mm. long. Capsule 3-angled. Seeds numerous, black and compressed.

Specimens were sent by Mr. C. N. Knox-Davies from Eastern Transvaal, Pilgrims Rest. Barnes states: "It is an exceptionally beautiful species, similar in the colour of its perianth to *T. violacea*, but differing widely in corona and leaf. In the shape of the corona it is nearest to *T. violacea*, but differs considerably in detail."

18. *TULBAGHIA CEPACEA*, Linn. fil. Ejus. Suppl. Plant. 194, 1781; Thunb., Prod. Plant. Cap. 60, 1794; Thunb. Flor. Cap. ed. Schult. 306, 1823; Willd. Spec. Plant. 2:34, 1797; Kunt. Enum. Plant. 4:484, 1833; Baker, Journ. Linn. Soc. 11:372, 1871; *Ontaria cepacea*, Salisb., Gen. Plant. 88, 1866.

Description—Basal leaves brown, membranous. Leaves 4 to 6, linear, 10 to 20 cm. long, 2 mm. wide. Scape 30 to 45 cm. long. Umbels 6 to 12-flowered. Spathe-valves lanceolate, lilac-tinted. Pedicels 6 to 10 mm. long. Perigone lilac, 1.2 cm. long. Perigone-segments oblong lanceolate, as long as tube. Tube 1 mm. in diameter, cylindrical. Corona lobes clearly visible to the base. Higher stamens situated in the tube near the throat.

Distribution—Native to South Africa. Uitenhage Div.; Van Stadens Berg, Burchell nr. 4741, Ecklon and Zeyher nr. 645. Also along arid situations in Kanna-land and Hantam. Thunberg Herb.

Species NOT CLASSIFIED under Subgenera

19. *TULBAGHIA CALCAREA*, Engler et Krause, Liliaceae Africanæ II., Engler Bot. Jahrb. 45:142, 1910.

Description—Bulbs subglobose, 1.2 to 1.8 cm. in diameter. Leaves glabrous, linear, obtuse, 1 to 2 dm. long or more, and 2 to 2.5 mm. wide. Scape 4 dm. long. Spathe-valves 1.8 to 3 cm. long. Flowers 1 cm. long, corona 2.5 to 3 mm. long. Fruit ovoid, 8 mm. long and 4 to 5 mm. in diameter. Flowers from November to December.

Distribution.—Reported from South West Africa near Grootfontijn, between lime stone. Dinter nr. 761 and 761-a.

20. *TULBAGHIA TENUIOR*, Krause et Dinter, Liliaceae Africanæ II. Engler Bot. Jahrb. 45:141-142, 1910.

Description.—Bulbs about 2.5 cm. long and 2 cm. in diameter. Leaves 2 dm. long and 1.8 to 2.5 mm. broad. Scape about 2.5 dm. long. Spathe-valves whitish, tinged with violet, 2 to 2.5 cm. long. Flowers light reddish brown, 1.8 to 2 cm. long. Flowers in December.

Distribution.—Native to South West Africa, near Grootfontijn along lime rocks. Dinter nr. 790.

21. *TULBAGHIA LUBBERTIANA*, Engler et Krause, Liliaceae Africanæ II. Engler Bot. Jahrb. 45:142, 1910.

Description.—Bulbs ovoid or globose about 2 to 3 cm. thick. Leaves glabrous, linear, 2 to 3 dm. or more in length, and about 3 mm. wide. Scape 4 dm. long, 5 to 7-flowered. Spathe-valves membranous, 2 to 2.5 cm. long; pedicels 2 to 4 cm. long. Capsules 6 to 8 mm. long and 4 to 5 mm. wide. The flowers of this species have not been found. The authors consider this plant important enough to elevate it to specific rank due to its peculiar irregular leaves. It is probably related to *T. alliacea*.

Distribution.—Reported from South West Africa. Luebbert nr. 44. No special locality is given.

22. *TULBAGHIA BRAGAE*, Engler, Die Pflanzenw. Ost. Afr. u. d. Nachbarb. Theil C 141, 1895.

Description.—Leaves narrow, linear, obtuse. Bracts lanceolate, acuminate, pedicels as long as the flowers. Tube two-thirds as long as the flowers; corolla segments linear, acute. Corona urceolate, orange. Outer stamens as long as the corona.

Distribution.—Native to East Africa. 20 (Beira-Braza.).

23. *TULBAGHIA PAUCIFLORA*, Baker, Liliaceae novae Africanæ australis herbarii regii Berolinensis., Engl. Bot. Jahrb. Beibl. nr. 35:5, 1892.

Description.—Corm small, oblong, 6 mm. in diameter. Leaves 5 to 6, filiform, glabrous, slender, 5 to 7 cm. long. Scape 5 to 7 cm. long, sometimes two from one corm. Umbels 1 to 3-flowered. Spathe-valves 6 to 8 mm. long, lanceolate. Pedicels

6 to 12 mm. long. Perigone-tube 4 mm. long, segments oblong sometimes linear, as long as the tube, white with a brown keel. Corona short, entire. Style very short. Capsule globose, 4 mm. in diameter.

Distribution.—Native to South Africa, no special locality is given. The type specimen is in the Herbarium at Berlin. C. B. Spei. (Ecklon et Zcyher, Hemerocall 6 !)

24. *TULBAGHIA MONANTHA*, Engler et Gilg, Kunene—Sambesi Expedition. 192-193, 1903.

Description.—Corm about 2 cm. long and 1.2 cm. wide. Leaves 5 to 7, narrow, linear or linear-filiform, glabrous, 13 to 15 cm. long and 1 to 1.8 cm. wide. Scape 11 to 12 cm. long. Spathe-valves elongated. Flowers 12 mm. long, tube 6 to 7 mm. long, corona 2 mm. wide.

Distribution.—Along the Kubango, within Kabinder. In loamy sandy soil under shrubs. (nr. 351-a) Flowers in October.

3. CONCLUSION

We have come to the end of this general review of the genera *Agapanthus* and *Tulbaghia*, that are found along the margins of two important families, namely the *Liliaceae* and *Amaryllidaceae*. With keen insight Hutchinson (1934) undoubtedly placed these genera closer to their nearest relatives. It might be well to note, in this connection, the statement of the late Sir Arthur W. Hill, Director of the Royal Botanical Gardens at Kew in the foreword of above work—"Though the treatment of these two families may arouse some controversy among the more conservative taxonomic botanists, it is, I believe generally felt that the present *Liliaceae* is not a very natural family. The revision of the two families, therefore, is all the more welcome," which is also our credo.

THE BRUNSVIGIEAE¹

HAMILTON P. TRAUB

The group under consideration was first recognized in embryo by Pax (1887) as Subtribe *Amaryllidinae* of his Tribe *Amaryllideae*. He admitted the genera *Nerine*, *Amaryllis* Aiton et Herbert non Linn. (now recognized as a synonym of *Brunsvigia* Heist.)², *Brunsvigia*, *Vallota*, *Anoiganthus* and *Ungernia*. In a revision of this Subtribe by Pax & Hoffman (1930) no important changes were made. This grouping of the genera is artificial, but it can be said that at least the first three of the six genera as recognized by him are closely related. This makes it possible to salvage the group. Of the remaining three genera, none are closely akin to the first three. *Vallota* and *Anoiganthus* are closely relatives of *Cyrtanthus*, and *Ungernia* is allied to the Genus *Lycoris*. A number of genera—*Crinum*, *Ammocharis*, and *Buphone*—that are allied to the first three genera listed above, were left elsewhere among strangers. *Crinum* and *Ammocharis* were placed by Pax under the Subtribe *Crininae* along with *Chlidanthus* and *Cyrtanthus*, thus creating a very artificial group. Later Pax & Hoffman (1930) placed a new genus *Stenolirion* (now recog-

¹ This is abridged from Chapter 12, The Brunsvigia Tribe (Tribe 6. **Brunsvigieae**) of the writer's manuscript monograph on the **Amaryllidaceae**. It is published in this abridged form at the request of members interested in this group.

² See Hannibal, L. S. Callicore and Brunsvigia. *Herbertia* 9:101-102, 146. 1942 (1943).

nized as a synonym of *Ammocharis*), under the Subtribe *Crininae*. *Buphone* was placed under the Subtribe *Haemanthinae*.

Hutchinson (1934) elevated Subtribe *Amaryllidinae* Pax to higher rank—Tribe *Amaryllideae*—and admitted the same genera as those recognized by Pax (1887), excepting the genera *Vallota* and *Anoiganthus*. The latter appears nowhere in Hutchinson's arrangement, and *Vallota* was transferred to the Tribe *Crineae* (Pax) Hutchinson which also included the Genus *Cyrtanthus*. This was a slight improvement, but *Crinum*, *Stenolirion*, *Ammocharis* and *Buphone* were still left among strangers.

The Tribe *Amaryllideae* (Pax) Hutchinson, as recognized by Hutchinson (1934) evidently overlapped with the Tribe *Crineae* (Pax) Hutchinson. At least two genera appear under both tribes according to the artificial key of Hutchinson (1930). This indicated that the two tribes had not been critically considered from the standpoint of phylogeny. This led Traub (1938) to propose a reclassification of all members of these two tribes, as recognized by Hutchinson (1934), on the basis of seed structure—seeds subglobose to globose, Tribe *Callicoreae* Traub [syn. Tribe *Amaryllideae* (Pax) Hutchinson] as contrasted with seeds flat, usually winged, Tribe *Cyrtantheae* (Herbert) Traub [syn. Tribe *Crineae* (Pax) Hutchinson]. This reclassification brought together under the Tribe *Callicoreae* Traub the genera *Stenolirion*, *Crinum*, *Ammocharis*, *Callicore*, *Brunsvigia* and *Nerine*. Uphof (1938) had shown that *Amaryllis* Aiton et Herbert non Linn., was a synonym of *Callicore* Link, which made it necessary to propose the change in tribal name from *Amaryllideae* (Pax) Hutchinson to *Callicoreae* Traub. The Tribe *Callicoreae* Traub thus includes all of the closely related genera mentioned above, excepting *Buphone*, and therefore constitutes a genuine natural group. It is in line with the grouping of "*Ammocharis*, *Cybistetes* and Allied South African Genera" by Milne-Redhead and Schweickerdt (1939) who list *Ammocharis*, *Cybistetes*, *Buphone*, *Crinum*, *Brunsvigia*, *Nerine* and *Amaryllis* Aiton et Herbert non Linn. (Now recognized as a synonym of *Brunsvigia* Heist.) It should be noted that these workers reduced *Stenolirion* to a synonym of *Ammocharis*; proposed the new Genus *Cybistetes*, and transferred here for the first time the Genus *Buphone*. This family completed the group from the phylogenetic standpoint. These changes and the addition of one genus are accepted in the present work. However, the addition of the Genus *Cybistetes* is tentatively accepted. Space limitations do not permit of a full discussion of this subject.

Herbert (1821) was the first to question the generic status of the provisional Genus *Amaryllis* Aiton et Herbert non Linn. (now recognized as a synonym of *Brunsvigia* Heist.). Worsley (1928), who made a special study of the genera involved, again raised the question. Herbert (1821) had expressed the belief that any differences between this genus and *Brunsvigia* were of questionable value as generic distinctions. Worsley (1926, 1928) presented evidence to show that there was apparently gene exchange resulting in fertile hybrids when species of these two genera met under natural conditions. In England, Holland and Australia, in the meantime, a series of beautiful fertile hybrids between species, assigned to the genera under consideration, had been produced. These results

have been summarized by Worsley (1926, 1928), Cowlshaw (1925) and Hoog (1935). This completed the evidence showing the intimate connection between species apparently erroneously assigned to two different genera.

These facts led Hannibal (1943) to propose *Callicore* Link. (syn. *Amaryllis* Aiton et Herbert non Linn.) as a synonym of *Brunsvigia* Heister. This latter genus was founded by Heister in 1853. It bears a valid name that has priority in nomenclature over the former which dates from 1829. This disposition of a provisional monotypic genus—the single species being capable of exchanging genes when its range overlaps with species of another genus—is apparently justified on the basis of the evidence presented. The gap between them is not sufficiently great to warrant two separate genera. We agree with the tentative definition of a genus proposed by Mayr (1942)—“A genus is a systematic unit including one species or a group of species of presumably common origin, separated by a decided gap from other similar groups. It is postulated for practical reasons that the size of the gap shall be in inverse ratio to the size of the group.”

Now that the generic name *Callicore* Link has lapsed into synonymy, it is necessary to make a final change in the tribal name. *Callicore* Link has become a synonym of *Brunsvigia* Heister and it is logical to base the new tribal name on the latter Genus. This is particularly fitting for the Genus *Brunsvigia* Heister is now indicated as the nomenclatural generic type of the tribe. The new tribal name, *Brunsvigieae*, is therefore proposed.

The masterly treatment of “*Ammocharis*, *Cybistetes* and Allied South African Genera” by Milne-Redhead and Schweickerdt (1939) did much to clarify some of the problems in connection with this group, especially in the case of *Crinum* and *Ammocharis*. The important bearings of their work on the delimitation of genera are discussed in detail under the genera concerned.

On account of lack of space, it is not possible to consider in more detail these genera and the others included under the Tribe *Brunsvigieae* in the present brief summary. However, the diagnosis of the Tribe, and the key to the genera, are given in some detail in order to indicate the scope of the Chapter.

Tribus 6. BRUNSVIGIEAE, Traub, *nom. nov.*

Amaryllidinae (subtribus), Pax, Engl. Nat. pfl.-fam. II (5); 105-106.1887; Pax & Hoffman, Engl. nat. Pfl.-fam. 15a, 2 auf. 1930, pp. 404-406; *Amaryllideae* (tribus) Pax et Hutchinson, fam. fl. pl. 1934, vol. II, p. 132; *Callicoreae* (tribus) Traub, *Herbertia* 5:111-113.1938.

Type genus: Brunsvigia Heister

Diagnosis.—Rootstock a bulb, leaves linear to oblong, biflabellately, spirally, or distichously arranged; flowers actinomorphic or zygomorphic; seeds subglobose to globose.

Key to the genera of Tribe 6. Brunsvigiaceae

- A. Leaves distichously or spirally arranged :
- B. Ovules numerous per locule :
- C. Pedicels not elongating in fruit 34. *Crinum*
- CC. Pedicels usually elongating in fruit (includes *Callicore*, Link) 35. *Brunsvigia*
- BB. Ovules few per locule :
- D. Perigone-segments equal, not crisped, actinomorphic, stamens inserted at throat of perigone-tube, pedicels elongating in fruit 36. *Buphone*
- DD. Perigone-segments subequal, more or less crisped, zygomorphic; stamens inserted at base of perigone segments, pedicels not elongating in fruit 37. *Nerine*
- AA. Leaves biflabellately arranged :
- E. Perigone actinomorphic 38. *Ammocharis*
- EE. Perigone zygomorphic 39. *Cybis tetes*

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BRUNSVIGIA ROSEA AND HYBRIDS

L. S. HANNIBAL, *California*

The South African "Cape Belladonna Lily," *Brunsvigia rosea** established itself in a very congenial home with the colonization of California in the middle of the last Century. The sources of the original types introduced are quite unknown. They may have come from cultivated stock grown in the Mediterranean area since there is much similarity between plants from that area and our very common early flowering variety *major* and a pale rose type which flowers somewhat later (See HERBERTIA: 159-160, 1941). It was generally accepted that these clonal forms, and a *rubra* type known as *Minor*, represented the sum total of our older garden importations, but the discovery of two other distinctive types recently in old gardens about San Francisco Bay attracted some interest in the nomenclature of these attractive plants. Subsequent attempts to identify these clones which one would assume as simple soon proved otherwise. Few of the horticultural types have been completely described—No monograph exists, and at best only a few widely scattered reports are available; the oldest dates back to 1755. None of these offered much aid in the original problem of identification of the local types. Extended correspondence with several West Coast members of the A. A. S. indicated that although several other forms of the "Cape Belladonna" existed their nomenclature was uncertain or very vague.

Believing a check list would be of value the writer then undertook to locate as much general data as available on the clonal types and hybrids of this interesting species and its relatives. This involved the examination, partly by the use of bibliofilm, of many early descriptions and bits of historical data which are now seldom available. To make the survey up to date, clones listed in catalogues of a half dozen foreign firms and as many firms as could be found in the U. S. A., were included. Van Tubergen's newer 1940 presentations are listed although no record of a number of these reaching the public can be found—We hope that they may survive in spite of the European chaos.

The tracing of the horticultural types by early description is indeed perplexing, but is understandable when one realizes that few writers checked their living specimens closely with earlier references or preserved type specimens, and names had been confused repeatedly. Historically the original bulbs were introduced into Portugal some time before 1700—Possibly in 1510 during their conquest of Goa in India. In Portugal, the plants became associated with religious festivals. In 1712 the London Horticultural Society imported several bulbs from Maderia and as they gained in popularity, Miller illustrated the plant

* *Brunsvigia rosea* (Lamarck) Hannibal; syn: *Callicore rosea* Link; *Amaryllis belladonna* Aiton et Herbert non Linn. See *Herbertia* pp. 101-102; 146, 1942. See also "The Genus *Amaryllis*," *R. H. S. Journal* 57, pp. 8-14, 1932. The name *Brunsvigia rosea* supersedes the synonyms and will be used throughout this report. The accepted common name is "Cape Belladonna." To distinguish between *Brunsvigia rosea* and those plants previously alone classed as *Brunsvigia*, the name *Eubrunsvigia* (subgenus) will be applied to the latter, and *Callicore* (subgenus) to the former, when referred to collectively.

and described its culture in his Gardener's Dictionary of 1755. Since it was already called the "Belladonna" in Portugal he assigned this name to it but stated that it did not coincide with the *Amaryllis Belladonna* Linn. (syn. *Hippeastrum equestre* Herb.) from the American Indies. Miller's plant was a *rosea* type having a fine penciling of light red in the perianth. Purple shadings in the throat were also quite common since numerous seedlings were raised and some variation was present. Van Royen of Leyden introduced a *pallida* type from the Cape in 1754, and Sir Joseph Banks also brought in a pale form which was less hardy than the *rosea* variety. *Blanda*, a distinct type, which Mr. Hibbert had in his collection, was never widely distributed although it seems that Dean Herbert produced some crosses with it that later appeared in France. The original plants in Portugal also spread to Italy and France, and either by chance or selection, seemed to have been more of the rose-purple in contrast to the English forms. As all of the early writers used whatever material they had available to illustrate the plant it is natural that some appreciable variation in form, type, and color exists in the various illustrations. Since Herbert's time, with the introduction of *Brunsvigia* hybrids, a new field of hybridization was opened up giving numerous new forms. The names of Bidwell, Sir Henry Parker, Van Tubergen, and Arthington Worsley will long be associated with this interesting race which is quite distinct from the intra-specific forms.

Although the writer could not obtain specimens or detailed taxonomic descriptions for all the clones listed in the check list, an attempt has been made to group them according to the outstanding characteristics as one would with the hybrid daffodils. This grouping should therefore be accepted as only tentative. Obviously some clones may be misplaced or apparently misnamed, for old names are often affixed to new or improved clones. This list should therefore serve as a starting point for further checking. One should continually bear in mind that color descriptions can be quite misleading as strong light tends to produce lighter shadings. Thus noticeable variation is evident for bulbs grown in Australia, England, South Africa, or California where latitude and climatic conditions are so divergent.

As an additional feature, the *Brunsvigia* inter-specific hybrids, and the *Crinum* F-1 bigeneric forms, were examined. If it were not for the work of Worsley much confusion would exist in the literature regarding the identity of the inter-specific *Brunsvigia* hybrids of which two general types apparently exist; those that are crosses of *Brunsvigia gigantea* (Van Marum) Traub (syn: *B. Josephinae* Redouté) on the *Brunsvigia rosea* which produce the *Parkeri* type of hybrids, and the crosses of *B. orientalis* Linn. (syn: *B. multiflora* Ait., or *B. gigantea* Heist.) which gave rise to the Bidwell "*Multiflora*" hybrids. Other species of *Brunsvigia* may have been used by Bidwell, at least he used the pollen of several. The literature contains no record as to the types of *Brunsvigia rosea* parentage used by any of the hybridizers, but this is not important since the "*Parkeri*" and "*Multiflora*" forms are the selection of the best from numerous crosses where many wide variations or breaks are

possible. The type of selected parents used in subsequent crossings is of far more importance and many F-2 and later segregates possess qualities which far exceed those of the original clones. However this progressive improvement is not so readily obtainable if one reintroduces common *Brunsvigia rosea* pollen.

It is only within the last few years that any of these hybrids arrived on the Pacific Coast, but at present a limited supply is available. The forms best known here are the "*Parkeri Van Tubergeni*" types which vary from light rose to white, and several white "*Bidwell Multiflora*" clones. So far, none of Sir Henry Parker's crosses have been recognized here with the exception of a clone that resembles *Kewensis*, although there may be a possibility that *Brunsvigia rosea* var. *minor* may belong to this group.

Van Tubergen was the first to propose the name "*Brunsdonna*" for his hybrids in 1906. Worsley favors the use of this name for all hybrid crosses and refers to them as "Garden Brunsdonnas" in contrast to "Garden Cape Belladonnas" which applies to *Brunsvigia rosea* forms supposedly of non hybrid stock. Since Worsley's reports are so complete, it is quite easy to trace the source of all but a few of the hybrids of which he thought so much. In several of his later writings (Gard. Chron. 84, 1928, p. 349; abstr. HERBERTIA: pp. 99-100, 1942.) he had suggested that this group was not of bigeneric origin since Dean Herbert had effected crosses both ways between several *Brunsvigia* and the "Cape Belladonna" and had seen no reason for two genera. Worsley also gave examples of hybrids having been found in the wild, and described several forms that are barely distinguishable from supposedly non-hybrid segregates.

In F-1 hybrids with *Brunsvigia gigantea* (syn. *B. Josephinae*) that have been secured both ways, those with *B. gigantea* seed parentage are very dissimilar from those raised on the "Cape Belladonna." The former resemble *B. gigantea* in form and are of slow growth, taking 15-30 years to flower, while the latter resemble *B. rosea* in structure, and flowers in 6 to 12 years, thus perplexing those who consider that whichever way a hybrid is raised it must bear the same name. This behavior and the ease of effecting these crosses where the offspring are entirely fertile at once raises the moot question as to just what constitutes a genus and what are its limitations. The bigeneric cross of *Crinum Moorei* on *Brunsvigia rosea* has long been known. The *Crinum* characteristics are seemingly dominant as sterile crinum-like offspring are always produced, representing what we should expect of a bigeneric offspring. But should the two genera discussed above (*Brunsvigia* and *Callicore*) which produce fertile offspring, be placed in separate genera? In 1837 Dean Herbert wrote that "No plants which interbreed can belong to separate genera" (HERBERTIA, 4, 1937. P. 37).

Brunsvigia rosea is apparently more closely related to the *Crinum* species of the Subgenus *Codonocrinum* than to the species classed under the two subgenera *Stenaster* and *Platyaster*. Although crosses between species of the latter two subgenera with those of the Subgenus *Codonocrinum* have been reported, it is doubtful if such are really possible.

The writer has not been able to verify any of these. At any rate the subject needs further investigation. There are a great many species of *Crinum* and only a fraction of them have been used in breeding experiments up to the present.

Morphologically the *Eubrunsvigia*, are semi-tropical in habit. The leaves are few, lingulate, and large; the scape short and thick, and they carry a large umbel of many flowers on long pedicels in an open hemispherical pattern. In contrast *Brunsvigia rosea* (Subgenus *Callicore*) comes from a restricted area about the Cape where the climate is more temperate. It retains some of the *Crinum* characteristics in that the flowers are few on a long scape, and the leaves are channeled and lance tipped.

It should be noted that there is a correlation between bulb sizes and shapes and leaf shape; the variety *major* has a linear leaf 1" wide with a near lance tip. The large, long pseudo-necks of the Bidwell "*Multiflora*" group produce a leaf with a blunt rounded tip, while *Parkeri* parentage which apparently produces very large oval bulbs, has a pointed semi-lorate shaped leaf that is several inches wide. Leaf number apparently varies with the clone and type—Variations from 7-16 leaves having been found among the varieties the writer has observed, but 12-14 seem to be normal for most of the non-hybrid types. Some of the variations in number of leaves and bulb sizes are summarized in the following table.

Leaf and Bulb Variations of BRUNSVIGIA ROSEA clones

Clone:	No. of Leaves:	Bulb Size:
BRUNSVIGIA ROSEA or "Cape Belladonna" types		
Variety <i>Major</i> , The common Calif. garden form)	10-12	Large
Chilean form, (A Chilean escape)	14	Medium
Variety <i>Minor</i> , (Of Carifornia)*	11-12	Small-Globular
Bicolor No. 1, (A seedling of <i>Minor</i>)	12-14	Medium
Bicolor No. 2, [An apogamic (?) seedling of above No. 1]	8- 9	Medium
Hybrid PARKERI types		
Kewensis type (Orpet) "Santa Barbara"	6- 7	Medium
Seedling of Elwe's <i>Rubra</i> , (An Oakhurst hybrid)	11	Very large
Seedling of <i>Minor</i> , (An Oakhurst hybrid)	8	Large
F. Leach's <i>Blanda</i>	10	Large
Hybrid Bidwell BRUNSVIGIA MULTIFLORA types		
<i>Multiflora Rosea</i>	12	Large
<i>Multiflora Haythor</i>	14	Large
<i>Haythor</i> (Possibly from Mrs. Bullard)	13	Large
<i>Baptisii Alba</i>	11	Medium
Orpet White	12	Large
Orpet <i>Multiflora</i> seedling	10	Large

* Possibly a hybrid **Parkeri** type; both this and the Chilean escape have seed stalked on placenta 3 mm. long. Once considered strictly a **Brunsvigia** characteristic, it is quite common in a number of clones, especially the hybrids.

CULTURE

Brunsvigia rosea varieties require a long, warm, dry summer and a moist, cool, near frost free winter for a normal habitat. The East Coast of the United States has never been well suited to their growth, and Florida conditions of wet, humid summers and dry winters are entirely at odds with their requirements. Perhaps the potting of the bulbs in a half nail keg full of loam, as has often been used on the Pacific Coast, could be tried by our A. A. S. friends in Florida, and similar methods could be used in other areas where protection from hard winter freezes or moist summer rains is desirable. At best transplanting should be avoided, for the "Cape Belladonnas" dislike root disturbances and usually take two or three years to reestablish themselves. The custom of planting the bulbs in full sun may also be overdone; in areas where daytime humidity may drop below 30%, part shade is conducive to better leaf growth and flowering.

Brunscrinum Howardii, the *Brunsvigia rosea* X *Crinum Moorei* hybrid, enjoys some moisture in summer and is well adapted to Floridan climatic conditions. The writer suspects that some hybrid *Brunsvigia* may eventually be developed which will also grow and flower under such conditions since several *Brunsvigia spp.* are said to be summer growing, winter resting plants. Unfortunately the required species like *Brunsvigia minor* and *B. Cooperi* seem practically unknown to the U. S. hybridizers; perhaps our South African friends will avail themselves of this interesting opportunity.

Soil conditions for *Brunsvigia rosea* varieties is not critical. Any good loam or clay soil which is suitable for roses is entirely satisfactory for these bulbs, but soils high in sand content may prove too porous. Different soils have little or no effect on color variations for any one clone, but intensity of light is important. Planting depth is likewise not critical; apparently in normal habitat a 2/3 bulb coverage is all that is required. In England the bulbs are planted two feet deep to avoid freezing. The *Parkeri* and other hybrids require a lighter loam and a warmer location. The large size and elongated necks of the Australian *multiflora* hybrids suggest that a shallow planting with a ground cover is advantageous. *Brunscrinum Howardii*, (syn. *Amarcrinum Howardii*) and similar *Crinum* X *Brunsvigia* hybrids in contrast need only the base of the huge bulbs covered, but *Crinum Moorei* parentage makes it advisable that this race receive some mid-day shade in warm areas. The plants have been grown outside at Kew where winter frosts of 15 degrees F. have not harmed the foliage.

REPRODUCTION

The writer has had little difficulty with *Brunsvigia rosea* varieties setting seed. As soon as the stigma raises into a receptive condition, which is 3 or 4 days after the flowers open, pollen should be applied. If the plants are left to themselves, self or cross fertilization usually takes place. The hybrid forms set seed most freely, but this is due to the fact

that these are not inbred pure line strains like the variety *major*, common in California, but not a prolific seed producer. Dry climates are always conducive to effective pollination for coolness and moisture promote the best seed production. About Valparaiso, Chile escape plants have spread by seed over large areas; they have been reported in regions where there are no vestiges of human habitation, but such conditions have not been noticed in California although the plants "self sow" quite readily. Rapidity of offset development and man's love for fine flowers have contributed largely to the distribution here.

Apogamic development of seeds may occur in the case of *Brunsvigia rosea*, but no exact data on this subject have as yet been presented.

The ease of crossing several varieties of *Crinum Moorei* on *Brunsvigia rosea* is interesting. Only two or three varieties out of a score of forms seemingly are capable of crossing, but with these few a distinct "take" can be noted from the first. Growth begins while the seed are still in the capsule. Plants one year old are distinctly crinum-like with bulbs often over an inch in diameter. Reverse crosses with a *Crinum* as seed parent have not been a success here, and there is some uncertainty regarding their existence. Neither have crosses with *Crinum* other than *Moorei* been definitely reported. However there are unquestionably interesting possibilities to be tried by our friends who have *Brunsvigia* and *Crinum* collections, for other forms of the *Brunscrinum* breed would indeed be welcome additions to our gardens.

KEY TO HORTICULTURAL FORMS OF *BRUNSVIGIA ROSEA* AND *BLANDA*, INTER-SPECIFIC,
AND INTER-GENERIC HYBRIDS

A. Species, intra-, and inter-specific hybrids of *Brunsvigia rosea*.
Plants deciduous.*

B. Intra-specific variations and horticultural forms of the subgenus *Callicore*; leaves linear, flowers few (seldom over 12).

C. Plant semi-hardy, flowers white turning suffused pink, leaves wide and sheathed in pseudo-neck 1. *B. blanda*

CC. Plants hardier, leaves linear, up to 1½" wide, no pseudo neck, flower colors as follows; (*Brunsvigia rosea* variations).

D. Colors uniformly blended light pink, pale lavender, or near white, fading slightly with age 2. *Pallida*

DD. Colors to coral red or rose, often deepening with age or not uniformly blended 3. *Rosea*

DDD. Colors same as DD, but set off in contrast to a white throat of large area 4. *Bicolor*

DDDD. Colors purple or lavender, especially in the expanding part of the segments 5. *Purpurea*

DDDDD. Flowers near white or soft pink, color deepening very pronounced with age 6. *Variabilis*

BB. Natural (?) and horticultural inter-specific hybrid forms of subgenus *Callicore* X species of *Eubrunsvigia*; plants often tender to frost, umbel large, flowers numerous and less compact than

CC, leaves often lingulate and sheathed in pseudoneck, mature ovaries large and fruit numerous.

E. Crosses of Spp. Subgenus *Callicore* (Pistillate) X Spp. Subgenera *Eubrunsvigia* (Staminate), i. e. *Corevigia*.

F. With *B. gigantea* (Syn *B. Josephine*) 7. *Parkeri*

FF. With *B. orientalis* (Syn *B. gigantea of multiflora*) 8. *Multiflora*

EE. Crosses the reverse of E, i. e. 9. *Brunscorea*

AA. Inter-generic hybrids of any *Brunsvigia Spp.* X *Crinum Spp* of subgenus *Codonocrinums*: Plants Evergreen.

G. Pistillate parent a *Brunsvigia* 1. *Brunscrinum*

GG. Pistillate parent a *Crinum* 2. *Crinovigia*

* Note; forms DD and DDD were both called **rosea** in the past. The plants of F and FF are often of the same shades and form of C, DD, and DDD and probably should be classed as such, as they often represent segregates approximating these ancestral forms.

I. *Species and intra-specific variations of subgenus Callicore*

I. BLANDA TYPE: a species or natural hybrid with white flowers which turns light pink with age.

Brunsvigia blanda (Gawler): HERBERTIA, pp. 101-102; 146. 1942. *Amaryllis blanda* Gawler: Bot. Mag. plate 1450, 1812. *Belladonna blanda* Sweet: Hort. Brit. 2nd. Ed. p. 506. *Cobergia blanda* Herbert: Curt. Bot. Mag. pp. 1-50, 49, 1822. *A. blanda* Herbert: Amaryllidaceae pp. 278-279. 1835. *Amaryllis belladonna* var. *blanda* Baker: Handbook of Amar. pp. 96. 1888. Also see Gard. Chron. P. 349. 84. 1928.



Fig. 89. *Brunsvigia rosea*, upper left, var. *major*; upper right, var. *minor*; lower left, var. *Looseriana*; lower right, *Brunsvigia* hybrid, Frank Leach.

This clone which may be a natural *Brunsvigia* hybrid has been lost to garden use since Herbert's time as it proved too tender for outdoor growth. Pending further information it is retained as a species although Worsley is quite convinced that it is a natural cross approximating the present *Parkeri* segregates, several of which he had in his collection. *Blanda* was introduced to cultivation in 1754. Her-

bert considered it distinct due to its wide leaves which are well sheathed in a pseudo-stem or neck. He used it in breeding since several *Blanda* hybrids were listed by continental nurserymen, and also by Montagu of Australia. But the fact that Mr. J. E. Elwes could not locate the true one for his collection suggests that the original clone has long been lost.

2. PALLIDA TYPES: Flower colors clear and delicate, uniformly blended with shades from white, or near white, to pink, soft rose, or pale lavender. Umbels compact, mostly fragrant and leaves sheathed in a green pseudo-neck. (All forms of *Brunsvigia rosea* have the leaves sheathed in a pseudo-neck although it is usually very short or obscure. A red-green or reddish pseudo-neck indicates a deeper colored flower.)

(a) *Brunsvigia rosea* var. *pallida*. Syn. *Amaryllis belladonna pallidas* Bot. Reg., t. 714.; *Belladonna pallida* Sweet: Hort. Brit. 2nd Ed., 1830.; *A. b.* var. *pallida* Redoute: Les Lil. t. 479.

This clone has few flowers to the umbel of a pale pink color, bulbs small, leaves slender. Gathered by Sir Joseph Banks in the Cape area.

(b) VAN ROYAN VARIATION. Herbert's *Amaryllidaceae*, 1837, P. 277. Curt. Bot. Mag. 19, 1804, t 733. Millers Garden Dict. 1755, Text No. 23, (No Plate)

Sir J. Banks and Van Royen, as well as Herbert, introduced pale forms of *pallida* types from the Cape. One of these forms, which is quite distinct from the *Blanda* of Bot. Mag. 1450, is still occasionally grown. It flowers in Calif. about October 1st. The segments are relatively narrow and the tube is short. It contains a light pink venation of a lighter shade than "Belladonna Major," but cannot be said to be of any outstanding merit. (See Fig. 89; "Chilean Belladonna," a near duplicate.)

(c) *Brunsvigia rosea* var. *Looseriana*. Syn: *Amaryllis belladonna* Looser: Nat. Hort. Mag. 21, 1942, P. 48. "Chilean Belladonna" (common name).

An escape form found about Valparaiso, Chile. An examination of a number of bulbs collected by the University of California Andes Expeditions showed very little variation in this bulb type. The flowers are a very pale pink with white throat and a yellow eye. The perianth segments are exceptionally narrow and quite reflexed. Scapes slender and red. Leaf number 14 which is the highest commonly observed. The foliage is narrow and deep green. It breeds true. See Fig. 89.

(d) *Brunsvigia rosea* var. *stricta*. Syn: *Amaryllis stricta*: (Montague Catalogue) Described by Montague as a light pink and white form.

3. ROSEA TYPES, including "Cape belladonna" types. Flowers tipped rich coral red or rose, often in marked contrast to a white throat. The colors may deepen appreciably as the flowers age, but the delicate shadings are usually not as uniformly blended as in *Pallida* Types. Scapes often colored red or red-green, and bulbs are sometimes small and globular. Several forms are not very frost hardy. Propagation by offset is usually prolific. Most forms have fragrant flowers but are not all free flowering.

(a) *Brunsvigia rosea* (Lamarck). Syn. *Amaryllis rosea* Lamarck: Dict. Enc. dr. Bot. 1, 1789, P. 122.; *Amaryllis belladonna*. Curt. Bot. Mag. 19, 1804, t 733.; Mrs. Bury's Hexandrian Plants, t. 45.; Trattinicks Thesaurus Bot. 40.; Linn. 2nd. "MS in HERBERTIA, 4, P. 99.; Baker's *Amaryllidaceae* 1888, P. 95.

The type species. Lamarck bases his description on Millers Plate No. 24 and states: "Umbels 2½' high with rather long perfect campanulate flowers of clear purple (?) blending to a white (throat) and a very pretty red (perianth). Flowering in Sept. or Oct." Plate 733 in the Botanical Mag. shows a light purplish-rose shade in the throat and states this plant came from Portugal in 1812.

(b) *Brunsvigia rosea* (Miller), Syn. *Amaryllis belladonna* Miller: Miller's Garden Dictionary, 1755 or 17771 with plates, Vol. 1, P. 15-16, t 23 and Plate 24.; Redoute's Les Liliacees, Vol. 3, t 150. 1806.

Miller's bulbs came from Portugal where it was called "Lilio-narcissus" or "Belladonna." Unfortunately he not only confused this bulb with the *Amaryllis belladonna* Linn. (*Hippeastrum equestre* Aiton) from Jamaica, but placed text 23 with plate 24, whereas text 24 and plate 23 refer to *Amaryllis reginae*. This Portuguese bulb was pink and white, a bit deeper in tones than the common California

Belladonna Major. Redoute's plate is very similar. It is interesting to note that Redoute commented at some length on the fact that this plant was not the *Amaryllis belladonna* of Linnaeus. The text of Redoute's contains an extensive list of pre-Herbertian references.

(c) *Brunsvigia rosea* var. *major*. Syn. *Amaryllis belladonna major*. "Belladonna Major" (Local name).

The common California garden form of Belladonna. Bulbs large, producing many offsets within a few years. Foliage 1½" wide, pseudo neck short. Flowers freely in early August on 30" scapes which are near green in color. Blossoms of soft rose to light lilac-rose shadings blending into a white throat that carries a faint touch of cream-yellow well down in the tube. Foliage vigorous, and hardy to 20 F. The source of this strain is unknown. The lack of variation in the number of selfed seedlings, as with the Chilean clone (2.c) suggests that pure line breeding has led to fixed characteristics. (See Figs. 89 and 90.)



Fig. 90. *Brunsvigia rosea* var. *major*; this variety is widely distributed in California.

(d) *Brunsvigia rosea* var. *elata*. Syn. *Amaryllis belladonna elata*: (Barr Catalogue).

Flowers of deep rose shade on 3' high dark stems blooming in August.

(e) *Brunsvigia rosea* var. *G. H. Frances*. Syn. *Amaryllis belladonna G. H. Frances*: (Montague Cat.)

An Australian form having very deep pink blossoms.

(f) *Brunsvigia rosea* var. *perfecta*. Syn. *Amaryllis perfecta*: (Montague Cat.)

Described by Montague as of dwarf habit, but with large pink and white blossoms.

(g) *Brunsvigia rosea* var. *pubica*. Syn. *Amaryllis belladonna pubica*: Kers. Reg. t 8, f2. *Belladonna pubica* sweet: Hort. Brit. 2nd Ed., 1830.

Flowers rose color. Introduced 1795.

(h) *Brunsvigia rosea* var. *maxima*. Syn. *Amaryllis Belladonna rosea maxima*: (Barr Cat.), Gardeners Mag., 45, P. 303.

Early August flowering form with large deep rose colored flowers; delicately scented; 9-10 blossoms to umbel; Height $2\frac{1}{2}'$, very vigorous.

4. BICOLOR FORMS. Similar to *rosea* but with large showy white throats. The extremes with red tipped perianths are sometimes called *rubra*.

(a) *Brunsvigia rosea* var. *bicolor* (Sprenger) Syn: *Amaryllis b. Spectabilis bicolor* Sprenger: Gartenflora, 45, Page 358 (Syn: *A. b. s. tricolor*)

The original reference contained a typographical error under the plate which called the plant *A. b. s. tricolor*. October-Nov. flowering with large umbels of marked fragrance, containing numerous blossoms with a rich rose colored (rosen farben) perianth about a white throat. Van Tubergen and Montague describe a type by the same name which is pale pink with large white centers. Are there two clones involved or is the interpretation of Sprenger's "rosen farben" at fault? The writer does not know.

(b) *Brunsvigia rosea* var. *minor*. Syn. *Amaryllis belladonna (rubra) minor*, commonly called "Minor."

Probably a form of *A. b. rubra*. Source not known—but according to Houdy-shel possibly from Spain. Common in Calif. previous to 1900 and at present a popular garden form on the West Coast. Several clones exist having small bulbs and narrow almost linear leaves. A 20" scape carries 10-12 flowers of a *bicolor* type with brightly tipped rose perianths set off in contrast from a white throat. The bulbs are not as prolific or quite as hardy as common *rosea* forms. Scape reddish and seed bright rose. Numerous unnamed *bicolor* and *rosea* hybrids have been produced by crossing this clone with other California garden forms. See Fig. 89.

(c) *Brunsvigia rosea* var. *rubra* (Truffout). Syn. *Amaryllis belladonna rubra*: Flores des Serres, t 1415, 14, 1861, P. 53-54. *A. b. mutabilis speciosa purpurea* Truffout.

Six or seven blossoms on a red scape. The individual flowers are very slender and open only slightly. The perianth, which is a rich rose color in contrast to a white throat, resembles the Californian *minor* quite closely.

(d) *Brunsvigia rosea* (Link). Syn. *Callicore rosea* Link: Handbuch Zur Erkennung der Nutzbartsen, etc. Berlin, 1829, P. 193. Syn. *Amaryllis belladonna* Baker.

"Scape red, segments rose colored and reflexed, throat white." Link's description is too limited for close identification but apparently it is a *bicolor*. There is no clue as to the exact form Link had in mind, although the name *rosea* may have come from Lamarck's Dictionary. Baker's type species as described in the handbook, is also pink and white.

5. PURPUREA FORMS: Many of the continental forms and wild clones show a large purple or lavender shaded area in the expanding part of the corolla. In some respects these markings have been considered objectionable and few are found in the trade at present. Planchon's plate is a splendid example.

(a) *Brunsvigia rosea* var. *purpurascenes*. Syn. *Amaryllis purpurascenes* Sweet: Hort. Brit. 2nd Ed. 1830; *Amaryllis belladonna* J. E. Planchon: Flore des Serres, 9, 1853, t. 911.

Flowers of a light purple cast, introduced into garden use from Italy. Numerous variations may exist. The plate in Flore des Serres shows a plant with many blossoms on a green scape. The segments are narrow and quite recurved, and the coloring, which is lavender in the limb in contrast to a wine-pink corolla is entirely distinct from any garden form in California.

(b) *Brunsvigia rosea* var. *purpurascenes* (Ferrari). Syn. *Narcissus Indicus* Ferrari: Florvm Cvltvra 117-118, Plate p. 121, Romae 916330. *Lilio Narcissus Ind.* Barvelius: Plant. per Galliam, P. 70, 1714.

Described as: "Flore Liliaeaceo, diluto clore purpurascenes." *Purpurea* in those days often meant rose; the position of this plant is doubtful.

(c) *Brunsvigia rosea* (Marloth). Syn. *Amaryllis belladonna* Marloth: Flora of So. Africa, 4. P. 125.

A light colored *purpurea* type with bluish throat and reflexed soft pink perianth. Bulb small, 5-10 flowers on a red scape. Stated to be a common form about the Cape. Perhaps this should be classed as a *pallida* due to its light shade.

(d) *Brunsvigia rosea speciosa purpurea*. Syn. *Amaryllis speciosa purpurea*: (Barr Catalogue)

Very rich rose-purple flowers with striking white centers. Height $2\frac{1}{2}'$ and flowers in early August.

(e) AYLETT'S HYBRIDS.

Bright wine colored shades developed recently by Aylett on New South Wales. Further information lacking.

6. VARIABILIS FORMS: Flowers open near white or soft pink and deepen in color with age to rose, wine, or purple, especially in the expanding part of the corolla. Scapes red, foliage hardy and plants free flowering.

(a) *Brunsvigia rosea variabilis*. Syn. *Amaryllis variabilis*, common name "Table Mountain Lily" (Montague Catalogue)

Opens nearly white and deepens to ruby red with age. Quite free flowering. The segments are narrow and the plant resembles "*minor*."

(b) *Brunsvigia rosea perfecta*. Syn. *Amaryllis rosea perfecta*: *Gartenflora*, 45, Page 442-443.

Satiny-rose flowers with a white throat. Segments narrow, quite reflexed and pointed. As the flowers age the color deepens to a pure rose flaked by fine white granular markings which glint in the sun. Considered a late flowering type. The plate shows it flowering with the foliage developed.

(c) *Brunsvigia rosea purpurea major*. Syn. *Amaryllis belladonna purpurea major*: *HERBERTIA*, 5, p. 57.; Baileys Cyclopedia of Hort. (Called *rosea perfecta* in French gardens)

A plant with a very deep pink bloom which takes on a purple tint with ageing in the expanding part of the corolla. Free flowering, robust plants which soon form large clumps. Sufficiently hardy to grow out of doors in Holland. This form was used by Van Tubergen in developing some of his *Parkeri* seedlings.

(d) ETHYL HOUDYSHEL (New Name) Syn. *Brunsvigia rosea* var. *E. H.*, *Amaryllis belladonna* var. *Ethyl Houdyshel*.

A *variabilis* form turning dark rose in contrast to white throat. A "*minor*" seedling.

II. Inter-specific *Brunsvigia* hybrids

7. PARKERI HYBRIDS: Hybrids of *Brunsvigia gigantea* (Van Marum) Traub, syn. *Brunsvigia Josephinae* (Redoute)—pollen parent. Bulbs usually very large, 4-6" diameter, often with long pseudo-necks and wide foliage. Scapes long, umbels large, showy and richly colored, but seldom fragrant. *Eubrunsvigia* parentage can often be identified by a large yellow-orange eye or an orange throat in many of the hybrids. The open hemispherical pattern displayed by the umbel of most forms is quite distinct. A marked elongation of the pedicels is very evident as the fruit matures. Most forms are very sensitive to frost.

(a) KEWENSIS HYBRID (Common Name), Syn. *Brunsvigia Kewensis*, *Amaryllis belladonna* var. *Arbuckle*: *Gard. Chron.*, 29, P. 37-38, 53; Pp. 71-72; 89-90; 111-112, 1901. *HERBERTIA* 1934, P. 57. *R. H. S. Journal*, Jan. 1926, P. 67. *The Garden*, 75, 1911, p. 462.

One of the better forms of Parker's original hybrids. Very attractive and fragrant. Grown in Kew Garden 1895-1901. Quite similar to the type named *Parkeri* in color and form, but lacking the large numbers of flowers to an umbel. Mrs. Arbuckle distributed the first hybrids in 1889, these having been developed in New Zealand about 1865.

(b) LADY PARKER (New Name), Syn. *Amaryllis Parkeri rosea*: *The Garden*, 1898, P. 57, *Gard. Chron.* III 50, 211., *The Garden* 75, 1911, P. 462 with fig. on P. 460. *Brunsdonna Parkeri*: *Gard. Chron.* 78, 1925, P. 391 & Fig. 164. *R. H. S. Journal*, 1926, P. 65-69.

A popular English form; flowers clear rose with a yellow-orange base, orange on outside of tube; pedicels suberect to horizontal with many blossoms on a tall red scape; umbel 16" across. Developed by Sir Henry and Lady Parker while in New South Wales.

(c) FRANK LEACH (New introduction by L. S. Hannibal)

Bulbs, 4" dia. x 6" long; plants vigorous and multiply rapidly; leaves, 10, 24" long x 2" wide and somewhat lingulate-lancelot; pseudo-stem, obscure, 2½" long; inflorescence, very free flowering on a red 30" scape in August; umbel open; flowers very pale self color on expansion, but becoming a deep satiny pink as they age, slightly fragrant; segments are quite narrow (¾") highly reflexed; fine white granular markings which glint in the sun produce a satiny-like texture; span, 5"; pedicels 2-3" long at flowering, but 6-8" long as fruit matures. See Fig. 89.

(d) OAKHURST HYBRIDS (Local name). Syn. *Amaryllis belladonna* hybrids.

Mixed hybrids of *Brunsvigia Parkeri* var. *Van Tubergeni* on "minor" and "rubra major" developed by Giridlian and Gordon Ainsley. The bulbs are very large with wide tapering leaves. Scapes red. Flowers of a deep rich color.

(e) WHITE QUEEN (New name), Syn. *Brunsdonna Parkeri Alba*. *Amaryllis Parkeri alba* Worsley: The Garden. 75, 1911, P. 460-462. R. H. S. Journal, 1926, P. 65-69.

Worsley called this his "Garden Brunsdonna." The flowers are pure white with throats of rich orange tone both inside and out. The umbel is very suggestive of a white flowered *Clivia*. This plant was derived from *Brunsvigia Parkeri* by Worsley in 1904. R. H. S. 1st. class award 11/9/28.

(f) VAN TUBERGEN (New name) Syn. *Amaryllis Parkeri* var. *Van Tubergeni*. Garden Chronicle, Jan. 23, 1909, with figure.

The name "Brunsdonna" was proposed by Van Tubergen in 1909 for this beautiful strain of hybrids that he developed by crossing *Brunsvigia Josephinae* with selected "Cape Belladonna" forms. Many of these hybrids are near white and the best were used as a basis for future breeding. The name "Brunsdonna" should be preserved for memory of this great Haarlem bulb firm.

(g) ZWANENBERG. Syn. *Amaryllis Parkeri* var. *Zwanenberg* Van Tubergen: *HERBERTIA*, 2, P. 113-114 inc. plate.

Plant free blooming with numerous large flowers on a long scape in October. These are colored deep rose and white, with a yellowish eye in the throat. A hybrid of "Van Tubergen's Brunsdonna" with *Purpurea major*.

(h) JAGERSFONTEIN (Van Tubergen). Syn. *Amaryllis* *hyb.* *Jagersfontein*.

A hybrid having deep rich pink flowers of a large size with yellow centers.

(i) JOHANNESBURG (Van Tubergen). Syn. *Amaryllis* *hyb.* *Johannesberg*.

Plant very free flowering with many light rose blossoms on a tall scape. This clone has the characteristic white throat and yellow base.

(j) KIMBERLY (Van Tubergen). Syn. *Amaryllis* *hyb.* *Kimberly*.

Blossoms of a deep rich pink, petals slightly striped turning deep crimson pink with age. Apparently a *rosea perfecta* hybrid.

(k) PRETORIA (Van Tubergen), Syn. *Amaryllis* *hyb.* *Pretoria*.

Having an umbel of 15 flowers of deep pink with large white throats and yellowish base.

(l) STELLENBOSCH (Van Tubergen), Syn. *Amaryllis* *hyb.* *Stellenbosch*.

Flowers with large white centers. Petals edged with pink lines. Throats yellow.

(m) ARLINGTON WORSLEY (New Name), Syn. *Brunsdonna pseudo blanda* Worsley. *Amaryllis pseudo blanda*: Gard. Chron. 84, 1928, P. 349.

A selfed seedling of *Brunsvigia Parkeri* which closely resembles *B. blanda* Herbert, having wide leaves and pale flowers which become entirely pink on the third day. Semi-hardy and late flowering on a 3½ foot scape.

(n) ELWES RUBRA (New Name), Syn. *Brunsvigia rosea* var. *rubra major*. *Amaryllis rubra major* Elwes: Gard. Chron. 84, 1928, P. 349. *HERBERTIA* 5, P. 57.

A *Brunsvigia* hybrid of unknown source. Bulb only semi-deciduous with pronounced pseudo-stem and wide leaves resembling *Brunsvigia blanda*. Free flowering with blossoms opening successively over a long period of time. Segments narrow, 1". Color of flowers a brilliant crimson-rose with yellow base. Plant very hardy. Elwes obtained this plant for *Brunsvigia blanda* about 1913.

(o) SANTA BARBARA (New Name). Syn. *Amaryllis rosea giridlian*, *Amaryllis Parkeri* var. *Orpet*. (see Catalogues)

A very late flowering form, described as rose and white with a yellow-orange throat. Apparently is very near to *Brunsvigia Kewensis*. Tender to frost.

(p) SANDERS WHITE (New Name). Syn. *Sanderi Alba*. *Brunsdonna Sanderi Alba*: The garden, 75, 1911, P. 462.

A reputed *Brunsvigia* hybrid that resembles a good white flowering *Parkeri*. Outside of the orange base in each flower there is little to indicate *Eubrunsvigia parentage*.

(q) SPAFFORTHIAE (New Name), *Amaryllis Spafforthiae* Herbert: Amaryllidaceae, P. 277, 1835.

A cross of *Brunsvigia blanda* with *Josephinae* effected by Herbert. No record of flowering plants can be found.

8. MULTIFLORA HYBRIDS. Hybrids developed by Bidwell supposedly of *Brunsvigia orientalis* (Syn. *B. multiflora*) on *Brunsvigia rosea*. Many beautiful forms with large flowers. Bulbs medium sized; leaves glaucous with blunt rounded tips. Flowers numerous on tall scapes, others on very short scapes. These hybrids are sensitive to frost.

(a) BIDWELL (New Name). Syn. *Brunsvigia Multiflora Bidwelli*: HERBERTIA, 2, P. 46. *Amaryllis multiflora*: Garden Chron. July 29, 1850, P. 470.

The original of several hybrid crosses effected by Bidwell in 1841. He was Supt. of the Botanical Garden at Sidney, N. S. W., and his crosses were made at the suggestion of Herbert, whose book had appeared 4 years earlier.

(b) WHITE MULTIFLORA (New Name), Syn. *Brunsvigia multiflora alba*: HERBERTIA, 2, P. 46. Syn. *Amaryllis Multiflora alba*.

Very vigorous and very free flowering. Blossoms are yellowish-white and not as large as many of the hybrids.

(c) ALABASTER, Syn. *Brunsvigia multiflora alabaster* (Cowlshaw), *Amaryllis alabaster* Cowlshaw: HERBERTIA, 2, P. 45 inc. plate.

A selfed pure white hybrid having many blossoms of excellent texture on a tall scape. Developed by Cowlshaw.

(d) HAYTHOR, Syn. *Brunsvigia Mult. hyb. Hathor*, *Amaryllis Hathor* Bradley: HERBERTIA, 2, 1935, P. 46.

A result of a pollen cross of "White Multiflora" on *Brunsvigia gigantea* (*Josephinae*). This is a pure white superior variety of large form very popular in Australia. It will not produce seed, but is an ideal pollen parent. Bulbs of this clone or a very similar clone were introduced into California many years ago by Mrs. Bullard and some seedlings were developed which are in cultivation. The true *Haythor* can be recognized by its ruffled petals with crimped edges.

(e) HARBORD (New name), Syn: *Brunsvigia multiflora Harbord*: HERBERTIA 2, 1935, P. 46.

Form developed by Halloway Bros. Of pure white blossoms.

(f) MONTAGUE (New Name), Syn: *Brunsvigia Multiflora intermedia*: (Montague Catalogue).

Flowers cream white, slightly shaded pink.

(g) ORVIETO (New name), Syn. *Brunsvigia Multiflora Orvieto*: HERBERTIA 2, 1935, P. 46.

Hybrid developed by Halloway Bros. A vigorous form of rich deep pink.

(h) AUSTRALIAN ROSE (New Name), Syn. *Brunsvigia multiflora rosea*: HERBERTIA 2, 1935, P. 46.

Large heads with 30-40 flowers. Excellent deep rose color with yellow cast in throat. Possibly a *Parkeri* type since Bidwell also used *B. Josephinae*.

(i) BAPTISTI (New Name), Syn. *Brunsvigia hyb. Baptist*, *Amaryllis Baptisi*; (Montague Cat.), *A. baptiste alba*: A. Worsley, Gard. Chron. 1932, P. 413.

Described as having yellow-white blossoms in Montague's catalogue. Apparently an alba form is available. The long neck suggests *B. multiflora* parentage.

(j) ORPET WHITE (New Name), Syn: *Amaryllis Orpet White*.

A hybrid form having parentage of *Brunsvigia multiflora Haythor*. Nearly pure white.

* * * * *

9. BRUNSCORE FORMS. Hybrids of *B. rosea* on other *Brunsvigia spp.* These *Brunscore* are seemingly difficult to raise. Growth is very slow and they seldom produce offsets. Not free flowering, but having very attractive bloom not

unlike a *Brunsvigia* on large spreading many-flowered umbels. None are in the trade.

(a) QUEEN WILHELMINA (New Name), Syn; *Brunscore Tubergeni*, *Brunsdonna Tubergeni*: Gardener's Chron. —, HERBERTIA, 5, P. 58.

B. gigantea (Syn. *Josephinae*) X *B. rosea* hybrid of unusual form. These plants take 15 or more years to mature and resemble a *Brunsvigia*, but give a wide variety of color and form of which the above represents one of the finest. Van Tubergen is apparently the only person who has succeeded in raising the cross to maturity. The writings of Bidwell suggest that he did not obtain any *Brunscore*, at least mature plants.

* * * * *

III. *Inter-generic hybrids of Brunsvigia and Crinum.*

1. BRUNSCRINUM HYBRIDS having *Crinum Moorei* or other *Codonocrinum* as a pollen parent. The only forms known at present are *Crinum*-like in growth, having white or rose blossoms which are often very fragrant. Bulbs are very large and quite hardy. Foliage evergreen, resembling *Crinum Powellii* in type and habits. Plants sterile; Forms in gardens apparently represent F-1 generations.

(a) *Brunscrinum Burbankii* (syn: *Crinum-Amaryllis* Burbank: Monograph, Vol. 9, 1914, P. 72 with figure. HERBERTIA 1942, Pp. 150-156.)

A bigeneric hybrid developed by Luther Burbank, Details of the *Crinum spp.* used is vague and no knowledge of existing specimens can be found. The hybrid had 8-10 blossoms of a clear white *C. Moorei* type.

(b) *Brunscrinum Corsii*, Syn. *Crindonna memoria Corsii* Ragionieri: Gard. Chron: Jan. 15, 1921, HERBERTIA I, P. 64, 1934. Curtis Bot. Mag.: Tab. 9162.

A hybrid similar to Mr. Howards but of fewer flowers to an umbel, and colored very light pink. Dr. Ragionieri named this plant in memory of the Marquis Bardo Corsi Salvati of Florence.

(c) *Brunscrinum Howardii*, Syn. *Amarcrinum Howardii*: Gard. Chron. Nov. 21, 1925, Vol. 78, P. 411, fig. 171. HERBERTIA 9, P. 200, 1942.

A bigeneric hybrid of *Brunsvigia rosea* X *Crinum Moorei*. An extremely hardy plant of very vigorous growth. Semi-evergreen, flowering periodically through the summer with tall scapes bearing numerous clear soft pink blossoms. Extremely fragrant with odor resembling apple blossoms. Bulbs large, up to 8" in diameter; enjoys warm moist situations, but desires some shade in citrus areas. R. H. S. Cory cup award in 1926.

* * * * *

Note: *Brunscrinum* hybrids are easily produced. It is reported that Dean Herbert made a similar cross about 1835, but like his *Brunsvigia* X "Belladonna" crosses no record is available. Unflowered hybrids produced by the writer using "minor" as a seed parent have a habit of blasting—One bulb split into 18 bulblets last spring. Since it is impossible to flower plants with such habits about 80% of the seedlings were discarded. It is of additional interest to note that of 4 variations of *Crinum Moorei* used for pollen parent only two took, one with extreme difficulty. Several *Powellii* hybrids including *C. Cecil Houdysbel* also failed.

Otto Staph (Curt. Bot. Mag., Tab. 9162) is of the opinion that *Crinum revoluta* (Syn: *C. lineare*) and *C. variabilis* are allied to this group as their blossoms differ little from the *Brunscrinum*.

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CRINUM MOOREI VAR. FRANK LEACH

L. S. HANNIBAL, *California*

Several years ago Mr. Frank Leach called our attention to a particularly fine specimen of *Crinum Moorei* which was growing in his garden at Diablo, Calif. The blossoms were a very light bluish pink and far larger than normally seen on the common *Moorei* type. During Dr. Traub's visit here we examined the plant and he reported that it was one of the finest he had seen, adding that it was unusual for *Moorei* blossoms to remain open all day in part sun without wilting, especially where the relative humidity drops to 30-50 percent. In tracing the clone we found that it came from an original planting of 1866 by Olmstead and Olmstead, the nationally known landscape firm of the last Century, who had used the bulbs in landscaping the Mountain View Cemetery of Oakland, California. Just where the stock came from previous to that, or if any of the ramets of the clone are in circulation, we do not know. The plant has several very interesting features. It is quite hardy, as it normally can stand two or three degrees more frost than the common *Moorei* before the leaves burn. Winter frosts of 17 degrees which cut it back have not impaired its flowering quality. Here it flowers in August—in Florida it flowers in April (Specimen #A-299). Seedling plants lack the quality of the parent which suggests that the clone may be a hybrid, but it is more likely that it came from selected stock. However, attempts to use it in crossing with the Cape Belladonna Lily (*Brunsvigia rosea*) were a complete failure. Normally this cross is extremely easy to make. This last behavior suggests the existence of some chromosome irregularity which makes the plant distinct from the typical *C. Moorei*. Since no record of a similar clone has been noted in the literature the name of *Frank Leach* is proposed—to keep in memory the name of a grand old man who knows and loves his flowers.

HAEMANTHUS COCCINEUS VAR. ALBUS, STANFORD, VAR. NOV.

All of us who are plant collectors can look back on certain red-letter days when the real treasures first appeared.

Such a day I remember when a neighbour rang me up to say that she had found a white *Haemanthus*. I was not very thrilled, a white form of a flower so often means just loss of colour—but all the same I went to see it.

The intense beauty of the flower gave untold pleasure. It was a white form of *Haemanthus coccineus* which grows plentifully on the hill sides and on the sandy flats, but no one had ever seen a white one before. The flower is most striking as the segments of the spathe are ivory white with the thick crisp texture of a Begonia, and the whiteness is intensified in contrast with the mass of golden yellow anthers. (See Fig. 91.)



Fig. 91. *Haemanthus coccineus* var. *albus*, Stanford, var. nov. Photo by A. C. Buller, Union of South Africa.

The stout stems are about a foot long and the flower pushes through the hard dry ground in early autumn and dies away with the first rains when the leaves appear. These grow to 2 ft. in length and some are 1 ft. across; they remain all winter but when the days get warm they dry off and there is nothing to be seen of the plant until autumn comes again.

Fortunately these treasures fell into good hands, the bulbs were marked and removed from the hill side when dormant and they are now flourishing in the safety of the finder's garden where they have set seeds and one bulb is making offsets.

The botanists tell us that they have no record of a white form of *Haemanthus coccineus* but we think it is possible that the plant may vary since a visiting British sailor and a small girl taking a stroll on

the hill side returned with a flower of a beautiful coral pink, neither of them knowing that it was anything unusual. However the bulb was located and is now safely in cultivation and the hybridist's fingers are itching. There is a white flowered *Haemanthus* in the Eastern Province of the Cape but that is quite different, the flowers are much smaller and the leaves are developed while the plant is in bloom.

The one of which I write is quite unique and probably more will be heard of it later but please do not write and order bulbs, it is not to be seen in the writer's nursery.

K. C. STANFORD

*Bloem Erf Nurseries,
Stellenbosch, South Africa*

DAYLILY DISPLAY GARDEN AT THE UNIVERSITY OF FLORIDA

JOHN V. WATKINS,

Assistant Professor of Horticulture, University of Florida

During the summer of 1943, it was necessary to change the site of the Daylily Display Garden on the campus of the University of Florida. Guided by Daylily polls, published evaluations, and the remarks of garden visitors, some 64 commercial varieties were selected for the new garden. As one of the functions of a regional test garden is to grow, and to evaluate seedlings, a part of the 1943 planting is devoted therefore to newly named selections that have been received for trial from *Hemerocallis* hybridizers. Because of the labor shortage it was necessary to abbreviate our list considerably, and to plant the daylilies in single clumps rather than in triangles of three as was our arrangement in the past.

As Dr. MacDaniels, Mr. Shull, and other writers in HERBERTIA have suggested, a list of daylilies must necessarily be a fluid thing. Therefore, our present catalogue is quite different from that of a few years ago, and it is certain that future lists will be very different from the one detailed in Table I.

TABLE I

DAYLILY COLLECTION, UNIVERSITY OF FLORIDA, 1943

Araby	George Yeld	Queen Wilhelmina
Aureole	Golden Glow	Radiant
Aurillo	Granada	Reba Cooper
Bijou	Hankow	Rouge Vermillion
Brownie	H. aurantiaca	Russell Wolfe
Carnival	Helen Wheeler	San Juan
Chisca	Indian Chief	Semperflorens
Cleo	John Blaser	Senator Andrews
Corinne Robinson	Kanapaha	Serenade
Cypriana	La Tulipe	Sir Michael Foster
Dauntless	Lidice	Sonny
Doctor Hughes	Linda	Sybil
Doctor Stout	Marcelle	Theodore Mead
Duchess of Windsor	Margaret Perry	Vesta
Elaine	Mayor Starzynski	Victory Taierhchwang
Emberglow	Mikado	Victory Montevideo
Emily Hume	Mildred Orpet	Vulcan
Estelle Friend	Mrs. John J. Tigert	Wekiwa
Fire Red	Osceola 2	Welaka
Fred Howard	Parthenope	Winsome
General MacArthur	Patricia	
George Kelso	Peony Red	

REGIONAL TEST GARDENS

Consistent with the policy of full collaboration with the five other Regional Test Gardens, the University of Florida sent out certain clones of *Hemerocallis* on June 15, 1943. These clones were, in all cases, varieties that had not been included in the shipments made to these gardens in the summer of 1942, and they have effectively increased the varietal lists of these gardens. In those cases where a sufficient stock permitted, three divisions of each variety were sent; if the variety was a slow growing type, in some cases it was possible to send only one division.

THE TEXAS COOPERATIVE DAYLILY TRIAL GARDEN

WALTER S. FLORY, *Horticulturist*
Texas Agricultural Experiment Station

A brief history and summary of the work carried on at the Texas Agricultural Experiment Station's Cooperative Daylily Trial Garden to date is given in the following paragraphs.

The test plots of the Texas Agricultural Experiment Station have contained a few varieties of daylilies since 1938. These have been included with a test garden of various plants belonging to the botanical groups with which the American Amaryllis Society is concerned. The original daylily varieties were received from the American Amaryllis Society in late 1937. This number was supplemented in June 1938 by a few varieties, and also some breeding selections, from Mr. H. M. Russell of Houston, Texas. In addition a few varieties were purchased later and added to this collection. This garden only contained about two dozen daylily varieties by the spring of 1942.

During the summer of 1942 the American Amaryllis Society designated College Station, Texas as the location of one of the cooperative daylily testing gardens, with the Division of Horticulture of the Texas Agricultural Experiment Station having charge of this. Since then Professor John V. Watkins has sent two generous shipments of daylily varieties from the University of Florida Daylily Trial Garden. About sixty varieties were added to the Texas garden by these shipments.

All varieties that appear to have flowered normally have been rated by the score card published on page 126 of the 1940 *HERBERTIA*. The few which have been scored for at least two years at College Station are listed here in the approximate order of their initial time of blooming. Excellent (9.0 and above): Mikado (late April), Russell's U-3, fulva Europa, Ophir, Queen of May, Margaret Perry (June 1), August Pioneer (July 1), Good (8.0 to 8.9): Cinnabar, George Yeld, The Miller's Daughter, Golconda. Fair (7.6 to 7.9): fulva maculata. Poor (7.5 and below): Missiana Russell, Spartan.

About 15 other varieties have been scored in one year only. Of these Mrs. John T. Tigert has shown up especially well. Some 30 additional varieties have not yet flowered, and a few varieties have been lost. Of the varieties which have not yet flowered Eldorado, Florham, fulva cypriana and Gold Imperial are making especially vigorous and attractive vegetative growth.

It is easy to see from the above that our test garden is really just getting underway. We hope to increase the number, especially of late-flowering, varieties materially. The stamina of the daylily enables it to survive the rigorous Texas summers when less hardy plants are eliminated. This makes the selection of the best varieties, covering the longest possible flowering season, especially desirable for this section of the country.

WHITNALL PARK DAYLILY TRIAL GARDEN

CHARLES E. HAMMERSLEY, *Wisconsin*

In the last ten years daylilies have become famous throughout the country. Year by year, these fine flowers are filling a large place in the hearts and gardens of flower lovers everywhere, and the constant demand for new and better varieties exceeds the supply.

Early in August, 1941, the writer was advised by our Secretary Mr. Hayward, that Dr. Hamilton P. Traub was doing special work at the University of Wisconsin, and suggested that the writer contact him. The writer wrote Dr. Traub, inviting him to visit the Milwaukee County Park System, and particularly, the Arboretum at Whitnall Park, which he did on August 23, 1941. The writer arranged to have Alfred L. Boerner, Superintendent of the Milwaukee County Parks, to accompany them. Several of the parks were visited, and while at Whitnall Park, Dr. Traub suggested that a Daylily Experimental Garden ought to be established there. Mr. Boerner had advised the writer several years before, that he was desirous of obtaining a large collection of daylilies for Whitnall Park, and perhaps we steered Dr. Traub into the suggestion. (I hope that he will forgive us,) because I believe that the results will eventually justify his faith in the location. So that this was the beginning of the Daylily Trial Garden at Whitnall Park.

Whitnall Park Arboretum is the only publicly supported institution of its kind, and consists of more than 1200 acres, protected from the North and West with a stream running through it. They already have large plantings of various groups of trees, shrubs and perennials. Before gas rationing, an average of more than 10,000 people visited this Park on Sundays—and it is only one of the seventy parks in this county. The Milwaukee County Parks have an annual \$1,000,000. Already one public-spirited citizen has donated a group of tree peonies, and it is expected that other public-minded citizens will likewise contribute various rare groups.

The Experimental Garden has been located just West of the main garden promenade, which has a Southerly and Westerly exposure, providing good drainage and ample sun for the development of the plants. The Park authorities now have a record of every tree and plant on the grounds, and have agreed to keep a complete record of every daylily and daylily cross made.

Dr. Traub promised to send to the Park some of his new introductions, and Mr. Seyler of the Farr Nursery has contributed all of Dr.

Stout's originations, and has promised such new ones as may come along. Our Secretary, Mr. Hayward, has likewise agreed to make a contribution of some of his introductions. At this point, I cannot too highly praise



Fig. 92. Flowers and scape of the Festival Daylily. About 1/3 natural size. From the same plate that appeared with the first description of the clone.

the contributions made by Prof. John W. Watkins of the University of Florida, who has generously sent three plants of a large number of varieties, and has promised to continue to do so as new varieties become

available. No man in this country has done more to expand the daylily interests than Prof. Watkins, and I want to publicly commend him for his interest and generosity. We have planned at Whitnall Park to segregate the introductions of various originators and their donors, and to put up a permanent placard showing who donated the plants, and we invite all originators of daylilies to send their introductions to Whitnall Park where the world will be advised of their introductions, and introducers given credit for their work.

Much of the credit for the development of the daylily goes to Dr. A. B. Stout, who was born only a few miles from Whitnall Park, and who graduated from the University of Wisconsin, and who has spent his life in the development of this flower. We want to acknowledge our debt to him for asking Mr. Seyler of the Farr Nursery to contribute the Stout introductions.

Our daylily collection has now more than 100 varieties, including many fine new varieties of the great originators. We want the world to know that Milwaukee at Whitnall Park has joined the modern march to appraise the *Hemerocallis*. The wide-spread interest in the new varieties has already brought countless visitors to the Park. They stand in awe and admiration when they see pinks, reds and soft yellows and lovely oranges. They say they never dreamed it possible that there could be so many beautiful varieties and they say they are well paid for their trips.

On the 5th of May, 1942, Elmer Claar of Wilmette, Illinois addressed several hundred people of this Community on the daylily, and showed his excellent pictures which had been taken in many hybridizers' gardens in this country. Mr. Claar is an enthusiastic plantsman, and has done much, and is still doing more, to advance the development and interest in daylilies. No garden talk in years has caused so much comment and favorable action as his.

I hope that those who read this report will start a collection of daylilies. No plant offers as great an opportunity to the amateur to hybridize and develop new varieties as the day-lily. The daylily grows almost anywhere, in any kind of soil, stands almost any kind of treatment, is subject to no diseases, and always blooms profusely.

We hope that when you are in our locality, that you will visit our seventy Milwaukee County parks, and particularly the Aboretum and Daylily Trial Garden at Whitnall Park.

THE ELMER A. CLaar DAYLILY

A. B. STOUT, *The New York Botanical Garden*

The seedling with its propagations that is here named the *Elmer A. Claar Daylily* is a sister of the plant that was named the *Festival Daylily*.* Due to an inadvertent mixture during nursery propagations divisions of these two seedlings were in several instances distributed under the one name of *Festival*. After the first selections in this particular

* Journal of The New York Botanical Garden 40:32-34. 1939.

series of plants were made in 1929 five seedlings were kept under evaluation until 1934. Then only two were kept and these were propagated and further evaluated in the trial plots of The Farr Nursery Company for the next five years. Thus after ten years of comparisons and evaluations one of the two clones was described under the name *Festival Daylily* and it was intended that the entire stock of the other seedling would be destroyed.



Fig. 93. Flowers and scapes of the Elmer A. Claar Daylily. About 1/3 natural size. Photo New York Botanical Garden.

But evidently there was some mixture of these two clones for divisions of both were obtained by several persons including Mr. Elmer A. Claar whose published statements ** are, in part, as follows:—

** *Herbertia* 9:31. 1942.

“*Festival*—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 is 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.”

It is quite probable that this clone which is *not* the *Festival Daylily* will remain in cultivation and become somewhat distributed. Hence it should have an individual name under which it may be kept distinct from any other clone.

The illustration for the flowers of *Festival* here reproduced (See Fig. 92) is the same halftone plate that was used with the original description; that (Fig. 93) for the flowers of the *Elmer A. Claar Daylily* is from a photo taken in 1934 and the following descriptions are from notes recorded during the ten years that the plant was under selection. Plants of this clone have reached a stature of from three to four feet. The flowers are medium full and of medium size. In the throat the color is near cadmium yellow with a stripe extending out along the midrib of *each petal* (not of each sepal); the anthocyanin coloring in the petals is near garnet brown with more intense color in the veins. The sepals have the general ground color of cadmium-yellow plastid pigmentation with areas of red sap pigments that are much less intense than in the petals, a distribution well shown in Fig. 93. In comparison with *Festival* the flowers are of a distinctly different shape, the petals being shorter and not twisted. Also the ground color is less orange and more yellow and the pattern of the red sap pigment is much less fully bicolor.

In my record of the final evaluations in 1937 there are the following notes for this plant. *Paler, less orange, and less bicolor than its sister under selection. We have better bicolors now. Can discard.* A comparison of Figs. 92 and 93 shows that the scapes of the *Elmer A. Claar Daylily* are less branched and floriferous than are those of *Festival*. But the naming of this daylily, largely due to Mr. Claar's remarks, will now give chance for evaluation by the gardening public. This mention of better bicolors refers to the race of which *Bicolor* and *Harlequin* were later named and which was first mentioned and illustrated in the issue of the magazine *House and Garden* for June 1936. The *Festival Daylily* is a bicolor with orange background; *Bicolor* and *Harlequin* have an almost yellow background.

From 1929 to 1934 the two seedlings, now named *Festival* and *Elmer A. Claar*, were rated highly among the seedlings which had bicolor and semi-bicolored patterns and both were used in selective breeding. The plant now named *Elmer A. Claar* was a parent in 21 different series of seedlings which totaled over 200 individuals, but not one of these was rated worthy of introduction, and nearly all have been discarded.

HORTICULTURAL CLASSIFICATION OF NARCISSI

COMMUNICATION FROM A. SIMMONDS,
Royal Horticultural Society, London, England

[The following communication was received from Mr. A. Simmonds, Secretary, Narcissus and Tulip Committee of the Royal Horticultural Society, London, under date of August 10, 1943. The American Amaryllis Society is in hearty accord with any attempts to bring the horticultural classification of Narcissi up-to-date. All members interested in this group are urged to send any suggestions they may have, without delay to the Narcissus Committee in care of Mr. L. S. Hannibal, Executive Secretary, Concord, Calif. The Committee will assemble these suggestions and transmit a summary to Mr. Simmonds.—*Editor*]

THE CLASSIFICATION OF DAFFODILS

As you are aware, in 1909 this Society drew up a system for the classification of Daffodils for show purposes which, with the minor adjustments which have been made from time to time, has found acceptance not only in this country but among Daffodil specialists generally. In the course of time, and with the gradual development of new types, ideas for the improvement of the scheme have occurred to many people and my Committee, therefore, appointed a Classification Sub-Committee to review the scheme in the light of suggestions which had been received from various sources. It is not proposed to make any alterations until it has been possible to consult all the more important groups of Daffodil specialists overseas, and that will not be until Holland is again free. It seems desirable, however, that some progress should be made so that, as soon as we are again in touch with our Dutch friends, we may be able to invite their comments on concrete proposals which appear to meet with the approval of the majority of other interested parties.

My Sub-Committee has held one meeting and has selected from a wealth of suggestions those which appear to it to be both desirable and practicable. I enclose a copy of the existing scheme, together with a copy of a tentative scheme embodying the above-mentioned suggestions. It will be observed that the suggested modifications are as follows:—

- (1) To abolish the Leedsii Division and to transfer the varieties concerned to the Incomparabilis and Barrii Divisions.
- (2) To provide in the Incomparabilis and Barrii Divisions a third Sub-Division, lettered (c) for varieties which are wholly white or whitish and formerly classified as Leedsii varieties; and to re-arrange the Trumpet Division so that the Sub-Division for varieties which are wholly white or whitish is lettered (c) instead of (b) as at present.
- (3) To specify that in the Trumpet, Incomparabilis and Barrii Divisions the corona may not be paler than the perianth segments, as a place is provided elsewhere [See (9)] for varieties with "reversed" colours.

- (4) To amend the specifications for Sub-Divisions (a) and (b) of the Trumpet, Incomparabilis and Barrii Divisions so as to allow of the corona being any colour other than white, thus providing for the existing pink-cupped varieties and the red-trumpeted varieties of the future.
- (5) To transpose the Poeticus Division so that it becomes Division IV and fills the gap left by the abolition of the Leedsii Division.
- (6) To transfer to Division XI such species and wild or reputedly wild forms of species as are at present included in other Divisions, e.g. the wild forms of *Narcissus poeticus*.
- (7) To subdivide the Cyclamineus Hybrids in the same way as Triandrus Hybrids.
- (8) To change the number of the Division for Double Varieties from X to XX.
- (9) To create a new Division, numbered X, for "Miniature and Miscellaneous Garden hybrids," to accommodate, among others, garden hybrids with "reversed" colours, i.e. with the corona paler than the perianth segments, and varieties in which the corona is divided.

As will be gathered, my Sub-Committee has given consideration to many suggestions which appear to it to be either impracticable or to have less to recommend them than the disadvantages which they would involve. In this connexion it has been constantly borne in mind that the ideal Classification is one which is readily followed by any novice who is prepared to give the matter a little attention, and is such as to permit a non-specialist to classify almost any unknown variety without the aid of a colour chart or of special appliances for making measurements.

As is well known, with the great increase in varieties which has occurred during recent years, many border-line varieties have naturally been produced. This has been particularly marked in connexion with the border-line between Trumpet varieties on the one hand and Incomparabilis and Leedsii varieties on the other. As a result various suggestions have been made for the alteration of the specification of Trumpet varieties so as to permit of the inclusion in Division I of varieties in which the corona is $\frac{7}{8}$, $\frac{9}{10}$ or some other similar fraction of the length of the perianth segments. My Sub-Committee is of opinion that such proposals are impracticable because of the difficulties they would involve in measuring and in the resulting re-classification of numerous varieties, and would, at the same time, increase the difficulty of deciding on which side of the borderline many varieties should be placed.

It has also been suggested that where classification is by measurement a "tolerance" should be specified, but my Committee considers that anything which leaves the classification of a variety as a matter of opinion, as distinct from fact, is undesirable because it is certain to lead to varieties which are, for practical purposes, identical, being placed in different Divisions or Sub-Divisions.

Several breeders have given much attention to the production of varieties with pink colouring, and no doubt such varieties will soon be numerous. It has consequently been suggested that special Sub-Divisions should be provided for varieties with pink colouring in the cup. My Committee does not favour the proposal because it considers that the determination of the point at which pink ends and other colours begin is such that it can be decided only with the aid of a colour chart. It will be observed, however, that the specifications for Sub-Divisions (a) and (b) of Divisions I, II and III in the Tentative Scheme provide for coronas with pink as well as other colours.

My Sub-Committee would be grateful if you would be so kind as to bring the matter before your Society and let me know its views at your earliest convenience.

Yours faithfully,

A. Simmonds, Secretary,
Narcissus and Tulip Committee.

THE ROYAL HORTICULTURAL SOCIETY'S
CLASSIFICATION OF DAFFODILS

I EXISTING SCHEME—1943

DIVISION I—TRUMPET DAFFODILS

Distinguishing character—Trumpet or crown as long as or longer than the perianth segments.

- (a) Varieties with yellow or lemon-coloured trumpets, and perianth of same shade or lighter (but not white).
- (b) Varieties with white trumpet and perianth.
- (c) Bicolor varieties, i.e., those having a white or whitish perianth and a trumpet coloured yellow, lemon, or primrose, etc.

DIVISION II—INCOMPARABILIS

Distinguishing character—Cup or crown not less than one-third but less than equal to the length of the perianth segments.

- (a) Yellow shades with or without red colouring on the cup.
- (b) Bicolor varieties with white or whitish perianth, and self-yellow red-stained, or red cup.

DIVISION III—BARRII (INCORPORATING BURBIDGEI)

Distinguishing character—Cup or crown less than one-third the length of the perianth segments.

- (a) Yellow shades, with or without red colouring on the cup.
- (b) Bicolor varieties with white or whitish perianth and self-yellow red-stained, or red cup.

DIVISION IV—LEEDSII

Distinguishing character—Perianth white, and cup or crown white, cream or pale citron, sometimes tinged with pink or apricot.

- (a) Cup or crown not less than one-third but less than equal to the length of the perianth segments.
- (b) Cup or crown less than one-third the length of the perianth segments.

DIVISION V—*TRIANDRUS* HYBRIDS

All varieties obviously derived from *N. triandrus*, such as *Queen of Spain*, *Earl Grey*, *Eleanor Berkeley*, *Moonstone* and *Agnes Harvey*.

- (a) Cup or crown not less than two-thirds the length of the perianth segments.
- (b) Cup or crown less than two-thirds the length of the perianth segments.

DIVISION VI—*CYCLAMINEUS* HYBRIDS

DIVISION VII—*JONQUIL* HYBRIDS

All varieties obviously derived from Jonquils (e.g., *N. Jonquilla*, *N. juncifolius*, etc.), such as *Buttercup*, *odorus*, etc.

DIVISION VIII—*TAZETTA* (GARDEN FORMS AND HYBRIDS)

To include *N. Tridymus*, *poeta* varieties, the Dutch varieties of Polyanthus *Narcissus*, *N. biflorus* and *N. Muzart*.

DIVISION IX—*POETICUS* VARIETIES

DIVISION X—*DOUBLE* VARIETIES

DIVISION XI—*VARIOUS*

To include *N. Bulbocodium*, *N. cyclamineus*, *N. triandrus*, *N. juncifolius*, *N. gracillis*, *N. Jonquilla*, *N. Tazetta* (wild forms), *N. viridiflorus*, etc.

II. TENTATIVE SCHEME

DIVISION I—*TRUMPET* VARIETIES

Distinguishing character—Trumpet or corona as long as or longer than the perianth segments, and not paler in colour.

- (a) Perianth and corona both coloured, i.e., yellow or any colour other than white.
- (b) Perianth white or whitish and corona coloured, i.e., yellow or any colour other than white.
- (c) Perianth and corona both white or whitish.

DIVISION II—*INCOMPARABILIS* VARIETIES

Distinguishing character—Cup or corona not less than one-third, but less than equal to, the length of the perianth segments, and not paler in colour.

- (a) Perianth and corona both coloured, i.e., yellow or any colour other than white.
- (b) Perianth white or whitish and corona coloured, i.e., yellow or any colour other than white.
- (c) Perianth and corona both white or whitish.

DIVISION III—*BARRII* VARIETIES

Distinguishing character—Cup or corona less than one-third the length of the perianth segments, and not paler in colour.

- (a) Perianth and corona both coloured, i.e., yellow or any colour other than white.

- (b) Perianth white or whitish and corona coloured, i.e., yellow or any colour other than white.
- (c) Perianth and corona both white or whitish.

DIVISION IV—POETICUS—GARDEN FORMS

Garden forms of any of the *poeticus*.

DIVISION V—TRIANDRUS—GARDEN FORMS AND HYBRIDS

Garden forms of *triandrus* and hybrids in which *triandrus* characteristics clearly predominate.

- (a) Cup or crown not less than two-thirds the length of the perianth segments.
- (b) Cup or crown less than two-thirds the length of the perianth segments.

DIVISION VI—CYCLAMINEUS—GARDEN FORMS AND HYBRIDS

Garden forms of *cyclamineus* and hybrids in which *cyclamineus* characteristics clearly predominate.

- (a) Cup or crown not less than two-thirds the length of the perianth segments.
- (b) Cup or crown less than two-thirds the length of the perianth segments.

DIVISION VII—JONQUILLA—GARDEN FORMS AND HYBRIDS

Garden forms of any of the *Jonquilla* group and hybrids in which characteristics of the *Jonquilla* group clearly predominate.

DIVISION VIII—TAZETTA—GARDEN FORMS AND HYBRIDS

Garden forms of any of the *Tazetta* group and hybrids in which the characteristics of the *Tazetta* group clearly predominate.

DIVISION IX—DOUBLE VARIETIES

DIVISION X—MINIATURE AND MISCELLANEOUS GARDEN HYBRIDS

DIVISION XI—SPECIES AND WILD FORMS

All species and wild or reputedly wild forms.

WORSLEYA, GENUS NOV., AMARYLLIDACEAE

HAMILTON P. TRAUB

Amaryllis procera was first described by Duchartre in 1863 but it did not come into cultivation until quite recently. The late Arthington Worsley (1929, 1936) made a study of this species in its native habitat,

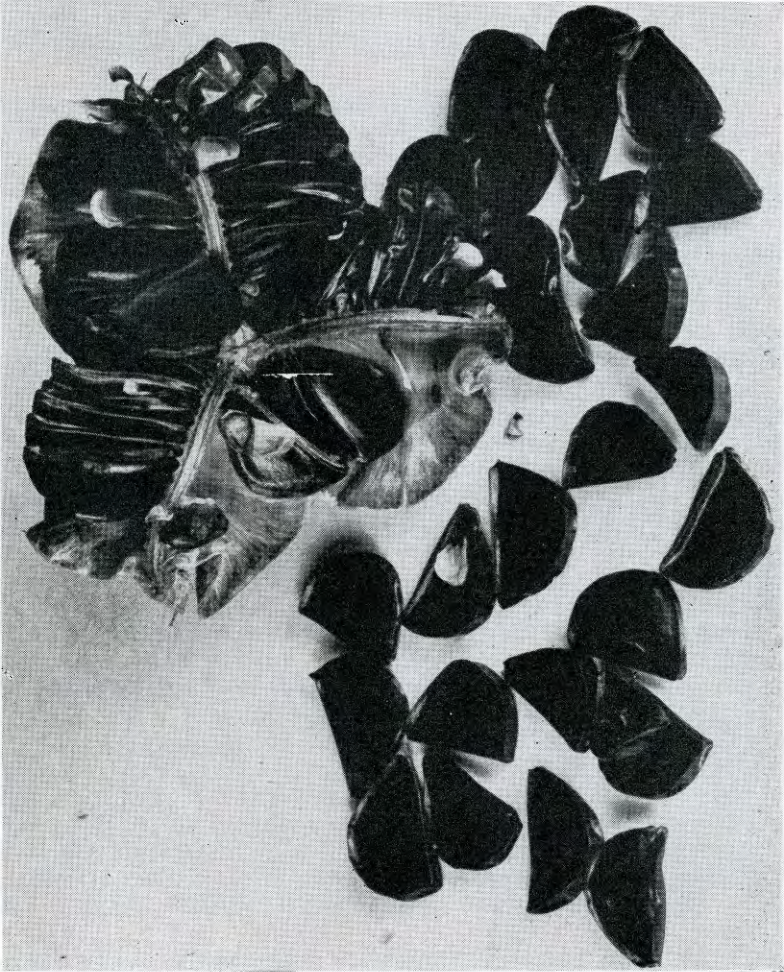


Fig. 94. *Worsleya procera* (Duchartre) Traub, gen. nov. Capsule and seeds, natural size. Grown at Las Positas Nursery, Santa Barbara, Calif. Photo by W. M. James.

and later grew it at his home in England. When the late William Watson, the Kew botanist, saw them in their glory, he was struck by their distinct appearance, and proposed that the species be used as the

basis of a new genus to be named in honor of Mr. Worsley. The latter was a very modest man, and suggested that the project be postponed until the species could be studied more in detail. Since that time, the interest in the species has increased. Much has been written about it in the past decade (See literature citations below). The Blue *Amaryllis* has been flowered in Florida (Anderson, 1940; Traub 1940); at the Las Positas Nursery, Santa Barbara, California (Lytel, 1942), and in England (Pam, 1943).

At the request of Mr. Lytel at Las Positas Nursery, Mr. James made some excellent photographs of the group of plants that are thriving there. He has also made some close-ups of the fruits and seeds. These photographs are reproduced in Plates 245, 246, and Fig. 94. The more important differences between the present species and the others classed under the Genus *Amaryllis* are summarized in Table I.

Mr. Worsley (1929) was the first to describe the fruit and seed characters of this species. Later, Traub (1940) reported on the seed structure in still greater detail. The seeds are D-shaped, jet black, the inner edge is thinner than the outer which is somewhat sunken and wrinkled between the margins of the side walls. On the basis of seed anatomy, this species is set off distinctly from the other species included under the genus *Amaryllis*.

The gestation period in the case of the present species is more than two and a half times as long as in the other species classed under the same genus.

There are four spathe-valves in the present species (Traub, 1940; Pam, 1943). The two outer valves are somewhat larger than the inner two. In the other *Amaryllis* species there are only two spathe-valves.

The leaves in the present species are falcate as contrasted with linear, lorate or petiolate in the other species. The perigone is lilac, a color that is absent in the other species (color range; from white, red, orange to yellow).

The bulb as a botanical concept concerns the perennial or persistent portion of plants with reduced stems, particularly of some Liliaceae and Amaryllidaceae. The bulb in the case of amaryllids, includes all of the plant excepting the roots that grow from the basal portion, and the leaves and scapes that protrude from the apex of the intermediate portion made up of a greatly reduced stem surrounded by living leaf scales (some Liliaceae), or enveloped toward the inside with living and toward the outside with dead bases of leaves and scapes. The principal parts of the bulb are the body and neck. The body is usually thickened and includes the basal portion at the bottom, continuing as a reduced stem with the main growing point at the top, and surrounded by living and dead leaf and scape bases. It may also include immature flower scapes. If the living leaves and scapes are surrounded by dead leaf and scape bases to any extent above the thickened portion, this narrowed part is known as the neck. This part above the body must be persistent in order to be considered a neck. In *Ixiolirion* for instance the plant makes a tuft of leaves above the ground in late fall and winter, and produces a stem from the center of this rosette in the spring. Shortly after flowering in the spring, the stem dies and disintegrates to the apex of the bulb body.

Each year a new rosette and stem are formed. Here we have a case where the bulb is not necked, or is at least only temporarily necked. In the typical amaryllids, however, the presence of the persistent neck is not a rare occurrence. In the Blue Amaryllis we have an extreme case where the neck is out of all proportion to the body of the bulb, and in this particular this species is quite distinct from the other species classed under the same genus.

Apparently most of those who have flowered the Blue Amaryllis have attempted to cross it with other recognized species in the same genus. There are no records of any successes. The writer has attempted reciprocal crosses. That is, he has transferred the pollen of species and hybrids in the same genus (*Amaryllis belladonna* Linn. non Ait. et Herb., *A. reginae*, and various hybrid clones) to the stigma of the Blue Amaryllis. The reverse crosses were also attempted. He had no successes at all. Communications from others who have attempted similar crosses state that seeds have not matured. This apparently indicates that there is a physiological isolating mechanism that prevents any gene exchange between the Blue Amaryllis and the other species now grouped under one genus.

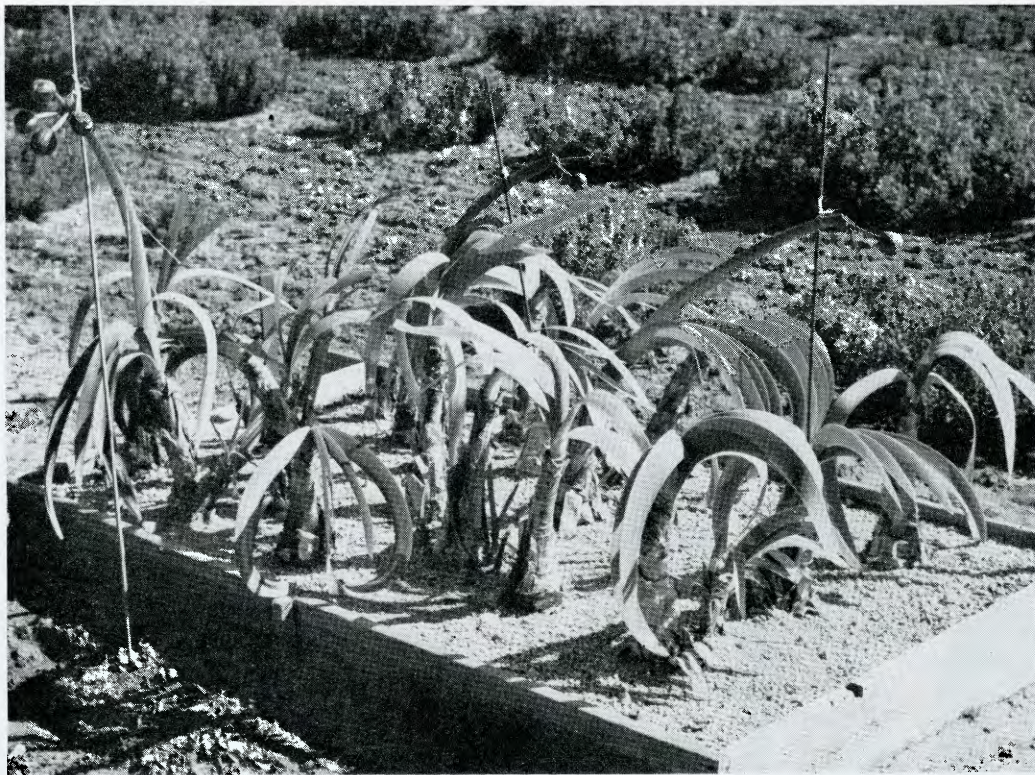
TABLE I
CONTRASTING CHARACTERS OF THE GENERA WORSLEYA
AND AMARYLLIS

Character	Genus Worsleya	Genus Amaryllis
Seed character	D-shaped, inner edge thinner than outer which is sunken and wrinkled.	Usually flat, disc-shaped, winged; rarely subglobose ¹
Number of spathes	4 (2 outer larger; 2 inner smaller)	2
Leaves	falcate	linear, lorate or petiolate
Bulb	neck very long	neck usually short, or lacking
Gestation period	Relatively long	Relatively short
Color of perigone	lilac	white, red, orange or yellow
Gene exchange	Apparently no gene exchange possible between Worsleya and Amaryllis ²	

After due consideration of the important differences between the Blue Amaryllis and the other species of the Genus *Amaryllis*, it is clear that the former is distinct and is a candidate for consideration as the basis of a separate genus. This fact was tentatively recognized by W. Watson as long ago as 1929, and later by Traub (1940) who proposed the Subgenus *Worsleya*. It now appears logical to elevate this Subgenus to full generic rank. On the basis of the evidence presented, the Genus *Worsleya*, with *Worsleya procera* as the type, is proposed. The name is given to perpetuate the memory of the late Arthington Worsley—that great Englishman who has so greatly influenced our modern outlook on the amaryllids.

¹ Species in the Subgenus *Sealyana* have subglobose seed Sealy, Bot. Mag. t. 9504; (Traub, 1933; Traub and Uphof, 1940).

² Within the Genus *Amaryllis* there is no gene exchange possible between the linear leaved section and the lorate-petiolate section. This physiological gap apparently indicates that these two sections, although morphologically similar, are not intimately related. The linear leaved section may prove to be more closely related to the genera in the Tribe *Zephyrantheae*. Further information on this subject can be obtained from a study of the chromosome morphology, a subject worthy of an academic thesis.



Worsleya procera (Duchartre) Traub, gen. nov. Group of plants imported from Brazil in 1939 by Las Positas Nursery, Santa Barbara, Calif. (See *Herbertia* 9:213-214. 1942) Photo 1943. By W. M. James.

Plate 245



Worsleya procera (Duchartre) Traub, gen. nov. Close up of plant at left in Plate 245, showing character of fruits, about one-half natural size. Photo by W. M. James.

Genus WORSLEYA Traub, *genus nov.*

Syn. Subgenus WORSLEYA, Traub, Genus *Amaryllis*, Linn. ex parte, non Ait. et Herb., HERBERTIA (1939) 6: 118-119. 1940; Traub & Uphof, HERBERTIA (1939) 6: 147, 149. 1940.

Diagnosis.—Bulb ovoid, with a very long neck; leaves about 12 to 14, distichous, falcate; peduncle usually shorter than the leaves; umbel 4-14-flowered; spathe-valves 4, the two inner shorter than the outer two, exceeding the pedicels; perigone lilac, not starred at throat; tube very short; perigone-segments oblanceolate, acute; stamens much shorter than the perigone; stigma capitate; seeds D-shaped, inner edge thinner than outer edge which is somewhat sunken and wrinkled between the margins of the side walls.

Quite distinct from Genus *Amaryllis*, its nearest relative, from which it is isolated by a physiological mechanism that prevents crossing. Differs from Genus *Amaryllis* mainly in the following characters: (1) gestation period is more than two and a half times as long as in *Amaryllis*; (2) *Worsleya* has 4 spathes, *Amaryllis* 2; (3) the seeds are D-shaped and otherwise distinct from those of *Amaryllis*; (4) leaves are falcate as contrasted with linear, lorate or petiolate in *Amaryllis*; (5) the bulb has a very long neck as contrasted with a much shorter neck or its absence in *Amaryllis*; and (6) the perigone is lilac, a color not found in *Amaryllis*. Type species: *Worsleya procera* (Duchartre) Traub, comb. nov., syn. *Amaryllis procera* Duchartre (jour. soc. imp. cent. d'hort. 9: 425-438. 1863, t. 17.)

Genus WORSLEYA Traub, gen. nov.

Bulbus ovoideus, collo longo; folia ca. 12-14, disticha, falcata; pedunculus saepe quam folia brevior; umbella 4-14 flora; spathe valvae 4, 2 interiores quam exteriores breviores, pedicellis excedentes; perigonium lilacinum, fause non maculatum, tubo brevissimo, segmentis oblanceolatis, acutis; stamina quam perigonium multo breviora; stigma capitatum; semina D-forma, atra, margine inferiore quam superiore tenuiore, margine superiore plus minusve depressa et corrugata.

Description of species ,

1. WORSLEYA PROCERA (Duchartre) Traub, comb. nov. ; syn. *Amaryllis procera* Duchartre, jour. soc. imp. cent. d'hort. 9:425-438, 1863, t. 17; Traub, HERBERTIA (1939) 6: 118-119; (1940) 7: 94-96, Fig. 51, Plate 177. 1941; (1941) 8: 82, Fig. 64. 1942; Traub & Uphof, HERBERTIA 5: 114-131. 1938; (1939) 6: 146-154. 1940; *Amaryllis gigantea* Duchartre (non van Marum), jour. soc. imp. cent. d'hort. 9:77. 1863; *Hippeastrum procerum* Lemaire, l'illus. hort. t. 408. 1864; W. Watson, The Garden. London, 1894, p. 350, t. 959; Baker, *Amaryll.* 1888, p. 50; Worsley, gard. chron. Lond. May 1929, pp. 377-379, figs. 188 and 189; Pam, jour. roy. hort. soc. LXVIII: 331-332. 1943, fig. 98; *Amaryllis Rayneri*, J. D. Hooker, Curtis' bot. mag. t. 5883.

DESCRIPTION.—BULB slender, overall length 0.5 meter to 1 meter; 13 cm. to 15 cm. in diam. above root base; tapering to 5 cm. to 7.5 cm. at apex; and 7.5 cm. to 9 cm. at the center of the root base, which may be as long as 15 cm.; LEAVES 12 to 14, distichous, falcate, 0.6 meter to 1 meter long, 4.8 cm. to 7.5 cm. wide at center, firm in texture, cartilagenous at the edges; PEDUNCLE compressed, two-edged, at first hidden in the center of the crown of the bulb apex but elongating ultimately to 30 cm. to 45 cm.; 4.5 cm. to 5 cm. wide; SPATHES 4, the two outer 17 cm. long by 5 cm. wide; the two inner 7.5 cm. to 10 cm. long; PEDICELS 8 cm. long, triangular in section; OVARY 1.3 cm. long, ovules many; UMBEL 4 to 14 flowered; PERIGONE 14 cm. to 16 cm. long, TUBE very short, SEGMENTS lilac, not starred at throat, 12 cm. to 15 cm. long, oblanceolate, acute, 2.5 cm. to 3 cm. wide; PARAPERIGONE, none; STAMENS much shorter than the segments; ANTHERS yellow, 1.3 cm. long; STIGMA capitate; FRUIT a capsule, 1.3 cm. long, 2.5 cm. wide, loculicidally 3-valved; SEEDS D-shaped, jet black, inner edge thinner than outer edge which is somewhat sunken and wrinkled between the margins of the side walls.

HABITAT.—Organ Mountains, near Petropolis. Brazil.

NOTES.—The above description is based on the descriptions by Baker (1888), Major Pam (1943); on Figs. 51, 64; Plates 112, 177, 190, 239, that appeared in *HERBERTIA*, and data recorded by the writer in 1940 when a specimen of *Worsleya procera* bloomed for him.

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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.

Genus *KLINGIA* Schoenland

Rec. Albany Mus. (S. Afr.) 3: 178-181. 1919. Figs. 1 & 2.

Bulbiferous herb, the bulb tunicate. Leaves numerous, late maturing, narrowly linear, enlarged and sheathing at base. Flower solitary. Perianth persistent, the tube long, slender, scarcely widened at apex, the lobes in 2 series, subequal, oblong-lanceolate, suberect. Stamens 6, in one series, affixed in the perianth throat, much shorter than the perianth lobes, the filaments free at apex, otherwise united among themselves and

with the perianth, the anthers attached basally, spirally twisted in flower. Style filiform, a little longer than the perianth tube, the stigmas short, obtuse. Fruit unknown.

Related to *Gethyllis* L., from which it differs in the filaments being united to each other and to the perianth.

Genus CHOANANTHUS Rendle

Jour. Linn. Soc. Bot. 38: 237-238. 1908.

Perianth narrow, funnel-shaped, the tube long, narrow, the throat naked, the lobes much shorter, broad, erect-spreading. Stamens inserted in the throat of the perianth, the filaments broad, narrowly triangular, acuminate at apex, the anthers oblong, versatile, affixed at the middle. Ovary 3-celled; ovules solitary in the cells, pendulous. Berry subglobose.

Choananthus Wollastonii Rendle, Jour. Linn. Soc. Bot. 38:237-238. 1908.

Rhizomatous herb, the leaves large, oval, many-nerved, narrowed at base into a contracted sheath; scape many-flowered (25 in our specimen), the flowers reddish-purple, falsely umbellate, finally recurved; bracts spathe-like, membranaceous, narrow, short; pedicel slender, shorter than the flower; perianth tube gradually enlarged upwardly, the lobes elliptic or elliptic-oblong, puberulous at the hooded apex; stamens scarcely equalling the corolla lobes; ovary ovoid.

Leaf blades 3 cm. long, 1 dm. wide; scape 3.3 dm. long, .5 cm. wide; pedicels up to 2.5 cm. long; flower 6 cm. long, the tube 4 cm. long, the throat about 1.2 cm. wide, the lobes scarcely 2 cm. long, 8-10 mm. wide, the interior ones a little shorter and more obtuse; ovary about 5 mm. long.

THE NAMING OF HORTICULTURAL VARIETIES

Under date of April 26, 1943, Mr. Donald Wyman, Horticulturist, at the Arnold Arboretum, Harvard University, Jamaica Plain, Mass., writes,—

“I am enclosing an article on ‘The Naming of Horticultural Varieties,’ [No. 2, Vol. 3, *Arnoldia*] which we believe contains *all* the necessary points essentially important. Many individuals who are experts in raising plants believe they are qualified to give new names to plants. This they can do—anyone can do—but in order to make the names ‘stick’ for all time, certain essential rules must be observed. Both botanists and the horticulturists agree on these. Consequently, the enclosed publication is of interest to *all* individuals who want to know ‘how plants get their names’ and particularly to those who actually give the new names.

These rules are simple and concrete. Everyone interested in American horticulture should be familiar with them and adhere to them. I sincerely hope we can do everything possible to assist American plantmen to conform to these rules.”

Anyone interested should write to Mr. Wyman for further information.—*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, Wis.*; (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.

HYBRID DAYLILY (HEMEROCALLIS) CLONES

Introduced by R. W. Wheeler, Winter Park, Fla.

Bobolink: A bicolor, medium sized, compact flower with very wide, frilled and creped petals of purple, a little deeper than Heliotrope (7814) of the Standard Color Card. Sepals are wide, golden yellow with a trace of purple dusting. The throat is greenish gold. The flowering stems are 3½ ft., are multiflora, have proliferations and stand erect. A vigorous grower, having produced four flowering stems at two years old from seed. A recurrent bloomer in Florida. (See Fig. 95.)

Easter Morn: A large, compact flower with very wide sepals and petals. The ground color, throat and sepals are deep yellow. The petals are dusted a light brown, rich with a violet sheen which, together with a showy eye zone, gives life and character to this fine flower. The flowering stems are 3½ ft., are multiflora and have proliferations. It is a recurrent bloomer and at two years old from seed had three periods of bloom, producing sixteen stems with more than 300 flowers.

Ganymede: Medium to large flower with flaring sepals of light sulphur yellow, slightly dusted. The petals are very wide, creped, frilled, tightly recurved and in color between Cornflower (6123) and Lilac (7163), both of the Standard Color Card. An unusual flower form in beautiful, delicate coloring. The flower stems are 2 ft.

Royal Lady: A bicolor with deep but bright violet purple petals, deepest in the center and shading to much lighter towards the tips and edges, with canary bands through the petal centers. The throat, sepals and high up on the petals is canary

yellow. The sepals are slightly dusted along the edges. The sepals are recurved, but the petals are somewhat flaring, pinched toward the tips and frilled. The flower stems are 2 ft. to 2½ ft.

Martha Washington: Compact and medium in size, wide sepals and petals, and a wide open flower. Sepals and petals are of the same color which is between Antique Ashes of Roses (2173) and Lilac (7163), both of the Standard Color Card. The throat is bright canary. Petals are frilled. The flower stems are 2½ feet.

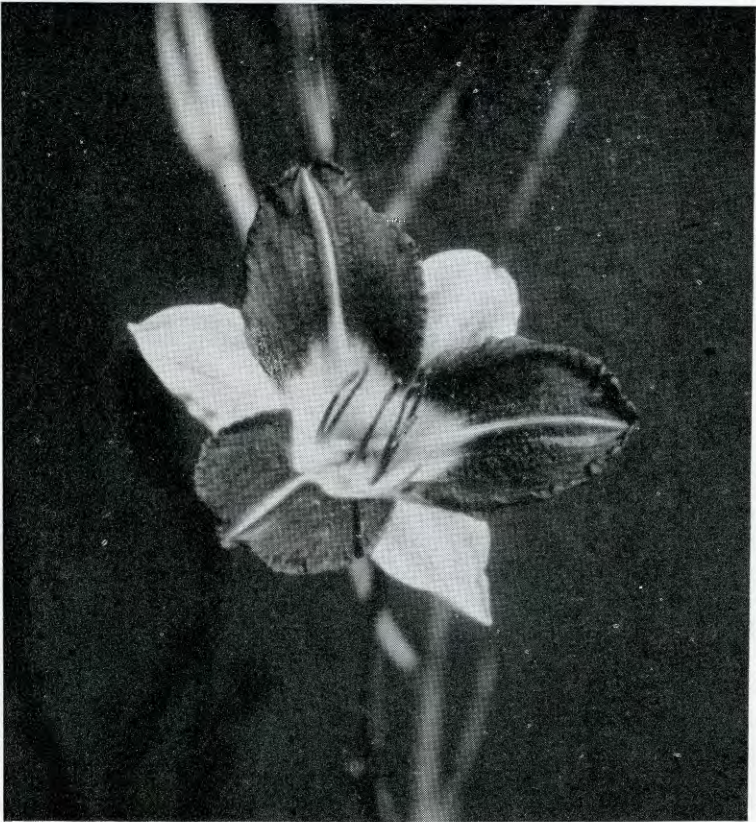


Fig. 95. Hybrid Daylily Bobolink

Introduced by Dr. A. B. Stout, New York Botanical Garden, N. Y.

Elmer A. Claar. Height to 4 ft.; flowers medium full, medium size, throat near to cadmium yellow with stripe extending out along midrib of each petal; anthocyanin coloring in petals near garnet brown with more intense color in veins; ground color of sepals cadmium-yellow with areas of red pigmentation that are less intense than in petals. (See Fig. 93.)

Introduced by L. Ernest Plouf, Craemore Gardens, Lawrence, Mass.

Amber Gold, 3½ ft. July-Aug. A smooth amber-gold trumpet; wide deep gold throat; very smooth narrow outer segments; inner segments much wider with brown blotch.

Classic Beauty, 3 ft. July. A pale soft-toned variety; 5" open flower of smooth form and tailored crinkling; inner segments delicate rose-ecru veined deeper and crinkled; outer segments ivory and embossed-crinkled at edges; no eye-zone; canary throat; no twisting; opens very well; ivory reverses; long tube.

Chicaro, 3½ ft. July-Aug. Very full 6" flower flaring from narrow throat; orange-yellow; all segments crinkled at edges; good substance; inner segments 1¾" wide; triangular outline; outstandingly large and full.

Kickapoo, 2½ ft. Large deep red firmly formed flowers which look right at you; orange throat; inner segments well recurved; well open; good substance; good stem.

Lady Rockingham, 3½ ft. July. Rather smooth 6" well open trumpet; narrow canary throat framed soft rose; rest of all segments pale rose-ecru; outer segments a little lighter; ivory midrib at throat edge only; fragrant; quite full, well held substantial flower; good form. In its color-class unusual in fragrance, form and size.

HYBRID AMARYLLIS CLONES

Introduced by Hermon Brown, Gilroy, Calif.

Lawrence. Striped and spotted on white ground; opens flat; three nine inch blooms.

White Orchid. Pure white; whitish-green throat; segments informal; eight and a half inch flower reminiscent of a white orchid.

Gilroy. A large clear red eight inch flower; three blooms.

Salisbury. Red lines on light background; good form, flat, eight inch blooms.

Kansas. Dark red with darker glossy red throat; very beautiful; three eight inch blooms.

HYBRID NARCISSUS CLONES

Introduced by Edwin C. Powell, Rt. 4, Rockville, Maryland.

Iana. (No. 29/66, *Mrs. E. H. Krelage* X *Tenedos*) White trumpet of beautiful form and substance; large upstanding flower with broad, flat perianth segments; beautifully proportioned trumpet. See Fig. 97. To be introduced in 1945.

Niantic. (32/348, *Minuet* X *Lord Wellington*, pollen parent) High quality Poeticus, with one, sometimes two, flowers on the tall scape. (See Plate 248.) To be introduced in 1944.

HYBRID CYRTANTHUS CLONES

Introduced by Mrs. J. Norman Henry, Gladwyne, Penna.

Coral Reef (H-1), *Cyrtanthus MacKenii* x *C. parviflorus*; large flower, fine form; coral red, paler face.

Fairy (H-2), *C. MacKenii* var. *Cooperi* (*lutescens*) x *C. flammeus*; pale yellow, face edged palest coral pink; small flower, dainty and beautiful.

Venus (H-3), *C. MacKenii* var. *Cooperi* (*lutescens*) x *C. flammeus*; apricot with light yellow face, edged apricot; vigorous and attractive.

Red Gem (H-4), scarlet red, pink face; small flower of fine form; a real gem.

Topaz (H-5), *C. MacKenii* var. *Cooperi* (*lutescens*) x *flammeus*; coral orange, yellow face, unusual and attractive.

HYBRID CRINUM CLONE

Introduced by L. S. Hannibal, Concord, Calif.

Frank Leach. A horticultural variety of *Crinum Moorei*; flowers very light blush pink, larger than those of the type, remaining open all day; plant is more frost hardy than type.

3. CYTOLOGY, GENETICS AND BREEDING

EIGHTEEN YEARS' EXPERIENCE IN BREEDING NARCISSUS

EDWIN C. POWELL, *Maryland*

Although I began to grow *Narcissus* when I moved to Washington, D. C., in 1921 it was not until five years later that I began to cross them. The late Dr. David Griffiths, then in charge of bulb investigations in the United States Department of Agriculture, said to me: "Why don't you breed daffodils? What we need is American daffodils adapted to American conditions." I took up the challenge as it offered a much greater field for pleasure and relaxation from official duties than the mere growing of bulbs for their flowers.

Since then I have produced more than 55,000 seedlings. Probably 10 per cent of these produced high class flowers and plants, and less than one per cent were rather outstanding and worthy of introduction. The other 90 per cent have been good, many of them, in fact, better than the run-of-mine varieties in the trade. There have been practically no "weedy" flowers among them.

I acquired ten or twelve common varieties in the early twenties; imported five or ten bulbs each of 50 varieties in 1925, before the Federal Horticultural Board put the ban on the importation of most plants, *Narcissus* included, without a special permit for scientific purposes or the increase of stock. In 1927 I imported 70 varieties and each year since I have obtained a few of the newer introductions of foreign growers and breeders until I built up a collection of more than 400 varieties. Although most of those that I imported in 1925 have been superseded by later introductions I obtained some very good seedlings from *Monarch*, *Madam Plemp*, *Glory of Noordwijk*, *Minnie Hume*, *White Queen*, *N. cyclamineus*, *N. jonquilla*, and *N. triandrus albus* as pollen parents, and from the importations of 1927 *Aeolus*, *Bernardino*, *Empire*, *Fair Bostonian*, *Mrs. E. H. Krelage*, *Mount Erebus*, *Phyllida*, *Sirdar*, *Hera*, *Expectation*, *Kingdom*, and *Obvallaris* gave some worthwhile things. Except for the three species mentioned none of the others has been used for many years, although I hope to repeat next spring the cross of *Aeolus* on *Kantara* which gave me the finest white trumpet that I have ever seen. After increasing the stock to four bulbs it died.

I have used *Fortune* quite extensively as a pollen parent, but while it has produced a few seeds they have all failed to grow to flowering bulbs. *Fortune's* most highly colored seedling, *Fortune's Crest* from *Seraglio*, has been a good seeder and its pollen is very potent. I have several good seedlings from it, as well as from *Bokhara*, another *Fortune* seedling. One of the most successful early crosses was *Fortune* on *Bernardino*. There were many beautiful flowers in the resulting batch of about 40 seedlings from which I selected *Forber* and *Pocahontas* for introduction, both yellow *Incomparabilis* with highly colored crowns.

Many of the high-priced novelties have failed as breeders, at least in the combinations that I have tried. Some varieties are nearly or completely sterile in my garden. *Croesus* produced only one seed in several

years of crossing; *Warlock*, which was highly recommended for breeding, failed to produce any seeds (although its pollen was potent) until I had used it for more than ten years and then it seeded abundantly. *Seraglio* and *Therapia* have been very useful. Last spring I selected for further test some very highly colored flowers of good form and substance from *Will Scarlet* x *Seraglio* and *Seraglio* x *Fortune* crossed in 1937, but it



Fig. 96. *Narcissus ovallaris-cyclamenius* hybrid—*Chicopee*. Introduced by Edwin C. Powell.

will be several years before their value is determined. *Hera* x *Fair Bostonian*, two fine old varieties, crossed in 1929 produced some outstanding seedlings from which *Esopus*, a bicolor *Incomparabilis*, and *Massasoit*, a yellow *Incomparabilis* with a richly colored crown, were increased and introduced last spring. Another very successful cross was *Nevis* x *Naxos*



Yellow Trumpet Narcissus — David Griffiths. Introduced by Edwin C. Powell in 1936.

Plate 247



Narcissus clones originated by Edwin C. Powell; left, *Poeticus—Niantic*, to be introduced in 1944; right, *Triandrus* hybrid—*Oconee*, introduced in 1939.

Plate 248

that produced *Agawam*, an early tall white trumpet. *Beersheba* x *Pilgrimage* produced something very unexpected—a beautiful lot of highly finished vigorous yellow trumpets from which it will take some time to select the best one or two.

I have dabbled a little trying to produce some pink-toned Leedsii varieties but have concluded that they are not well adapted to our climate. Most of the delicate colored varieties have been short lived, but *Mrs. R. O. Backhouse* has been very steady and reliable and its pollen on *Pinkeen* has given some beautiful flowers. Its pollen is potent but it is valueless as a seed parent.

My first introduction was *David Griffiths* (Plate 247), a fine, large yellow trumpet named for the late Dr. David Griffiths, who gave me 50 grams of seed from intercrossing *King Alfred*, *Van Waveren's Giant*, *Weardale Perfection*, and *Glory of Noordwijk*. It was the best among more than 300 seedlings. One of the most vigorous and prolific of my seedlings is *Tioga* from *Robert Sydenham* x *Pilgrim*—the only good thing from a lot of *Pilgrim* seedlings, a variety that has been highly useful in the hands of some English breeders. *Tioga*, a bicolor *Incomparabilis*, is in the same class as the popular *Bodilly*, but larger and more prolific. Three outstanding productions because of their form and size are *Hia-wassee*, a Poetaz from *Cassandra* x *Cyclamineus*, *Chicopee*, (Fig. 96) a very early hybrid from *Obvallaris* x *Cyclamineus*, and *Oconee*, (Plate 248) a *Triandrus* hybrid whose seed parent is unknown, while from *Nevis* x *Godolphin* I got *Itasca*, a reversed bicolor trumpet having light yellow perianth segments and a creamy white trumpet. *Powhatan*, a yellow trumpet from *The Perfect Gentleman* x *Sunstar*, may be heard from later if it continues to be a good actor. It is very large and extremely vigorous, has splendid form, thick heavy substance, and is about the richest and darkest yellow of any variety in its class.

Alachua is an early fine bicolor trumpet raised from a lot of mixed seed. It has broad flat well overlapping perianth-segments that stand at right angles to a shapely tubular rich yellow trumpet with a slightly frilled trim. It was shown as a first-year flower at the Annual *Narcissus* Show of the Garden Club of Virginia in 1940 and was given an Award of Distinction as the best variety not in commerce. It was awarded first prize as the best seedling and the best flower in the show at the Annual *Narcissus* Show of the Takoma Horticultural Club in 1943.

Oconee (Plate 248) is a late flowering *Triandrus* hybrid introduced in 1939. It is outstanding because of the decided contrast in color and unusual form. It bears two to three flowers on a stem; has a flaring light yellow crown, and white perianth pointing backward. *Iana* (Fig. 97; to be introduced in 1945) is a white trumpet of beautiful form and substance bred from *Mrs. Ernst H. Krelage* by *Tenedos*. It is a large up-standing flower with broad flat perianth-segments and a beautifully proportioned trumpet. *Niantic* (Plate 248; to be introduced in 1944) is a poet that usually produces one flower on a tall stem; sometimes two. It was bred from *Minuet*, one of the finest poets, and its pollen parent is recorded as *Lord Wellington*, a giant yellow trumpet. It is outstanding among a considerable batch of poets because of its high quality.

Triandrus albus as a pollen parent has produced several very beautiful flowers of characteristic form. Most are white but I have a few very attractive yellows and one or two bicolors, including the bicolor *Oconee*. The pollen of the species *Narcissus Jonquilla* is very potent and although most of the Jonquil hybrids are yellow I have obtained several attractive white ones.

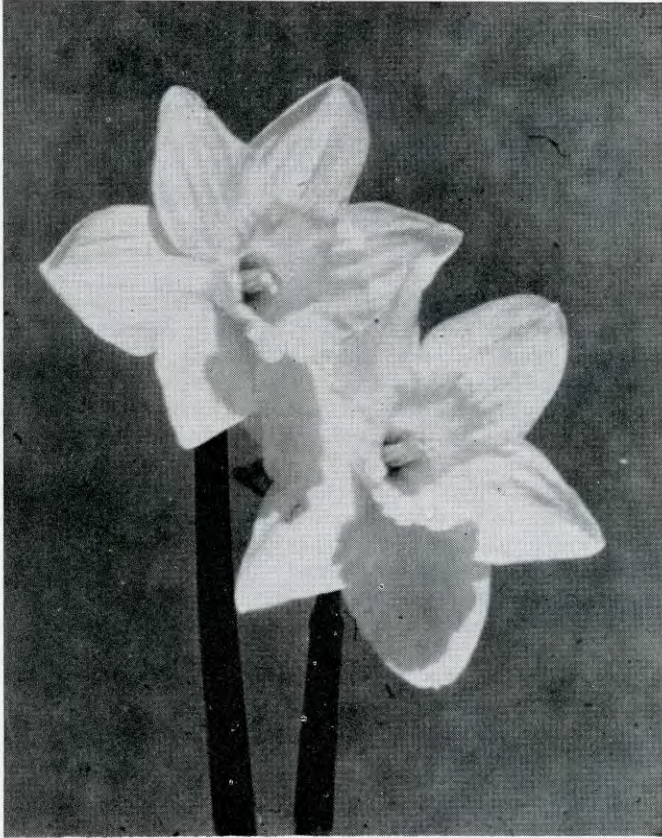


Fig. 97. White Trumpet *Narcissus--Jana*, to be introduced by Edwin C. Powell in 1945.

Soon after the first seedlings flowered I began to use them as parents and in recent years I have worked largely with my own productions. There are some worthy flowers in the second-generation seedlings, and a few of the third generation that have blossomed show a marked gain in one or more characteristics.

It requires from four to seven years to bring a seedling to flower and from four to six more years to determine the worth of the best of the few selected for trial. The breeding and production of seedlings is rather easy and simple, but a great amount of time and careful attention

is needed. Many combinations of parents are figured out in advance, but as many more are made on the spur of the moment because of the condition of the flowers—they do not all open when you would like to use them because the flowering period covers six to ten weeks. I select each fall ten or a dozen varieties that I wish to use and pot a few bulbs. They are plunged in the ground and brought into the house in March to obtain the pollen for use on earlier flowering varieties. Anthers are removed either as or before the flower opens and the pollen is placed on the pistil with a camel's hair brush or a pencil. A small price tag bearing the cross number is placed on the flower stem and the cross recorded in a record book. This number, preceded by the year (as 29/303) follows the seed and seedling until it is either named or discarded. The flowers are not covered because there is little open pollination in this climate.

The seed pods are gathered daily as they ripen and the seeds are counted and placed in coin envelopes into which are placed zinc or galvanized-iron tags, $\frac{3}{4}$ by $1\frac{1}{4}$ inches, bearing the cross numbers stamped into them with steel dies. During the summer or fall the seeds are planted in flower pots, each cross in a pot, and plunged to the top in a frame where they remain for two years. The frame is covered with glass sash in February to prevent the tiny plants from being heaved out by the alternate freezing and thawing.

After the end of the second growing season the pots are lifted, the contents dumped into a wire screen, and the small bulbs and metal tag picked out. Before the general planting season begins the bulbs are planted in rows a foot apart, the tag being hung on a No. 12 wire which is placed before each lot. Here they remain for four or five years until nearly all have flowered and the most promising have been marked, dug, and planted for further observation. Bulbs that have not blossomed by the sixth year have not produced any high class flowers after being dug, replanted and tested for a longer period. Less than one per cent blossom during their fourth year; about 50 per cent in their fifth; and 95 per cent or more the following year. It is a long wait from the crossing of two flowers to observing the final result in a new flower, but each spring as hundreds of new ones open there is keen anticipation and unbounded happiness in observing the efforts of one's skill and patience.

NARCISSUS BREEDING

FRANK REINELT, *California*

Ten years of breeding daffodils makes me only a seasoned beginner at the game, so my remarks and ideas are only partly from my own experience—the greater part are drawn from the experience of other more advanced breeders.

The great progress in daffodils in the last two or three decades was due to years of patient work by English amateurs, of whom the quartet, G. Englehart, Mrs. Beckhouse, P. D. Williams and Brodie of Brodie, were the most outstanding. All four are gone today but they left us a magnificent collection of material with which to continue the work.

Englehart gave us the advancement in white trumpets, Leedsii and Poets, among other things. Mrs. Backhouse brought color in red cups to an enviable intensity. P. D. Williams was responsible for the finest daffodils practically in every division. Brodie of Brodie was the most versatile, as his creations were most numerous, covering all of the forms and types.

At the present time, Guy Wilson and Lionel Richardson, both in Ireland, are sharing the honors of bringing out the finest new varieties. From Australia, New Zealand and Tasmania, various breeders have brought out excellent varieties; their chief contribution is perhaps the variations in pink cups of the Leedsii Division.

American breeding is still in its infancy, since it takes a lifetime to really accomplish anything in the breeding of daffodils. Advanced new varieties only recently began gaining more popularity. Our diversified climatic conditions present the difficulty to a breeder of producing varieties which would be adaptable for every condition. Our most ideal growing conditions, corresponding with the English climate, are in the Pacific Northwest. Unfortunately, the majority of the gardening enthusiasts do not live in that part of the country and cannot obtain equally good results in growing most of the varieties. For instance, here in California the very early varieties do much better than the late Barrii and Poets. Our season is too long, beginning in January with early varieties and ending in April with the late Poets. The sun during March or April is too warm to bring out their color so that they seldom look at their best. On the other hand, Eastern conditions, where early varieties often freeze in bloom, assure much better results with late varieties; and under some climatic conditions where long winters prevail, all of the varieties bloom practically at the same time, making the season extremely short.

From my point of view, the future breeder should consider several cardinal points, of which vigor and resistance to diseases, are the most important. Hundreds of perfectly beautiful varieties were introduced in the past, but disappeared from commerce very rapidly because of a delicate constitution. Basal rot, for which the tendency is strongly inheritable, eliminated for me a number of the finest white trumpets now in existence. Englehart's *Naxos* and Brodie's *Askelon* were perhaps responsible for the greatest advance in white trumpets recently, but both have the fault of inheriting a tendency for basal rot. *Askelon* never survived for me the first year. *Naxos* seems to linger for a while at least. They may be perfectly all right in very cool climates, but they are decidedly not for California.

Length of stem, short neck with good carriage, are next in importance. A flower which stands above the foliage on a strong stem with a short neck is more pleasing than one which bends down due to a long neck. It will stand rain and wind much better and will be more effective in the garden. In the matter of the flower, good form, balance and quality are very important, as well as color. There is no restriction as to variation of form that one has to adhere to. The Royal Horticultural Society dimensions for each type should not necessarily obstruct the

breeder's point of view. Too many varieties look too much alike and greater variations in the form of the cup, particularly, would make the distinction easier.

Color in daffodils is considerably limited, although the variation has been extended steadily with each new advance. One should strive both for the white or yellow in the perianth with more clearness and intensity. Too many varieties have muddy perianths with indistinct and variable shades of cream or light yellow. It is desirable to strive for greater variation in color of the cup. We already have cups of every shade of yellow, orange and red, which, in the case of *Hades*, is very deep. Unfortunately, the large red cups are more or less combined with perianths that are not white but cream in color at their best. Only a few flowers so far have the whiteness of perianth seen in the Poets. The work with red cups combined with yellow perianths is more advanced as there are a number of varieties with very good color contrasts already. A large possibility for beautiful color combinations is in the Leedsii class. An example is to be found in the recently developed pink cups. Not very much has been done with the Poets since Englehart, and his creations are still some of the best in that class. I am personally interested only in the first four classes; namely, trumpets, incomparabilis, Barrii and Leedsii. Therefore, I am not mentioning the other classes. Since I live in California, naturally I am judging according to our conditions and prefer varieties which do well with us. The subject is too large to be handled by one breeder and each locality presents an opportunity for developing something else. My own ideas about a good flower do not necessarily correspond with others', and are by no means a measure of any standard.

During the last ten years I have tested or have seen elsewhere the majority of the best English products, some of which impressed me a great deal, others again not at all. I shall chiefly name the newer and latest varieties in each class, since older varieties, long-established in commerce, have practically no breeding value any more.

The yellow group of trumpets and incomparabilis are perhaps the most difficult to breed. *Crocus*, *Cromarty*, *Principal*, *Royalist*, *Trenoon*, *St. Issey* and *St. Egwin* are my choice of breeders. All of them more or less proved of fine breeding value already. *Mortlake*, an Australian product, impressed me as a possibility. I have not had enough experience with *Kilkenny*, *Kingscourt*, *Galway* and *Portmarnock* to pass judgment on them. All of them do comparatively well. *St. Issey*, the earliest of the lot, has also the tallest stem, which is important here since most of the varieties do not produce sufficient length of stem, especially if the winter is comparatively dry. *Royalist*, the latest of the group, is often quite short; however, it has a good carriage, fine form and very, very fine smooth quality, which it transmits to its seedlings; the best example of this being, perhaps, *Kingscourt*, judged in England the finest and deepest trumpet yet produced. Heavier substance, wider perianths are the chief pending improvements in this class.

In the white group, I have combined both the white trumpets, incomparabilis and Leedsii, since they can be bred as a group, the difference often being only small measurements in the length of cup, or

parentage. The true white trumpets are comparatively short here and none too vigorous. I have been continually losing such things as *Askelon*, *Cameronian*, *Slemish*, *Beersheba*, so that I more or less decided to get away from their progeny when possible. They may be perfectly good to breed with in more adaptable climates. *Trostan* although an *Askelon* seedling, seems to have inherited from *King Alfred* more vigor, *Kanchenjunga* proved of enormous value in breeding already; and third, their child, *Broughshane*, from all indications, seems to be the biggest advance in white trumpets so far. *Samite*, I consider very important since it was raised from *Mrs. E. H. Krelage*. For superfine quality and finish it has only a few equals. *Polindra*, which is classed as incomparabilis, I like perhaps best of any daffodil. It is the nearest to perfection in every way. It does magnificently with us and should prove a very valuable parent. *White House*, bred from *Nisa* and *Tenedos*, is very promising, very early, tall, white. *Zero*, as pollen parent, is proving of value, and certainly it is the whitest flower I have seen so far. In combination with these whites, *Brunswick*, which actually has a lemon ring to the trumpet, has great possibilities.

Another group of whites from the Leedsii class, with possibilities of color in pink, copper and buff tones in their cups, is perhaps the most exciting to me: *Carnlough Penrose*, *Trousseau*, *Pink of Dawn*, and *Cleena* are the finest examples I have seen so far. *Niphedor*, which proved of fine breeding value in England, is very short here in California, and perhaps out of *Polindra* one might get the same results with much taller stems. *Cleena*, a seedling from *Fortune* (therefore an incomparabilis), should be of very great value. It has inherited the smooth bulb of *Fortune*, a strong, tall stem, and a very short neck. I do not mention the late Leedsii's with pink cups bred from *Mitylene* or *White Sentinel*, which die out rapidly with us. All of *Mitylene's* progeny are quite weak in California, although it is a good flower in other localities.

Yellow or red flowers do very well with us as they are earlier and have more vigor. *Fortune*, I still consider worthy of breeding, although only a few really outstanding varieties were raised from it, such as *Cleena* and *Hongkong*. If one could transfer the vigor, type of bulb, and size of flower of *Fortune* to the other red cups, one would make a great advance in breeding. *Carbineer* gave some of the best recent yellow and reds, of which *Narvick*, bred from *Carbineer* by *Porthilly*, is best. *Penquite* is another good breeder, due to its very short neck and very wide perianth. *Bahram*, its child, is a perfectly beautiful thing. *Diolite* is a very good flower. *Porthilly* has a very intense cup. *Royal Ransom*, with its buff perianth and *Market Merry* with a strong contrast of gold and red, should be included.

The group of white perianth flowers with color in cups is bewilderingly large. Unfortunately, they bloom late with us and the strong sun burns the color and generally they are not any too vigorous. *Blarney*, *Flamenco*, *Forfar*, *Hades*, *Jean Hood*, *Limerick*, *Rewa*, *Rubra*, *Seraglio* and *Therapia*, at present, are the chief varieties I have chosen. *Jean Hood*, an Australian product, is the earliest red and white flower, also the tallest daffodil I know of. It should be important for combining white and red flowers with early flowering, which, in California, means

a lot. At that season the color develops perfectly without fading or burning. *Rewa*, although not a large flower has a very tall stem and again is quite early. Bred from *Bernardino* by *Fortune*, it should give new color combinations in the cups. *Rubra*, another Australian product, is actually a short crown Leedsii; however, it can be included in this group as it too has a tall stem, is vigorous, and has a very smooth, round flower. *Seraglio* transmits its heavy substance, and some very fine seedlings have come from it. Its sister seedling, *Therapia*, is extremely large for a Barrii, quite important as a pollen parent. *Flamenco* does not burn and is very vigorous. *Hades* has the strongest red color in cup, which it transmits freely to its progeny. *Blarney*, bred from *Mitylene* by *Sunstar*, both of which are very difficult to breed in California, seems to be the exception to the rule and grows quite freely. It is a beautiful flower with a novel coloring in the cup showing new possibilities in combinations of color for the future.

In conclusion, I should like to stress that I mention only the varieties that did well with me so far and which I choose in each respective class for my work. When one traces the parentage of the best new varieties, it seems to narrow down to a very few original parents. Some parents occasionally produce good flowers, but on the whole they are too defective. Therefore, I choose without regard to class and try to limit the number only to the few which eventually will bring home the bacon. If one uses a large number of varieties of secondary quality, one at least can expect only second quality progeny.

It takes, as a rule, five years to raise one generation and the beginner should regard the first two generations that he raises as an education before he can hope to produce something worth while. Unless the product will have combinations of all the factors which make it either an excellent garden variety or commercial cutting variety, there is not much sense in introducing it as it will not survive the competition. No matter how beautiful a flower otherwise, if it lacks propagation ability or is subject to diseases, it is valueless to the gardening society at large. Each year I see disappearing from the catalogs a number of varieties that are superseded, but there are also old-timers that seem to withstand the competition very well and stay on and on. What we need is such varieties possessing practically cast-iron constitutions, wider range in color and form of the cups to make them more distinctive.

RAMBLES IN THE NARCISSUS SEEDLING BED, 1943

S. STILLMAN BERRY, *California*

Since the informal report on my work which appeared in the 1942 Daffodil Yearbook was written (1940) three springtimes have transpired in my garden, all good ones for Narcissi and one of them quite outstanding for the number and quality of the blooms. Each season has brought its little measure of further progress in the breeding of interesting flowers and it is of this that I would now briefly write. It is of course a constant goal of breeders in southern California to attain flowers of intense coloring reasonably adapted to persistence in our dry air and brilliant sunlight. I believe my early feeling is already being amply

borne out that progress in this direction is likely to be much surer by the method of direct selection from seedling plants grown on the spot than it is when one relies only on the costly system of trial and elimination of varieties developed elsewhere and already subjected to selection under quite other environments. In fact it increasingly appears that resplendent crowns which hold up under any but the most unreasonable onslaught by sun and wind are much more rapidly attainable in the seedling beds than smooth, finely formed perianths, or even perfect carriage. That matter of carriage is often, indeed, even more troublesome than the perianth. Quite a number of the named varieties of daffodils which are among the most potent in the way that they distribute high color and gorgeous patterns amongst their progeny are incorrigible offenders in the way they transmit too long or awkwardly attached pedicels. I do not deny that flowers exist which are still graceful despite quite long pedicels, while others with much shorter "necks" may yet be ungainly because of the awkward angle formed where the pedicel springs from the scape. When the pedicel is both long and inserted at a bad angle, it becomes a breeder's nightmare. One can attempt to deal with such flowers in one of two ways,—either reject them from the breeding stock, with the deliberate sacrifice of such more desirable genetic traits as the plant might appear or be presumed to carry, or attempt more patiently to screen out the bad and propagate the good qualities through successive matings. In practice I find myself no consistent dogmatist in this, adopting now one procedure, now the other.

I have made this rather trite digression into the field of general principles to pave the way for an interesting concrete illustration, the old daffodil *Brightling* having revealed itself as a rather trying instance in point. Its own neck is not too good, but earlier in my breeding work I was for a time rather poor in flowers of highest color, so resorted to this in one series of crosses. Several hundred seedlings resulted, most of which, as chance had it, came into bloom in near proximity to one another. If one yearns for a springtime introduction to the fireworks of Independence Day I know of no very much better way of attaining it than to grow a batch of *Brightling* crosses. My own display of red fire, Bengal lights, and Catherine wheels was visible from as far as one could distance one's self from the bed, but it was as though a chance match had fallen into the box—they shot off at all angles and in all directions. There was no denying the color, however, all the parents grouped together could not have equalled the show—but never in all my seedlings, outside of *N. triandrus* var. *albus* hybrids, have I seen so many gawky pedicels. Nine-tenths of the lot could be eliminated at once, and mostly through this fault alone, yet I could not bring myself to make a clean sweep and I confess that I have since been breeding pretty heavily from two or three of the ultimate selections—a bad mistake, perhaps—but time inexorably will tell, and it would be worth much to contrive one of those flaming bowls against a perianth with the poise and fine formation of a *St. Egwin* or a *Carmlough*.

The desirability of smoothness of perianth further complicates the task. It is the easiest thing in the garden to breed flowers of high color if one will rest content with the coarse ragged perianths which so detract

from one's pleasure in many of the most spectacular flowers enjoying present acclaim, and which abound in many of the broods from what otherwise would appear the most promising of crosses. We know the complete lineage of so few of the flowers we must use that it is often quite impossible to predict about this in advance and only the actual experiment reveals upon its completion whether the marriage has been well advised. Some years ago when the famous *Fortune* was scarce in America and I had but a flower or two of it, I thought I would like to know the result of matings within the strain, and chose for this purpose the two smoothest-petaled of the *Fortune* seedling then in my garden, *Bokhara*, which is said to come from *Fortune* on *Tamarlane*, and *Copper Bowl*, which is given as a *Fortune-Beacon* cross. A heavy seedling resulted and in the end more than a hundred plants of this parentage were raised. A monotonous lot they were. I had expected a fair production of flowers throwing back somewhat strongly to the double ancestor *Fortune*. However, the great majority were simply poorer, rougher *Copper Bowls* or *Bokharas*. The lot ran 2a throughout; the uniformity in color, a yellow perianth with the crown some tone of orange, was marked. Conspicuous depth of color was a feature of the minority, and in the entire batch only a very few flowers proved in any way outstanding. If my experience extended no further than this lot I would be inclined to look with small favor upon the further use of either parent, but fortunately a number of out-crosses had been made with each of them at about the same time and the story of some of these is quite different. In the article I have mentioned something has been said of the happy consequences of the reciprocal matings made between *Bokhara* and the Australian *Warflame*. Another essay nearly as interesting has been the pollinating of *Scarlet Queen* by *Copper Bowl*. A lot of pretty rough flowers might be expected here and I got them, but a fair proportion turned out reasonably smooth. There was plenty of fine color, one flower in particular unfolding a large bowl-shaped crown of intense flaming scarlet which will surely bear watching both in its own right and for use as a parent. I have used the pollen of this brilliant flower to its utmost capacity and have harvested seeds by it from *Carbineer*, *Marksman*, and *Telopea*, all of which seem somewhat hopeful possibilities.

A less spectacular but not less interesting result, providing the scratching of birds in the seed pans did not effect an unpremeditated interchange, came from a back-cross of *Bokhara* on *Fortune*, where a small batch of seedling plants, most of which revealed strong *Fortune* influence, included one very trim and handsome yellow trumpet. *A priori* one would think that the recovery of 1a flowers where both parents are 2a and therefore each possesses trumpet blood, might be frequent in the progeny, but in practice it seems a strangely uncommon event, for which we may need a carefully controlled genetic analysis adequately to explain. I have noted such a revision only two or three times among my seedlings, and the same holds for white trumpets coming from interbred 4a's. I read with no little envy of the increasing occurrence in some numbers of flowers with pink or pinkish crowns in the seed-beds of other growers, where they seem frequently to crop out from the most unexpected combinations. To date I can report little luck in this direction, and it has been only this past spring that my first flower of a

definitely pinkish tone reached blooming age. It resulted from rather a surprising cross and has served as a spur to jaded hope, though it is only fair to mention that all of the most promising of my really planned "pink" matings are still to come on. The plant referred to is a seedling of *Zoe* by *Fortune*, its white perianth rather starry in form like that of its mother daffodil, but the rather short, bowl-shaped crown a somewhat orange-salmon tone throughout. *Zoe* is an immense, rather narrow-petaled 2b of Australian origin, much like a considerably amplified and glorified *Bernardino*, of which old-time standby I am informed that it is in its turn a derivative. I presume this seedling would be classed as a 2b, but it is pale for that and the step required to take it into 4a or even 4b would not be a stride. I used pollen of Mr. Guy Wilson's beautiful *Carnlough* on the single flower, harvesting therefrom five seeds.

I would like to add a few words about green-eyed flowers, but the space allotted me has by now been filled and it is as well to leave something for next time.

STEPS IN PRODUCING HYBRID NARCISSUS¹KENYON L. REYNOLDS, *California*

1. As a flower starts to open the anthers are removed with a small pair of forceps. This makes chance pollination very unlikely. The flower is then left for about three days, when it is ready to receive the pollen from some other flower. (See Fig. 98, upper left.)



Fig. 98. Steps in *Narcissus* breeding: upper left, step 1; upper right, step 2; lower left, step 3; and lower right, step 4. See text for details.

2. If it is desired to save the pollen for use on other flowers, the anthers when removed should be placed in an open container of some kind, like a small vial, watch-glass or piece of tin-foil where it can be exposed to the drying action of calcium chloride in a cookie-jar or similar container. If such a dessicator is not available the anthers should be

¹This note, and also the illustrations accompanying it, are reproduced by permission, from page 56, *Sunset Magazine*, March 1940, Lane Publishing Co., San Francisco, Calif.

placed in the shade in the open air until the pollen "comes up" and appears in the form of yellow powder on the anther. (See Fig. 98, upper right.)

3. When the flower has been open a couple of days the dry anther from some other variety is taken in the forceps and the pollen is applied to the stigma which can be easily found in the center of the flower. (See Fig. 98, lower left.)



Fig. 99. Steps in Narcissus breeding (continued): upper left, step 5; upper right, step 6; lower left, step 7; and lower right, step 8. See text for details.

4. A tag with the number of the cross is then tied around the neck of the flower tightly enough so it will not slide down the stem. (See Fig. 98, lower right.)

5. The name and number of the cross is then recorded in a note book which is kept for permanent reference. (See Fig. 99, upper left.)

6. About two months later the seed-pod should be watched. If it rattles when snapped with the finger, it should be harvested and the seed placed in an envelope marked with the name and number of the cross. (See Fig. 99, upper right.)

7. The seeds should then be planted about one inch deep in soil which has good drainage and has been enriched with some bonemeal. They may either be placed in the open ground in the place where they are to be left to bloom, in which case they should be at least one and one half inches apart each way; or they may be planted much closer in a frame or box (not a flat) and transplanted after they go dormant at the end of the second year. Planting may be done immediately or at the end of the summer. (See Fig. 99, lower left.)



Fig. 100. Steps in *Narcissus* breeding (continued): step 10. See text for details.

8. In December or January the first leaves will appear above ground. The ground should be kept fairly moist from then until the leaves die down in June or July. The second year they will reappear with two or more leaves which will be larger and flat as seen in the rear frame in this picture. (See Fig. 99, lower right.)

9. About twenty five to fifty per cent of the seedlings will flower in the fourth year.

10. Most of the remainder will flower in the fifth and sixth year and from then on they are treated like any other bulbs of new varieties.

NARCISSUS FROM SEEDS

KENYON L. REYNOLDS, *California*

Narcissus are easily grown from seeds and do not require expert handling or special equipment. Furthermore, bulbs grown from seeds will almost invariably be healthier and more vigorous than any which can be purchased. Each bulb grown from seeds will be a new variety

and no two will be exactly alike, but once a bulb has flowered it may be perpetuated by propagating the increase from that particular bulb. The only negative consideration is the time required from seeds to first bloom. This is usually four years. The procedure is as follows:—

If plenty of space is available it is a little less work to plant the seeds where they may be left in one place for the entire time from seed to bloom. If garden space is a consideration it is advisable to plant the seeds in a frame or boxes or large pots. The soil in any case should be at least 8" deep. Any garden soil will do. If the drainage is not good it should be improved by adding peat and sand. Bone meal and wood ashes may also be added, an ounce or two of each to the square yard, but they are not necessary. Other fertilizers are not recommended.



Fig. 101. Desiccator for preserving *Narcissus* pollen.
See preceding article for details.

The seeds may be planted at any time after they ripen in May or June, but should be in the ground by mid-October at the latest. Cover the seeds with about an inch of soil. A quarter inch of peat on the top is desirable but not necessary. In pots, arrange the seeds at least one half inch apart. In boxes or frames plant in rows 3" apart but the seeds may be as little as one fourth inch apart in the row. If the seeds are planted where they are expected to mature they should be 1½" apart in the row and the rows should be 6" apart.

It will add greatly to your pleasure if the seeds from each cross are kept separated and carefully labeled. If you are trying them for the first time it may not seem important now, but you will surely regret it if you do not know the cross when blooming time comes. Remember, when making the labels that they must last for six years or more.

Water sparingly until October 1st. After that supplement the rains with frequent watering. Keep the weeds pulled. The plants will appear above ground between December and February depending upon the lateness of the variety. The first year they produce a single round leaf which may grow six or eight inches long. If watering is not neg-

lected they will continue to grow until early summer. Then they will turn yellow and die down. The dead leaves may then be removed and watering practically stopped until the following October, but it is well not to let the soil remain powder-dry if an occasional light sprinkling is practical.

The cut-worm is about the only enemy of these plants during their first two years. They eat the leaves from the top down and if not checked they may destroy a whole year's growth, but seldom kill the plant. If their presence is observed the plants may be sprayed with an arsenic coating spray. The safest procedure however is to go out after dark with a flashlight and gather the worms. They will almost always be found at the top of the leaf and at first they are very small, perhaps less than a half inch long and only as thick as the lead of a pencil, but later they are easy to find. Usually they can be eliminated after a few nights attention.

The second year the plants usually have two or more leaves of the characteristic shape and coloring of daffodil foliage, but they seldom exceed a quarter inch in width and a foot in length.

If the seeds were planted in close quarters, the little bulbs should be dug at the end of the second growing season. They will be found to have drawn themselves down so the bottom of the bulb is about four inches under ground. The bulbs will be about the size and shape of peanuts or smaller and usually have one or more fleshy roots attached. They should be planted back without removing these roots the same day they are dug if possible. The bulbs should be set in rows 6" apart and 3" or 4" apart in the row. They should be from 3" to 5" deep at the bottom depending upon the size which will vary considerably. An easy way to dig the bulbs without mixing them or losing any is to take one lot at a time, soil and all, and place them on a $\frac{1}{4}$ " mesh screen gently shaking the soil through and leaving the bulbs on the screen.

After they are re-planted they will need no further attention except for water during the growing season. They may be left in the same spot until they have bloomed for two or three years.

CHROMOSOME NUMBERS REPORTED IN RECENT YEARS FOR
HEMEROCALLIDEAE, ALSTROEMERIALES, AND AMARYLLIDALES

W. S. FLORY, JR.

Texas Agricultural Experiment Station

Six years ago a compilation of known chromosome numbers for the plants dealt with by the American Amaryllis Society appeared in Volume 4 of *Herbertia* (8). The present article brings up-to-date the summary of chromosome numbers reported for plants in these same groups.

In the previous review were listed chromosome numbers for about 240 species or botanical varieties from 28 genera, and in addition for some 60 horticultural varieties. The present article lists in table 1 the chromosome numbers for all species and varieties given in available published form since the 1937 review.¹ It includes numbers for about 160 species and botanical varieties, and in addition for some 40 horticultural varieties. Some of these numbers are for the same species listed earlier and in such instances they may be either identical or different from the counts reported in the earlier list. In either case they represent studies of papers not represented in the earlier review—with one exception. Several species and varieties of *Hemerocallis* for which chromosome numbers were reported by Dr. Stout in 1932 (37), and which were inadvertently omitted in the 1937 summary, are now included for completeness.

Table 1 includes chromosome numbers for several different categories not studied before 1937. No published cytological studies had been made on any member of the tribes Gillesieae or Ixioliriae prior to 1943. Chromosome descriptions of one species of each of these tribes have been made (1, 43). This leaves only the tribe Eustephieae, in the Amaryllidaceae, on which no chromosome reports have appeared. Altogether 85 species for which chromosome numbers were unknown in 1937 are included here. These species are scattered among 21 genera. The names of six genera—*Miersia*, *Cooperia*, *Habranthus*, *Griffinia*, *Ixiolirion* and *Sprekelia* are new to the list—although actually one species of *Habranthus*, then given as a *Zephyranthes*, appears in the earlier table. In addition to the species there are some 50 varieties (about 15 botanical, 35 horticultural) whose chromosome numbers are given here but not in the earlier table.

From the standpoint of generic gains in numbers of species studied cytologically during the past six years; we find the already comparatively well-covered *Narcissus* and *Allium* groups at the top of the list. Previously unreported numbers for 14 species, 7 botanical and 23 horticultural varieties of *Narcissus*, and for 14 species and 1 interspecific hybrid of *Allium* are given in table 1. Considering only the botanical species in the various tribes there also have been somewhat more in-

¹ The one exception to this is in the case of Dr. Fernandes' complete chromosome list (4) of *Narcissus* species and varieties, which appeared in the 1942 *Herbertia*. Species whose chromosome numbers had already been credited to Dr. Fernandes in the 1937 summary are not relisted now. Numbers for species not known by the compiler to have been published elsewhere, however, are given here in table 1.

creases in the Allieae than in other tribes, with numbers having been reported in about 26 species and in addition 1 hybrid and 2 or 3 varieties, not studied prior to 1937. In the Zephyrantheae numbers are listed for 17 species and 1 interspecific hybrid which have been reported since 1937.

Hutchinson's arrangement (11) is again followed in listing the plant groups in table 1 except that changes since proposed by various workers have been adopted along the lines indicated in a recent article by Albert Pam [*Herbertia*, 9:85-98. 1942 (1943)]. However, the genera are arranged alphabetically within the tribe. Also the same general columnar headings and arrangement are used as in table 1 of the earlier review. Tables 1 of this and the preceding report therefore lend themselves to being easily used together. The two tables together are as complete as it was possible for the compilers to make them, but it is probable that certain papers—from foreign countries especially—have not come to attention. Reference may be made to the 1937 review (8) for the terminology used.

It will be noted in table 1 that in some cases authors for species have been given while in other instances this is not done. The authors of the cytological papers referred to have been followed in this matter.

The data compiled in this report gives only the chromosome numbers for the species and varieties studied by various authors. In many cases these workers have also studied the types of chromosomes and described karyotypes and presented idiograms for the complements in different species and varieties. Good examples of this trend are found in the extensive papers by Sato (33) and Fernandes (4). Not only have extensive chromosome numbers and descriptions been published in cytological studies on the Amaryllidaceae. Certain members of the family, most especially some of the *Allium* species, have been the subject of different descriptive and experimental cytological studies. These include studies of spontaneous (28) and of X-ray induced (34) chromosome aberrations in *Allium*; of the effects of acenaphthene and colchicine (17), and of sulfanilamide and other sulfa compounds (42) on *Allium* as well as some other plants; of chromosome breakage and knot formation in *Pancreatium* (10); of male gamete formation in an Amaryllis (*Hippeastrum*) hybrid (14); of the mechanism of mitosis in pollen tubes of *Zephyranthes* (35); of the effects of colchicine on the spindle mechanism in pollen tubes of *Crinum* and of *Amaryllis* (41), and of cytological structures in *Allium* and *Narcissus* (23). A number of species in the Amaryllidaceae and related groups have comparatively small numbers of rather large chromosomes. It is such species—other things being equal—which best lend themselves to such cytological investigations.

As the list of chromosome numbers becomes longer and more definite it also becomes more apparent that both polyploidy and also aneuploidy are rather common phenomena in these plant groups. Polyploidy is now reported to occur in about 18 genera and aneuploidy seems apparent in 10 or 11 genera. Aneuploidy, secondary polyploidy, and sexually unstable polyploidy, such as triploidy, apparently are more apt

to occur in horticultural hybrids and varieties, as for instance those of the genera *Nerine* and *Narcissus*. It is often possible that the addition of one or more chromosomes or sets of chromosomes will produce plants containing gene combinations which make that particular plant very desirable horticulturally. In seed propagated plants such individuals are apt to be lost because of sterility, but in forms that are vegetatively propagated an irregular chromosome condition does not interfere with the plants increase.

This summary does not have for its purpose a detailed discussion of phylogeny, evolution and general relationships within and between the various groups. However, it may be pointed out here, as has been done in several of the papers referred to (especially references 12 and 33), that 11 is a predominant basic chromosome number in several groups. This basic number has been reported as occurring in no less than fourteen of these genera. It appears to be the predominating basic number in *Hemerocallis*, *Leucojum*, *Nerine*, *Crinum*, *Clivia*, *Pancratium*, *Amaryllis*, *Lyconis*—and perhaps in *Brunsvigia*, *Griffinia*, *Sprekelia*, *Stenbergia* and other genera. If this basic number of eleven is as consistent and definite in some groups as it appears to be, a possibility worth consideration in future studies is that species in a 10- or 12-chromosome series in these (and perhaps other) genera have been derived from 11 chromosome forms. Other prominent basic numbers in several genera are 8 and 9. Also four or five genera have 6 (or 12) for the predominant basic number. In a list of numbers like those reported in *Zephyranthes*, for example, it is easy enough to postulate how somatic numbers like 25, 38, 46, and $47 + 1$ fragment may have been derived from complements with a chromosome number evenly divisible by 6. Detailed study of the various chromosomes in the complements of different species could furnish evidence for or against such postulations.

The importance of both cytological and morphological studies to the correct interpretation of plant relationships has become more apparent during recent years. In the Amaryllidaceae the cytological picture is gradually taking form. In some genera, and also in some wider taxonomic groups, this picture is already becoming definite and concrete. In such groups the cytological evidence indicates the trend of evolutionary relationships, thus either supplying evidence for or against current taxonomic views—and in some cases suggesting promising directions for future systematic investigations. On the other hand a great many genera have not been studied cytologically, and some tribes have either not been touched, or at most have been sampled very sketchily. Thus this family continues to offer many fertile lanes down which cytotaxonomic and cytogenetic problems may be pursued with good probability of profit.

TABLE 1.

Chromosome numbers in the Hemerocallideae, Alstroemeriales and Amaryllidales as reported since the 1937 compilation (8).

Species or Variety	n	2n	Literature reference
LILIALES			
LILIACEAE			
HEMERCALLIDEAE			
<i>Hemerocallis citrina</i>		22 ²	37
<i>H. fulva</i>		22	2
<i>H. fulva</i> clone "Europa"		33	2,37
<i>H. fulva</i> clone "maculata" ¹		33	37
<i>H. Middendorffii</i>		22	37
<i>H. minor</i>		22	37
<i>Hemerocallis</i> hybrid hort. clones:			
<i>aurantica</i> Major ¹		22	37
Aureole ¹		22	37
Chengtu ¹		33	38
Hankow ¹		22	38
Luteola ¹		22	37
Mikado ¹		22	37
Mulleri ¹		22	37
Rosalind ¹		22	38
Sirius ¹		22	37
Vesta ¹		22	37
ALSTROEMERIALES			
ALSTROEMERIACEAE			
<i>Alstroemeria chilensis</i>		16	33
<i>A. pulchella</i>		16	33
<i>Alstroemeria</i> sp. ("accession no. 36.1215") ¹		ca. ³ 32	9
<i>Bomarea</i> ⁴ <i>salsilla</i> ¹		18	33
AMARYLLIDALES			
AMARYLLIDACEAE			
ALLIEAE			
<i>Allium Ampeloprasum</i> ¹		32	22
<i>A. amplexans</i> Torr. (- <i>A. attenuifolium</i> Kell.)	7 ²		22
<i>A. amplexans</i>	7 ²	14 ² , 28 ²	18
<i>A. Babingtonii</i> ¹ (- <i>A. Scordoprasum</i>)		48	22
<i>A. Bidwelliae</i> S. Wats. ¹		28	24
<i>A. Cepa</i> L.	8	16	24
<i>A. Cepa</i> L. x <i>A. fistulosum</i> L. ¹		16	3,15,20
<i>A. cilicicum</i> Boiss. ¹	8		24
<i>A. cyaneum</i> Reg. ¹		32	24
<i>A. darwasicum</i> Reg. ¹		16	24
<i>A. decipiens</i> Fisch. ¹		16	24
<i>A. Déséglisei</i> Bor. ¹		32	24
<i>A. margaritaceum</i> Sibth. & sm. ¹		16, 3 ²	24
<i>A. nigrum</i> L.	8	16 ²	24
<i>A. Ostrowskianum</i> Reg.		16 ²	24
<i>A. Porrum</i>	16	32	19
<i>A. sativum</i> L.	8	16	24
<i>A. scorzoneraefolium</i> (DC) Red. ¹	7		24
<i>A. senescens</i> L.		48 ²	24
<i>A. Sewerzowi</i> Reg. ¹	8		22

* Exponential figures refer to explanations at the end of this table.

Species or Variety	n	2n	Literature reference
ALLIEAE (contd.)			
<i>A. sibiricum</i> ¹		16	22
<i>A. siculum</i> Ucria ¹		16	24
<i>A. Wallichianum</i> Steud. ¹		16	24
<i>Brodiaea elegans</i> ¹ (<i>B. grandiflora</i>) ⁵	16	32	1
<i>B. coronaria</i> (<i>B. grandiflora</i> , Oregon) ⁵	21	42	1
<i>B. minor</i> ¹ (<i>B. Purdyi</i>) ⁵	16	32	1
<i>B. minor</i> var. <i>nana</i> (<i>B. minor</i>) ⁵	6 ²	12 ²	1
<i>B. stellaris</i>	6 ²	12	1
<i>B. californica</i> (Blue) ⁵	6 ²	12 ²	1
<i>B. californica</i> (Lilac Pink) ⁵	6 ²	12 ²	1
<i>Dichelostemma pulchellum</i> (<i>B. capitata</i>) ⁵		18 ²	1
<i>D. sp.</i> (<i>B. capitata</i> var. <i>multiflora</i>) ⁵		18	1
<i>D. congestum</i> (<i>B. pulchella</i>) ⁵		36	1
<i>D. volubil</i> ¹ (<i>B. volubilis</i>) ⁵	9 ²	18 ²	1
<i>D. ida-maia</i> (<i>B. coccinea</i>) ⁵		48 ²	1
<i>Nothoscordum inodorum</i> (<i>N. fragrans</i>)		32 ²	21
<i>N. inodorum</i> (<i>N. fragrans</i>)	9,10	19 ²	16
<i>Triteleia grandiflora</i> ¹ (<i>B. Douglasii</i>) ⁵		32	1
<i>T. peduncularis</i> ¹ (<i>B. Eastwoodii</i>) ⁵		14	1
<i>T. sp.</i> ¹ (<i>B. peduncularis</i>) ⁵		28	1
<i>T. laxa</i> ¹ (<i>B. laxa</i>) ⁵	14	28(30)	1
<i>T. laxa</i> (<i>B. laxa</i> , Blue King) ⁵		42	1
<i>T. laxa</i> (<i>B. candida</i>) ⁵		48	1
<i>T. crocea</i> ¹ (<i>B. crocea</i>) ⁵		16	1
<i>T. ixiooides</i> ¹ var. <i>scabra</i> ¹ (<i>B. ixiooides</i> var. <i>splendens</i>) ⁵	5(6)	10(11)	1
<i>T. ixiooides</i> var. <i>analina</i> ¹ (<i>B. ixiooides</i> var. <i>erecta</i>) ⁵		50	1
<i>T. hyacinthina</i> ¹ (<i>B. lactea</i>) ⁵		28	1
<i>T. hyacinthina</i> (<i>B. lactea</i> , Oregon) ⁵		28	1
<i>T. Hendersoni</i> ¹ (<i>B. Hendersoni</i>) ⁵	16	32	1
<i>T. Bridgesii</i> ¹ (<i>B. Bridgesii</i>) ⁵		16	1
GILLIESIAEAE			
<i>Miersia chilensis</i> ¹	10,11	20,21	1a
IXILIRIAEAE			
<i>Ixiolirion tataricum</i> Herb. ¹		24	43
GALANTHEAE			
<i>Galanthus nivalis</i>		24,25 ² ,6,28 ²	32,33
<i>G. Elwesii</i>		24,48 ²	32,33
<i>Leucojum aestivum</i>		22	31,33
<i>L. autumnale</i>		14	31,33
<i>L. vernalis</i>		22 ²	31,33
<i>L. vernalis</i> var. <i>carrathicum</i> ¹		22	31,33
BRUNSVIGIAEAE			
<i>Brunsvigia rosea</i> (syn. <i>Amaryllis belladonna</i> Ait. et Herb. non Linn.)		22 ²	12,33
<i>B. sp.</i> (<i>Amaryllis alba</i>) ¹		39	33
<i>B. sp.</i> [<i>Amaryllis striatiflora</i> (<i>Zephyranthes</i>)] ¹		12	33
<i>Crinum bulbispermum</i> (<i>C. capense</i>) ¹		22+2ff.	33

Species or Variety	n	2n	Literature reference
BRUNSVIGIEAE (contd.)			
<i>C. asiaticum</i> var. <i>japonicum</i>	11 ²	22	40
<i>C. asiaticum</i> var. <i>japonicum</i>		22	12,33
<i>C. asiaticum</i> L. var. <i>sinicum</i> Bak. ¹		22	12
<i>C. gigas</i> ¹		24	39
<i>C. gigas</i>	11 ²	22 ²	40
<i>C. gigas</i> Nakai		22	12,33
<i>C. latifolium</i>	11 ²	22 ²	40
<i>C. latifolium</i>		22	12,33
<i>C. lineare</i> ¹		22	33
<i>C. lineare</i> var. <i>album</i> ¹		22	33
<i>Crinum macrantherum</i> ¹		33	33
<i>C. maritimum</i>		24 ²	39
<i>C. Moorei</i> ¹		22	33
<i>C. Moorei</i> var. <i>album</i> ¹		22	33
<i>C. Rattrayii</i> ¹		22	33
<i>Nerine Bowdeni</i>		22(-23?)	13
<i>N. curvifolia</i> Herb.		33 ²	12
<i>N. curvifolia</i> ⁷		22	33
<i>N. curvifolia</i> var. <i>Fothergilli major</i> ¹		24	13
<i>N. falcata</i> ¹		22(-23?)	13
<i>N. filifolia</i>		24	13
<i>N. flexuosa</i> ¹		33	33
<i>N. flexuosa</i> var. <i>alba</i> ¹		22	13
<i>N. humilis</i> ¹		33	12,33
<i>N. pudica</i> ¹		33	12,33
<i>N. sarniensis</i>		33 ²	12,33
<i>N. sarniensis</i> var. <i>coruscans major</i> ¹		22	13
<i>N. undulata</i>		22	12,33
<i>Nerine</i> hybrid Hort. clones			
Chameleon ¹		22(?)	13
Manselli ¹		24	13
Elegantissima ¹		28	13
Mrs. George Barr ¹		28	13
Ingens ¹		32(-34?)	13
CYRTANTHEAE			
<i>Crytanthus obliquus</i> ¹		22	33
ZEPHYRANTHEAE			
<i>Cooperia Drummondii</i> Herb. ¹		48	6
<i>C. pedunculata</i> Herb. ¹		48	6
<i>C. Smallii</i> Alex. ¹		54	7A
<i>C. Traubii</i> Hayward ¹		24	6
<i>Habranthus robustus</i> Herb. ¹ (syn. <i>Zephyranthes robusta</i>)		12	5
<i>H. robustus</i> (syn. <i>Zephyranthes robusta</i>)		12	33
<i>H. Andersoni</i> var. <i>texanus</i> (syn. <i>Zephyranthes texana</i>)		24	33
<i>H. Andersoni</i> ¹		21	33
<i>H. Andersoni</i> Herb. ex. Lindl.		24 ²	7C
<i>H. brachyandrus</i> (Baker) Sealy ¹		24	7c
<i>H. brachyandrus</i> (Baker) Sealy x <i>H. robustus</i> Herb. ¹		18	7c

Species or Variety	n	2n	Literature reference
ZEPHYRANTHEAE (contd.)			
<i>Sprekelia formosissima</i> (L.) Herb. ¹		ca. ³ 110	12
<i>S. formosissima</i>		110-117	33
<i>Sternbergia lutea</i>		16 ²	27
<i>S. lutea</i>		22 ²	12,33
<i>Zephyranthes Atamasco</i> (L.) Herb. ¹		24	7B
<i>Z. Ajax</i> ¹		ca. ³ 43;44	7B,7C
<i>Zephyranthes candida</i> Lindl. (Herb.)	19	38	12
<i>Z. candida</i> (Lindl.) Herb.		38	7B,33
<i>Z. grandiflora</i> (syn. <i>Z. carinata</i> Herb.)	24 ²	48 ²	12
<i>Z. grandiflora</i> (syn. <i>Z. carinata</i> Herb.)		48	7C,33
<i>Z. macrosiphon</i> Baker ¹		ca.48;46	7B,7C
<i>Z. longifolia</i> Hemsl. ¹		46	7B
<i>Z. pulchella</i> J. D. Sm. ¹		48	7B
<i>Z. Taubertii</i> ¹		12	33
<i>Z. texana</i> (- <i>Habranthus Andersoni</i> var. <i>texanus</i> , which see above.)			
<i>Z. Treatiae</i> S. Wats. ¹		24	7B
<i>Z. robusta</i> (- <i>Habranthus robustus</i> , which see above.)			
<i>Z. Lindleyana</i>		24 ²	33
<i>Z. Simpsoni</i> Chapman ¹		48	7B
<i>Z. tubispatha</i> Herb. ¹		25	7C
<i>Z. sp.</i> (from lower Rio Grande Valley of Texas) ¹		47+1f.	7B
HAEMANTHEAE			
<i>Clivia crysanthiflora</i> (<i>C. nobilis</i> x <i>C. miniata</i>) ¹		18	44
<i>C. miniata</i> Reg.		22	12
<i>C. nobilis</i> ¹		22	12
<i>Haemanthus albiflos</i> Jacq. ⁸		16	12,33
<i>H. albiflos</i> var. <i>pubescens</i> ¹		16	33
<i>H. coccineus</i> L. ¹		16	12,33
<i>Haemanthus</i> "Prince Albert" ¹		18	12,33
AMARYLLIDAEAE			
<i>Amaryllis hybridum</i> (<i>Hippeastrum hybridum</i>) ¹		44	12
<i>A. rutila</i> (<i>H. rutilum</i>) ¹		44	33
<i>A. vittata</i> (<i>H. vittatum</i>) (L.) Herb.		44 ²	12,33
<i>A. Blumenavia</i> (<i>Griffinia Blumenavia</i>)		77	33
<i>Lycoris albiflora</i> Koidz.	17/2 ²	17	12
<i>L. aurea</i> Herb.	6 ² ,13/2 ²	12,13 ²	12
<i>L. radiata</i> Herb.	33/2 ²	33	12
<i>L. sanguinea</i> Maxim.	11	22	12
<i>L. squamigera</i> Maxim.	27/2 ²	27	12
<i>L. squamigera</i>		27	33
<i>L. straminea</i> Lindl. ¹		16	12
<i>Lycoris</i> sp. ¹		22	29
NARCISSEAE			
<i>Narcissus asturiensis</i> Pugsley ¹		14	4
<i>N. biflorus</i> Curt. (<i>N. tazetta</i> L. x <i>N. poeticus</i> L.)		17	4

Species or Variety	n	2n	Literature reference
NARCISSEAE (contd.)			
<i>N. Broussonetti</i> Lag. ¹		22	4
<i>N. Bulbocodium</i> L.			
var. "Chiqueda" ¹		26,27	4
var. "Foz do Arelho" ¹		26	4
var. "Leca do Bailio" ¹		21	4
var. "Mira de Aire" ¹		26	4
var. "Parede" ¹		26	4
var. "Pinhal de Leiria" ¹		35	4
var. "Pinhal do Valado" ¹		26	4
var. "Pontal" ¹		26	4
var. "Povoa de Lanhoso" ¹		42	4
var. "Raposeira" ¹		26	4
var. "Redinha" ¹		28	4
var. "S. Martinho do Porto" ¹		26	4
var. "Tapada da Ajunda" ¹		26	4
var. "Vimeiro" ¹		14	4
<i>Narcissus dubius</i> Gouan ¹		50	4
<i>N. elegans</i> Spach.			
var. <i>fallax</i> F. Q. ¹		20	4
ssp. <i>intermedius</i> (Gay) F. Q. ¹		20	4
<i>N. gaditanus</i> Boiss et. Reut.		14	4
<i>N. gracilis</i> Sabine ¹		14	30,36
(<i>N. Jonquilla</i> L. x <i>N. Poeticus</i> L.)			
<i>N. incomparabilis</i>			
var. <i>auratus</i> ¹		14	33
var. "Sir Watkins"		21	36
<i>N. Jonquilla</i>		14	33
<i>N. Jonquilla</i> L. var. <i>Henriquesi</i> Samp. ¹		14	4
<i>N. Jonquilla</i> "Simple odorante" ¹		14	4
<i>N. Jonquilla</i> "Double odorante" ¹		14	4
<i>N. jonquilloides</i> Willk. ¹		21	4
<i>N. juncifolius</i> Lag. ¹		14	4
<i>N. odorus</i> L. (<i>N. Pseudonarcissus</i> L. x <i>N. Jonquilla</i> L.)		14	30,36
<i>N. pachybolbos</i> Durieu ¹		22	4
<i>N. Panizianus</i> Parl. ¹		22	4
<i>N. papyraceus</i> Ker. ¹		22	4
<i>N. poeticus</i>		21 ²	33
<i>N. poeticus</i> L.		14	36
<i>N. poeticus</i> L.	7-14	21	26
var. <i>recurvus</i>		21	25
var. "King Alfred" ¹		28	36
<i>Narcissus polyanthos</i> Lois. ¹		22	4
<i>N. Pseudonarcissus</i>		14	33
<i>N. Pseudonarcissus</i> L. var. "Victoria"		22	36
<i>N. serotinus</i> L.		30	4
<i>N. Tazetta</i> L.		21 ²	36
<i>N. Tazetta</i> L.		30 ² , 31 ²	26
var. <i>caniculatus</i> ¹		29	36
var. <i>papyraceous</i> ¹		22	33
var. <i>suisen</i> ¹		32	33
var. "Almalguez" ¹		29	36
var. "Cerca do Convento de Mafra" ¹		22	4
var. "Grand Soleil d'or" ¹		20	36
var. "Jardim da Quinta das Varandas, Coimbra." ¹		30	4
var. "Narcisse a bouquet totus albus" ¹		22	4
var. "Narcisse a bouquet totus albus grandiflorus." ¹		22	4

Species or Variety	n	2n	Literature reference
NARCISSEAE (contd.)			
<i>N. Tazetta</i> L. var. ?		20	4
<i>N. viridiflorus</i> Schousb. ¹		28	4
<i>N. Watieri</i> Maire ¹		14	4
EUCCHARIDEAE			
<i>Eucharis grandiflora</i> ¹		68	33
<i>Hymenocallis lacera</i> (-rotata)		69 ²	33
<i>H. littoralis</i> ¹		46	33
<i>Hymenocallis</i> sp. (<i>galvestoniensis</i> ?) ¹		52	7A
<i>Pancratium illyricum</i> ¹		44	33
<i>P. speciosum</i> Salisb.		46 ²	12

1 This species (or variety) was not included in the 1937 review because the first report on its chromosome number has only appeared in recent years (note exception mentioned in the text in case of **Hemerocallis**).

2 This chromosome number has been reported for this species (or variety) in recent years, and consequently did not appear in the 1937 compilation.

3 Abbreviation for circa (about or approximately).

4 Spelled **Bomalia** in reference cited but very apparently meant for **Bomarea**.

5 Name in parenthesis is the one listed in Carl Purdy's catalog (Ukiah, California) from whom the material was obtained.

6 Only one plant was found with this number.

7 Listed as **Nerine curviflora** by Sato (33) but apparently meant to be **N. curvifolia**.

8 Listed as **Haemanthus albiflorus** Jacq. by Inariyama (12), but no listing of a species with this spelling is found in Index Kewensis.

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AMARYLLIS BREEDING REPORT, 1943

HERMON BROWN, *California*

Since the appearance of my short account of breeding activities in 1939 HERBERTIA (pages 203-205), I have imported six bulbs of pure white hybrid amaryllis from Holland which arrived after World War II had started. I also have two lots of seedlings from Holland firms that have come into bloom. Mr. Pierre S. du Pont has also kindly sent me some of his choice clones and seedlings. All of this material has been added to my own good stock and this gives me some very fine parents for my breeding operations.

I am not attempting to keep any of my original strain separate but am using the best from all sources for crossing. Seedlings from such crosses are now coming into flower, and it is a great pleasure to observe the new ones for the first time.

I was still somewhat hazy about the ideal in view in my breeding work since I had never shown my hybrids to other amaryllis breeders. However, in April of this year, I had the good fortune to have Dr. Traub come to see my collection on a Sunday. He saw them at their best and liked many of them and seemed very much pleased over the progress I have made. Some of my "choice" ones he characterized as gaudy and common, but in the majority of cases we did agree, and I feel that I am now on the right track. Dr. Traub was especially pleased with my pastel colored blooms. I had a dark red of my original strain that he considered as good as the best.

I have room in my greenhouse for only a few hundred bulbs in pots for breeding purposes. Dr. Traub looked them over and rated my best ones. About 30 were rated 90% or better, and about an equal number 85 to 90%. To these I have added about 40 excellent bulbs so that I have about 100 now that rate 85% to 99%. I plan to bring in about 50 each year from the large field of seedlings and will then discard others that fall behind in the competition. In this way my breeding stock should be constantly improved.

Due to the shortage of orchard workers, I have been very busy in my prune orchard and I can do only a small part of what I would like to do with my amaryllis. But I am getting pleasure and some profit from my flowers. Many garden enthusiasts come to see my flowers and that is as it should be for this old world needs some beauty and enthusiasm to assist in keeping up morale in these trying times.

NOTES ON INHERITANCE IN BRUNSVIGIA

E. O. ORPET, *California*

In 1936 the writer imported white-flowering hybrid *Brunsvigia*¹ clones including the clone *Multiflora Alba*, from Australia. A brief report was made on these in 1937 HERBERTIA. In 1938, a large number of seeds was obtained by hand pollination from an isolated planting of *Multiflora Alba*. No notes were made on color of seeds.

¹ See articles by Hannibal, *Herbertia* 9:100-101; 101-102, 146. 1942 (1943).

TABLE I

Brunsvigia hybrid, *Multiflora Alba*, analysis of number of seeds per capsule, proportion in the seedcoat color and seed size classes; season 1943, Santa Barbara, California (E. O. Orpet).

Capsule No.	Colorless				Tinted pink				Splashed red				Total No.
	large	medium	small	total	large	medium	small	total	large	medium	small	total	
1	2	2	0	4	1	2	0	3	1	0	0	1	8
2	2	0	0	2	0	2	0	2	3	1	0	4	8
3	2	1	1	4	1	0	1	2	2	2	0	4	10
4	0	0	1	1	5	3	1	9	4	1	1	6	16
5	0	0	0	0	3	1	0	4	4	1	0	5	9
6	1	5	2	8	1	1	0	2	2	2	0	4	14
Total No.	7	8	4	19	11	9	2	22	16	7	1	24	65
Average No.	1.1	1.3	0.6	3.1	1.8	1.5	0.3	3.6	2.6	1.1	0.1	4	10.8
Ratio				3				4				4	

These seeds were planted, and in 1942 a few of the seedlings flowered—all were pink-flowered. In 1943, many more flowered and a large proportion, approximately 30 per cent, were pure white and true to the *Multiflora* flowering habit.

Seeds of the clone *Hathor*, a distinct, white clone, were also planted in 1938. All of these seedlings were white-flowering with no pink segregates.

Seeds of the clone, *Multiflora Alba* were again harvested in 1943. After placing the seeds under glass to harden, it was noticed that the seedcoats were either colorless, or tinted pink, or splashed red. An analysis was made of the seeds in six seed capsules. The data is presented in Table 1.

It should be mentioned that as to distribution in the capsule, seeds of the three color classes were in most cases intermixed. Some red ones, for instance, were found at the base of the capsule, and colorless ones at the top exposed to full sunlight.

All of the colorless seeds and some of each class of the colored ones were planted in order to study further the inheritance of the color character in *Brunsvigia*. It would be of interest to know if the white flowering habit is associated with colorless seeds. Any results secured will be reported in future issues of HERBERTIA.

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BRUNSVIGIA ROSEA BREEDING

E. P. ZIMMERMAN, *California*

The breeding and growing of amaryllids is one of the writer's specialties. In the nurseries and fields, there are over 150,000 bulbs in all sizes from the seedling stage to flowering size of the Cape Belladonna, *Brunsvigia rosea* (syn. *Amaryllis belladonna* Ait. et Herb., non Linn.), and hybrids. The breeding work on this subject has now gone through four generations from seeds.

The original stock of *Brunsvigia rosea* was secured from Truffaut, Versailles, France, and included the type *B. rosea*, and the varieties *spectabilis*, *bicolor*, and *purpurea*. Additional stock, consisting of bulbs collected in their native habitat in Cape Province, South Africa, were secured from a collector.

This splendid species, *B. rosea*, is quite variable in size, shape and color of flower. The color ranges from almost white to various shades of red and purple. From a block of 20,000 flowering bulbs in the open field, 36 outstanding clones have been selected as worthy of naming. Some are broad-petaled and others narrow-petaled. These latter have an attractive informal appearance. It is a most beautiful sight when this block of bulbs is in bloom.

The writer experienced a surprise during the present year—something that had not been seen by him before during his 32 years in growing *B. rosea*. Four bulbs bloomed in a 6,000 batch of 4 year old seedlings still in the seed flats. It may be that these can be used as the basis of an early flowering strain of *Brunsvigia rosea*. Such an advent would make this worthy subject even more popular.

MUTATIONS IN AMARYLLIDS

L. S. HANNIBAL, *California*

Last year Dr. Traub mentioned umbellate mutations (HERBERTIA 9:53, 1942.) pointing out the importance of the subject. This brief report concerns some that have come under the writer's observation.

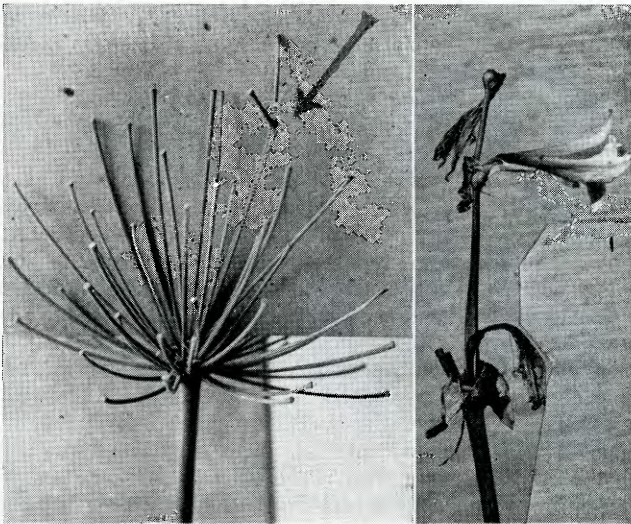


Fig. 102. Branched pedicels, left, *Agapanthus orientalis*; right, *Brunsvigia rosea*.

Agapanthus orientalis, a common garden plant in California, which is usually called *A. umbellatus* (an exact replica of plate No. 6 in Redoute's *Les Liliacees*) seems to show the most primitive of mutations. Secondary branching of pedicels is quite common, (See arrow in Fig. 102.). A number of these have been examined and have always been found to be three branched, with the secondary pedicels usually of the following lengths, or ratios of these lengths, respectively: 4 mm., 15 mm., and 25 mm. Floral mutations have also been noticed. It is not unusual to find a blossom with 8 perianth segments and occasionally 10. One plant was found with 16% of the blossoms having 8 segments but as *Agapanthus* grow easily from seeds this may be an exception for this individual only.

A mutation with a branched scape in *Agapanthus* is less commonly found. The writer has observed it only 3 or 4 times. In some cases the branching seems to come up from within the sheathing about the scape as two scapes may appear together from the same leaf axil.

The only other case of branched scapes noticed in a genus other than *Agapanthus* was in *Ismene calathina*. About one inch below the spathe-valve, which contained 3 blossoms, a $\frac{1}{4}$ inch stem appeared which carried a single small aborted blossom complete with spathe-valve and all floral parts in miniature. The overall length was less than $\frac{1}{2}$ inch.

Figure 102 shows a mutation in *Brunsvigia rosea* (syn. *Amaryllis belladonna* Ait. et Herb. non Linn.). The secondary umbel contained three pedicels with normal blossoms. (An apology is due for presenting such a sad looking specimen but for the sake of science the scape was rescued from an ash heap.) Also noticed is an occasional tendency for the pedicels of the variety *major* of our local form of *Brunsvigia Rosea*, to fuse together giving a "double flower." This seems to occur more often in some years than in others.

In 1937 the writer became quite interested in colchicine which had been reported as an agent capable of doubling the chromosome. The work was followed closely and note was taken of the reported success with *Lilium*. Before long some of this poisonous alkaloid was purchased locally and tried on *Amaryllis* seeds and seedlings. The results were far from satisfactory—disastrous in fact. A solution of sufficient strength to act usually meant death to the seedling plant. If the seed did grow, waiting 4 or 5 years for a mature bulb seemed too slow to observe results. The treatment of the sub-terminal buds of mature bulbs was suggested and preliminary tests indicated that the idea was apparently sound. A number of amaryllids were selected—the portion of the bulb above the plate was cut away until the subterminal area was exposed. The region was then wetted with several drops of 0.75% colchicine solution and after it was absorbed into the bulb the latter was set away to await results. In most cases well established bulbs in pots were used. The root systems were not disturbed since each plant would need all the energy it could get to reestablish itself. Offsets attached to mature bulbs offered the most favorable possibilities and much of the material seemed to respond with the formation of a badly warped and swollen bulblet in the subterminal area. The exactness of exposing the growing point immediately above the basal plate was the most critical factor, but the results seemed so promising that subsequently several hundred *Narcissus* bulbs were treated in the early spring of 1940 just before the development of the foliage parts in miniature for the following year. Details of the method were reported in 1941 (*Jour. of Calif. Hort. Soc.*, Pp. 117-120, 1941) and in the year following extensive work was carried out on a number of sterile *Narcissus hybrids* of *Triandrus*, *Jonquil*, and *Tazetta*.

Fortunately a portion of this latter material was planted quite deeply in a raised bed of sandy soil where excellent drainage was possible. The remainder of the bulbs were stored in moist peat moss until fall. Mosaic disease had not appeared in previous tests, but the weakened *Triandrus* bulbs that had been stored in the peat-moss developed

a bad case which showed up the following spring. Those in the well drained bed did better—that is, as good as could be expected for bulbs that had been so badly cut up and exposed to the drastic effects of colchicine—for the foliage which appeared was badly warped and twisted from the irregular cellular mutation and divisions. Naturally no blossoms appeared, but that had been experienced before. In fact, no flowers appeared on the bulbs treated the previous year, but what seemed odd was that with the bulbs treated two years before, both *Amaryllis* and *Narcissus*, no indication of larger cell structure or double chromosome behavior could be detected. This last spring (1943) the *triandrus* also failed to show any abnormal condition. The writer did not have the facilities to make sections for microscopic study, but he is quite convinced that the effects of colchicine are readily thrown off in the second year of foliage development. Dr. Traub mentioned similar experiences with daylilies. Temporary mutations are very common in *Narcissus*. If they were more permanent we would have all kinds of queer things. Very few mutations from colchicine treatment are ever more than temporary. Our results are by no means final, for we are still trying to get seeds or viable pollen from these sterile hybrids, but it does not look too encouraging at present.

NOTES ON DAYLILY BREEDING

J. MARION SHULL, *Maryland*

This fragmentary report on *Hemerocallis* breeding is presented only for what it may be worth. It is not a completed work. The chief interest being horticultural rather than genetic the work has not been carried on under the rigid discipline demanded for research in genetics, nevertheless it seems worth recording as a sidelight on the complexities of genetic behavior.

Possession of a green-house-forced plant of the clone *H. fulva rosea*, *Rosalind*, in early spring of 1941, made possible the use of *Rosalind* pollen on the three *Hemerocallis* species then blooming in the garden. These were *H. Middendorffii*, *H. minor*, and *H. flava major*. *Rosalind*, like most close relatives of *H. fulva*, is tall and freely branched, but is roseate in body color as well as red eyed, and is quite late with its bloom.

Hemerocallis Middendorffii on the other hand is dwarf, unbranched, a clear orange yellow self, and blooms early. Thus there are four distinct and completely opposing characteristics: dwarf—tall; unbranched—branched; yellow self—red with eye pattern; and early—late.

The family was not large, only 35 plants, of which all but 3 bloomed in 1943. Twelve were definitely early, blooming along with the mother, *H. Middendorffii*, and while none of these was identical with *H. Middendorffii*, there were only slight differences of color and form, and several that had some stems with one or more short branches. In fact the resemblances to the mother were so close as to suggest that pollen other than that of *Rosalind* may have found access to the stigmas during the period of receptivity. Beginning bloom of these early members was from May 12 to 17 for the year 1943 here at Chevy Chase, Md.

In the remaining 20 there would appear to be a broad general dominance of the male parent with slight variation. One began blooming as early as May 31, and one as late as June 23, but mostly they fell between June 4 and 19. Thus they are definitely midseason rather than early or late like the parents.

Inasmuch as these all show decided resemblance to the male parent there can be no question of their legitimacy. All are decidedly branched, like the father, none capitate. As to color, while all show the eye pattern of the pollen parent, *Rosalind*, sometimes sharply defined, sometimes blurred, but always markedly present, not one shows any suggestion of the roseate body color of *Rosalind*. The body color is a clean bright orange, a little brighter than in *Europa* at its best, and never tawny. In general, however, they remind one of *Europa*, and the blooming time is coincident or nearly so with that clone. As they are nearing the end of their bloom, the first scapes of *Rosalind* are still just emerging from the leaf fans.

Sufficient reliable data is not at hand for a report on *H. flava major* by *Rosalind*, but in the family resulting from *H. minor* by *Rosalind* the story is similar in some respects to that of *H. Middendorffii*, but quite different in others. Of 23 plants I shall rule out as probably illegitimate the two which bloomed early and nearly identical with *H. minor* in all characters. The remaining 21 all display the eye pattern derived from *Rosalind*, but unlike the preceding family, body color is quite variable, from pallid yellow flesh tones to fairly dark tawny or even blackish reds. Never is the bright orange yellow of the preceding family attained. In general the quality of the color is not as good as one would like, and in all cases they are considerably affected by the sun, whereas in the other family the colors appear to be sun-fast.

I have no reason to offer as to why the combining of *Hemerocallis minor* with *Rosalind* should give a progeny so different from that of the closely similar combining of *H. Middendorffii* and *Rosalind*. It only goes to show what an intricately variable thing heredity is, and that one dare not generalize from one species to another.

As a final and seemingly unrelated observation, most of the offspring of *H. Middendorffii* by *Rosalind* carry a long banner-like bract subtending the lowest branch of the inflorescence, in some cases attaining a length of more than a foot. This seems totally unaccounted for in the immediate ancestry, for both *H. Middendorffii* and *Rosalind* are quite short bracted, nor do long bracts appear to be present in *Europa*. I do find long bracts in such clones as *Sir Michael Foster*, *Calypso* and *Hyperion*, though not equal to those reported above, and there is considerable variability within the same clump of any of these.

DICHOGAMY AND INTERSPECIFIC STERILITY

HAMILTON P. TRAUB, *California*

During the present year attempts were made to hybridize *Alstroemeria* species under the conditions of the lower Salinas Valley. As a preliminary, a study was made of the time of stamen maturity and pistil receptivity in this Genus.

Dichogamy. In the species studied—*Alstroemeria pulchra*, *A. haemantha* and *A. psittacina*—dichogamy was quite pronounced. Dichogamy refers to the condition, brought about by the maturity at different times of the anthers and stigmas, that promotes inter crossing between hermaphrodite flowers. Dichogamy in *A. haemantha* is diagrammatically illustrated in Figure 103. It should be noted that the stamens mature first

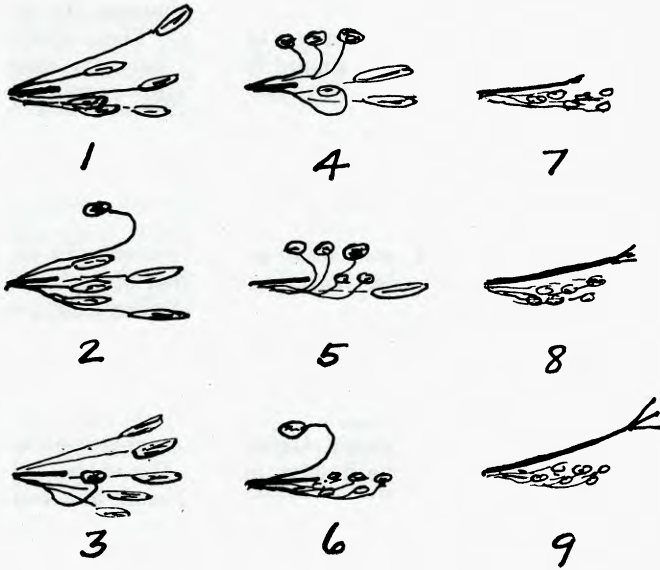


Fig. 103. Dichogamy in *Alstroemeria haemantha*; development of stamens and pistil: (1) July 1; (2) July 2, first stamen shedding pollen; (3) July 3, stamens withering after shedding pollen; (4) July 4; (5) July 5; (6) July 6; (7) July 7, all stamens withered, pistil elongation begins; (8) July 8; (9) July 9, stigma is receptive.

and the last ones have all shed their pollen and have withered by the time the stigma becomes receptive. There is at least a three days' interval between the time the last stamen sheds pollen and the time the stigma becomes receptive. This condition leads to extensive interchange of genes between the individuals of this species and would also lead to hybridization with compatible species if their ranges would overlap.

These observations were made under the conditions of the lower Salinas Valley where the climate simulates that of a cool greenhouse for most of the year. Daylilies, for instance, last from two to three days,

which means that growth and senescence are slowed down considerably as compared to warmer climates. In the latter case the time table for stamen and pistil development as outlined for *A. haemantha* would differ as to time intervals but otherwise the development would be similar.

Attempted crosses. The following crosses were attempted:

A. pulchra (seed parent) X *A. haemantha* (pollen parent)

A. psittacina (seed parent) X *A. haemantha* (pollen parent)

The first cross, *A. pulchra* X *A. haemantha*, proved successful in so far as seed production was concerned. Only six seeds were secured and these have been planted and it remains to be seen what will come from them.

The attempt to cross *A. psittacina* and *A. haemantha* did not prove successful. In all cases the pericarp enlarged to normal size following the application of *A. haemantha* pollen to the stigmas of *A. psittacina*, but when the apparently normal capsule had ripened and was broken open there were only aborted ovules to be seen. These ovules had aborted at an early stage after development began. In every case of fifteen trials, under strictly controlled conditions, this same result was secured. Apparently the tropical Brazilian species, *A. psittacina*, has been isolated for such a long time from the temperate zone species, *A. haemantha*, that physiological isolating mechanisms have been developed in the course of evolution so that gene exchange between them is no longer possible.

It is unfortunate that *A. psittacina* and *A. haemantha* do not cross for the former species has the desirable character of blooming from early summer to mid-winter here in the lower Salinas Valley. *A. pulchra* and *A. haemantha* die down soon after flowering. The flower of *A. psittacina* is not outstanding for beauty, but the shade of red and type of flower are worth considering by the plant breeder as pointed out by Harry L. Stinson in 1942 HERBERTIA (p. 125).

Bagging technique. In making *Alstroemeria* crosses, it is necessary to remove the anthers before the flowers open if the entire inflorescence is bagged but in any case, the flower must be covered, and must be kept covered after the cross has been made until the pistil has abscised. Crosses made without this precaution have a doubtful status. Humming birds, especially, may transfer pollen from other flowers.

AGAPANTHUS CLONE, ARTHINGTON WORSLEY

HAMILTON P. TRAUB, *California*

In 1935, the writer imported a number of amaryllids and alstroemerias from van Tubergen in Holland, including a collection of *Agapanthus* species, and the *Agapanthus* clone, *Arthington Worsley*. The species were planted in the border in Florida and all died within two years. This was apparently due to the acid condition of the soil. The clone, *Arthington Worsley*, was planted in a tub and survived. This note is in the nature of a brief history of this plant up to the present. The illustration, Figure 104, is reproduced from a photograph furnished by Perry Coppens who also imported this clone.

The clone was introduced by the late Arthington Worsley. In one of his illuminating letters he pointed out that this clone needs "seads of water during the flowering season." This hint was followed with the result that a scape appeared on the plant in 1936. Unfortunately, during the writer's absence, the tender scape was snapped off, apparently



Fig. 104. Agapanthus clone—Arthington Worsley. Photo by Perry Coppens.

by a bird that attempted to use it as a perch. On the writer's return he surveyed the damage carefully and he decided on the unusual procedure of performing grafting operations on a monocotyledonous plant. The severed portion of the scape was wedge-grafted back on the portion still on the plant. Surprisingly a union was secured but the development

of the scape was slowed down and the flowers never opened normally. No scapes were produced in Florida from 1937 to 1940.

In 1940 the plant was taken to Beltsville, Maryland, and in the early spring of 1942 another scape was produced. The flowers were a beautiful light blue. It is of interest to note that one of the pedicels was branched. One capsule developed but it contained no fertile seeds. In the summer of 1942, the plant was taken to Salinas, California, and planted in the border at 115 Carmel Avenue. In the early summer of 1943 the third scape was produced, and seeds were set.

The balance of this brief note is devoted to an analysis of the inflorescence, the fruits (capsules) and the seeds.

The Inflorescence. The umbel was borne on a tall, solid peduncle. The flowers numbered 144, and 38 or 26.3 per cent of these developed into ripe fruits (capsules). The pedicels were in groups, of varying lengths and some of them crossed one another in different directions (crisscrossed). The flowers are sub-erect but the developing fruit turns downward.

Pedicel lengths. The pedicel lengths are analyzed in Table 1. This shows that there is considerable variation in pedicel length with the majority ranging from 4.1 cm. to 8.0 cm.

TABLE 1

Agapanthus clone, **Arthington Worsley**; distribution, into length classes, of 106 pedicels taken at random from the total of 144.

Number in each class	Length classes, cm.						
	2.1-3.0	3.1-4.0	4.1-5.0	5.1-6.0	6.1-7.0	7.1-8.0	8.1-9.0
	2	4	22	16	26	22	14

The variation in pedicel length will give us a clue as to the origin of the inflorescence. This will be discussed below.

Pedicel aggregation groups. The variation in pedicel lengths and their crisscrossing led to closer examination of the umbel, and this revealed that the pedicel aggregation groups are apparently abbreviated bostryxes. These groups are analyzed in Table 2.

TABLE 2

Agapanthus clone, **Arthington Worsley**; analysis of 10 pedicel aggregation groups of the umbel taken at random.

Number of groups in each class	Class; number of pedicels in aggregation groups		
	5	6	7
	3	2	5

Preliminary observation on many amaryllids seems to indicate that the umbel in this Family had its origin in the bostryx. Dr. Stout (Bul. Torrey Bot. Club, 68:305-316, 1941) has shown that the typical inflorescence in *Hemerocallis* is the bostryx. We have thus a gradual series from *Hemerocallis* which shows the typical bostryx in such species as *H. multiflora*, and the pseudo-umbel in *H. nana*; the near-umbel in *Ixiolirion*, *Kolpakowskia* and *Tritelelopsis* in which the pedicels are branched (somewhat abbreviated bostryxes), the umbel in *Agapanthus* made up of very much abbreviated bostryxes, and finally the typical amaryllid umbel in such genera as *Allium*, *Brunsvigia*, *Haemanthus*. Further evolution is then in the direction of reduction of flowers in the

umbel which reaches its highest development in species of such genera as *Zephyranthes*, *Habranthus* and *Cooperia* that are characterized as a rule by the umbel with a single flower.

Sterility. Of the 144 flowers in the umbel of the *Agapanthus* clone under consideration, 38, or 26.3 per cent developed into mature fruits (capsules). It is important to note that a high degree of sterility was encountered within these capsules. The information is summarized in Table 3.

TABLE 3

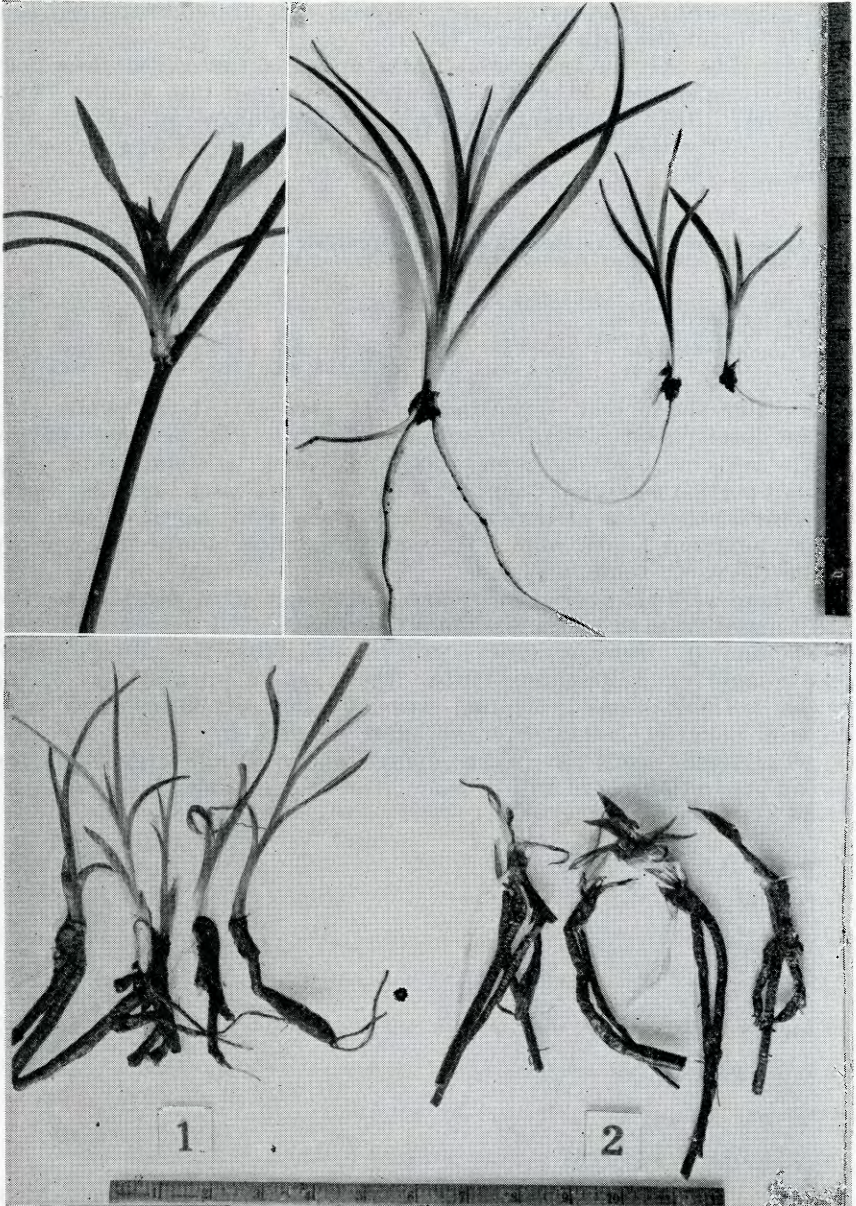
Agapanthus clone, **Arthington Worsley**; analysis of fertile and infertile seeds in 10 capsules taken at random from the total of 38.

	Capsule Nos.										Mean
	1	2	3	4	5	6	7	8	9	10	
Number of fertile seeds	13	10	13	11	8	13	13	10	12	17	12.0
Number of sterile seeds	15	25	18	14	20	16	18	15	17	13	17.1
Total number of seeds	28	35	31	25	28	29	31	25	29	30	29.1
Per cent fertile seeds	46.4	28.5	41.9	44.0	28.5	55.8	41.9	40.0	41.3	56.6	41.2

This Table shows that approximately 41 per cent of the ovules that began development actually reached maturity. The seedcoats of the fertile seeds were black, 8 mm. long and 3 mm. by 4mm. wide. The embryo portion measured 3 mm. by 4 mm. and the wing 5 mm. by 3 mm. In contrast the testa of the sterile seeds were light brown or colorless, 5 mm. long and 1 mm. wide. The embryo portion measured 1 mm. by 2, and the wing, 4 mm. by 1 mm.

There were no *Agapanthus* plants in the immediate neighborhood of 115 Carmel Avenue and most likely the flowers (F-1 generation) were self-pollinated. However, there is still the possibility that foreign pollen was brought in by humming birds. These are an integral part of the garden. There is one individual especially that sits nearby and sings his trial notes when the writer works in the garden.

The fertile seeds have been planted and a detailed report on the second generation (F-2) will be made after the seedlings flower.



Upper left, scape proliferations, *Lidice Daylily*, forming roots at base; upper right, *Hemerocallis* scape proliferations rooted in peat and sand medium. Lower, *Hemerocallis* crown cuttage, $\frac{1}{8}$ divisions rooted after period of incubation in sand rooting medium, (1) evergreen clone. (2) deciduous clone. Photos from U. S. Department of Agriculture. Plate 249

4. PHYSIOLOGY OF REPRODUCTION

SOME PROBLEMS IN THE PROPAGATION OF THE AMARYLLIDS

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In any field of horticultural activity an occasional pause for an inventory of recent progress is justified. Such a review serves several functions; not only are the most notable recent advances recounted, but gaps in the body of knowledge are called to the attention of those who may be able to study such problems. Furthermore, advances in related sciences which have not yet been applied are brought to the attention of those interested in the narrower field. Though some worthy contributions in propagation practices have been made through studies on the amaryllids and their relatives during the past few years, because of the minor economic importance of many members of this group, there are many questions on which no authoritative statements can be made at present. During the past few decades, many species belonging to the *Amaryllidaceae* have been grown at the U. S. Plant Introduction Garden, Glenn Dale, Maryland, and some observations on these are included in this review.

POLLEN STORAGE AND GERMINATION

Breeders' efforts to make crosses between forms which bloom at different periods have been facilitated by studies on storage of pollen. Although the requirements for satisfactory storage apparently vary from plant to plant, in general the best results are obtained with temperatures reduced somewhat and with humidities stabilized at intermediate or somewhat low level. This has usually been accomplished by using desiccators in which various saturated solutions of salts or appropriate concentrations of sulfuric acid are kept. Details of preparation of solutions to produce different humidities can be found in tables in the chemical handbooks. The saturated solutions of salts are generally preferred to sulfuric acid because of the greater convenience and safety. Another means which has been used occasionally to prolong viability of stored pollen is through reduction of atmospheric pressure. This, however, is beyond the means of most amateur horticulturists. An ordinary household refrigerator furnishes a temperature suitable for the storage of pollen. A desiccator may be provided by a tightly closed Mason or similar jar, placing a supply of the salt or sulfuric acid solution in the bottom to maintain the desired humidity. Traub (31) used a saturated aqueous solution of calcium chloride in a desiccator of this type which provided a relative humidity of 38 per cent at 50°F. He advocates storage of the various pollens in gelatin medicine capsules which are easily obtained at any drug store, using sizes suitable to the quantities of pollen to be handled. A small label for the identification

of the pollen may be placed within the capsule, or identification marks may be placed in ink on the exterior.

Pfeiffer (21) (22) used a temperature of 50°F. for storage of pollen of hybrid amaryllis and found it to be 32 to 67 per cent viable after four months. She considered a relative humidity of 50 per cent superior to lower or higher humidities.

Some recent studies on pollen storage indicate that pollen may be kept for the longest time when held at temperatures near, or even below, freezing. Unquestionably, more exact studies on the storage conditions best for pollen of the various types of amaryllids are needed, together with more information on the periods of viability which may be expected. Some convenient and reliable methods of packing pollen for shipment by mail would likewise be desirable, although wrapping the dried pollen in tinfoil or waxed paper will be satisfactory for relatively short distances.

Frequently the pollen is carried away so rapidly by insects that it should be obtained from opening buds and dried for a short time. Often the stigmatic surfaces of amaryllids are not receptive until some time after the opening of the flower.

The germination of pollen and the growth of the pollen tubes has been promoted by trace elements (36) (38) such as boron, and by certain vitamins (5) and synthetic growth substances of the auxin type (23). Few studies of this type have been conducted with amaryllids up to the present. Addicott (1) tested the action of many chemicals on pollen of *Milla biflora* Cav. A number of compounds either increased the percentage of germination or the elongation of the tubes or both. However, no synthetic medium was as active in promoting growth of the pollen tubes as the exudate from the stigmatic surfaces. This probably indicates the presence of one or more growth factors as yet unidentified.

The noted Russian plant breeder Michurin always insisted that the use of mixed pollens, including some of different unrelated genera, made possible crosses which were difficult or impossible otherwise. In view of the recent discoveries of the effects of growth substances in overcoming self-sterility (8), this subject would appear to warrant careful investigation. Though careful breeders condemn the making of crosses without the record of both seed and pollen parents, unquestionably some breeders of amaryllids have demonstrated that the use of mixed pollens can produce some very outstanding results.

The experiments of Eyster (8) on a self-sterile strain of *Petunia Golden Rose* are a remarkable example of the value of a plant growth substance in overcoming self-sterility. In this strain, the pollen germinates normally, but grows slowly and rarely penetrates more than a tenth of the distance down the style. An abscission layer forms before fertilization can possibly take place. However, pollen of this variety is functional on some other types of petunia. Apparently some substance secreted by the placenta of the ovary is responsible for the slow growth. This is confirmed by the fact that if sap is expressed from the ovaries of the self-sterile strain of petunia and placed on the stigmas and styles of other strains, seed setting is inhibited. Setting of seed could be induced on the self sterile plants by spraying immediately be-

fore or after pollination with a 10 parts per million aqueous solution of alpha naphthyl acetamide. The same treatment was also effective on self-sterile forms of African marigold, red clover and cabbage. Apparently the growth substance is able to compensate for the effect of the inhibitory secretions. However, the delay in the formation of the abscission layer may be an important factor in these results.

SEEDS OF AMARYLLIDS

The amaryllids are a group in which the seeds are frequently short-lived and therefore should be sown as soon after ripening as possible. This is true even for sorts such as *Narcissus* in which a period of dormancy intervenes between sowing and germination. The short span of viability of many sorts often makes them unreliable when obtained from commercial sources.

Vivipary or a condition approaching it is fairly common among the amaryllids. The seeds of *Crinum asiaticum* L. germinate when harvested without the addition of any water since the seed carries sufficient to make germination possible (19). *Hymenocallis speciosa* Salisb. has a seed in which the embryo is commonly immature when the seeds are shed (6). An interesting example of a condition which is intermediate between vivipary and dormancy is the spider lily, *Hymenocallis occidentalis* (Le Conte) Kunth. The embryo of the seed after fertilization undergoes a continuous development toward the formation of an independent seedling even without the presence of light and additional moisture. Apparently this is made possible by foods elaborated by the chlorenchymatous integument of the seed (37). However, the photosynthetic activity in such seeds may play a part in germination (9), and when those of this type are planted, they are best left above the surface of the soil. Seeds of *Haemanthus* often germinate while attached to the parent plant. Commonly when such seeds are shipped long distances they are received in a germinated condition. They should be packed in a medium such as sphagnum moss in such a manner as to allow the root to grow at right angles to the seed. Crowding makes the root curl around the seed which requires that the seed be planted beneath the surface.

Occasionally seed formation is hindered by the competition of the bulb for food materials following the period of flowering when the storage organs become depleted of food reserves. One treatment to induce setting of seed in such cases has been to cut off the flower scapes and keep the base in a nutrient solution containing sugar (17). A treatment also reputed to induce setting of seed of the *Madonna Lily*, which sets seed poorly in northern Europe, is to dig the soil when the buds show and remove the scales from the stem so that the plant becomes practically an annual. However, these reports are difficult to evaluate since the compatibilities of the material used were not investigated.

The culturing of embryos under sterile conditions has become a routine technique in the breeding of certain types of stone fruits and has recently been applied with success to orchids. There are crosses of amaryllids in which this technique might be very useful, but to the best knowledge of the authors few reports of its utilization are available.

Care must be taken to avoid loss of seeds of many plants in this group following the dehiscence of the ovary. One solution of the problem is to gather the pods just before full ripeness and place them on well aired trays to open.¹ The bagging of seed pods is another solution which is satisfactory for the relatively small lots of seeds desired in most plant breeding.

Alternating temperatures may possibly be helpful in germinating some seeds in this group. For instance, although most seeds of *Alstroemeria* require no special treatment, seeds of *A. aurantiaca* D. Don. germinated best when held at 77°F. for two months and then at 50°F. for one month, the germination taking place at the lower temperature (16). According to Hannibal (11), however, the seeds of this species require stratification at 45°F. or lower.

The need for stratification is not common in this group, and may be confined to seeds of certain strains of hybrids. Thus seeds of most hybrid *Hemerocallis* require no stratification, but some need it for satisfactory germination (26). Seed pans which do not germinate in a period of several weeks should be placed at once in a temperature slightly above freezing for six weeks. The need for stratification is especially common among the pink types.

Unfortunately, the light requirements of the seeds of amaryllids have not been studied extensively. In general, experience at the U. S. Plant Introduction Garden has shown that reduction of light accelerates the germination of amaryllids. A possible exception is in those sorts, such as *Haemanthus*, which show a tendency toward vivipary.

The extensive experiments of Kinzel on light requirements of *Liliaceae* have been summarized by Crocker (7). Kinzel found that germination of the majority of species which he studied in this family was favored by darkness, although some species were favored by light. In his studies with the genus *Allium*, he found that seeds of *A. ascalonicum* L., *A. cepa* L., *A. moly* L., *A. porrum* L., *A. schoenoprasum* L., *A. ursinum* L. and *A. victorialis* L. germinated best in darkness. On the other hand, seeds of *A. schoenoprasum* var. *sibiricum* (L.) Hartm. and *A. suaveolens* Jacq. germinated best in light.

According to Stinson (24) seeds of *Alstroemeria* require the light of the sun to germinate, but those of *Bomarea* must be protected from the direct rays of the sun to germinate successfully. Our experience with seeds of *Bomarea* substantiates these observations. With all of the amaryllids, light should be increased after germination in order to strengthen the cotyledon and prolong the time during which the seed can aid in nourishing the young plant.

Probably methods of storage could be devised which would prolong the viability of the seeds of amaryllids. Thus a few years ago, stocks of onion seeds over one year old were considered unsatisfactory for producing commercial stands. This led to very high prices for the seed in years following crop failures. However, by drying the seed to a low moisture content and by storage under reduced temperatures with a low relative humidity, the seed could be kept for several seasons (2).

¹ See *Herbertia* 9: 181.1942; and also article by W. M. James—A Decade with Amaryllids, in this issue (1943).

Seeds sealed in a dry tight container held at 20°F. were kept for seven years without noticeable deterioration. The importation of seeds of amaryllids has often been unsatisfactory and doubtless some attention could well be paid to the results of certain modern experiments on prolonging the period of viability of seeds. The seeds of tropical amaryllids are said to be injured by freezing.

METHODS OF SEEDING

Seeds of the many plants of this group which have been grown at the U. S. Plant Introduction Garden have usually been germinated on sphagnum moss, a method which has been explained previously by Close (4). This seeding medium has many excellent qualities, and prevents the appearance of damping-off, but soil is often quite satisfactory, since the seeds of amaryllids are not usually susceptible to disease. When seeds are germinated in the greenhouse or in frames, decay-resistant flats such as those of sheet metal, concrete or ceramic ware are highly advantageous for many sorts which are slow growing and may remain for two years without transplanting. Seedlings of *Narcissus* are an example.

If the seed beds are outdoors, a well drained friable soil should be selected. Porosity and good aeration are always advantageous, but some of the species grow best under special conditions of acidity, organic matter and mineral nutrients. Animal manures should be used with great caution, and are best applied during the previous season during the growing of preparatory green manure crops. Chemical fertilizers can be used with care and frequently the formulas and applications for the growing of ornamental bulbs are patterned after the methods used in the potato growing of the region.

The three foot "Dutch" bed is excellent for the production of seedlings of bulbs, although it has been largely displaced by the row system in the newer large scale production methods now used commercially in this country. Production of bulbs is becoming localized in the Pacific Northwest and also in California and Florida where favorable growing conditions or a long season makes competition from less favored regions difficult.

Propagation by seeds is the best method with a great many sorts, since many members of this group of plants produce offshoots sparingly. Of course, the use of seeds is impossible with many choice hybrids since they do not come true.

NATURAL VEGETATIVE MULTIPLICATION

Vegetative propagation by offsets is so slow in some of the plants of this group as to be almost useless, as for example, in some of the crinums. The rate of multiplication is often quite variable within a genus. Thus most species of *Haemanthus* produce offshoots rather sparingly, but *H. albiflos* Jacq. and *H. brachyphyllus* produce them rather freely. *Urceolina*, *Stenomesson*, *Cyrtanthus*, *Phaedranassa* and others multiply rapidly. The natural increase is likewise sufficient for commercial production of *Narcissus*, although some varieties have an unfor-

tunately slow rate of multiplication. Division is used with *Alstroemeria* successfully, but the process is somewhat wasteful since many of the roots are broken and lost.

In cases in which natural vegetative increase is adequate for multiplication, the problem becomes one of promoting and increasing growth. Certain responses to fertilizers have been observed by the Dutch and American bulb growers although further experimentation is needed. An interesting example of the effect of mineral nutrients on multiplication is noted in the experiments of Traub and Hughes (35) in which an increase in number of bulbs of *Zephyranthes* took place with both a high concentration of nutrients and with starvation, although the size of the bulbs was satisfactory only in the former instance.

Aside from cultural practices, the means of increasing vegetative growth are few. The use of supplementary lights during the active vegetative period may be used to aid in working up a stock of valuable sorts quickly (27). The depth of planting is an important factor in regulating the rate of increase of some bulbous plants. Shallow planting often tends to favor a rapid increase; and deep planting, to decrease it (20).

Aside from the offsets normally produced by the bulbs or roots of this group of plants, some unusual types of multiplication are found. Thus in *Hemerocallis*, scape proliferations often form roots while on the plants. These may be removed and used to produce increase, but are not common except on certain varieties (Plate 249).

INTENSIVE METHODS OF VEGETATIVE MULTIPLICATION

Since many of the amaryllids have a natural rate of vegetative increase which is too slow for practical commercial purposes, in recent years there has been much interest in artificial means of propagation involving in all cases a cutting of the meristematic tissues to produce a greater number of functional units. In this family and in closely related plants, the meristematic tissues are much less widely distributed than in the *Liliaceae* and are found in the bulbous types only at the basal plate. Therefore some types of propagation used with other bulbous plants cannot be followed. In the *Liliaceae* for instance, even the upper portions of bulb scales of many plants such as the red squill, *Urginea maritima* (L.) Baker, will often produce new bulblets. Leaf cuttings can be used for many members of this family such as *Lachenalia*, but have few possibilities with amaryllids. Some of the possible methods of artificial reproduction will be discussed in detail here.

Excision or destruction of the terminal bud. This method is seldom used in a practical way but is included for the sake of completeness. It would doubtless be usable for many plants. The time for applying the treatment varies somewhat according to the species of plant. Heaton (13b) killed the buds of plants such as *Clivia* by heating the tip of a No. 12 wire or a knitting needle to a dull red color and plunging it through the stem axis of the bulb, starting at the growing point. The operation is done quickly to avoid damaging more than the bud cells. *Hemerocallis* may be treated by pressing a hot wire through the side of the stem at an angle which will intersect the growing point.

A variation of this method known as "coring" has been used in which the growing point is excised without destroying the basal plate, using an ordinary apple corer. The advantage claimed for this method has been the greater freedom from rots during the period of incubation (10).

Scoring or basal incision. This method of artificial propagation is the one used to some extent in the commercial production of Hyacinths. In scored bulbs, the new bulblets arise on the basal plate of the bulb, between the scale axils. One possible disadvantage of scoring as a means of commercial production is that the bulblets produced are quite variable in size.

The operation of scoring is done by making several perpendicular cuts across the bulb deep enough to extend a little beyond the growing tip of the bulb. With this method, the drying out of the cuts in starting incubation is sometimes a problem, since they are not well exposed to the air and decay may start. A satisfactory method is to pack the incised bulbs in dry sand and keep in a warm greenhouse or shed. A moderately high temperature should be maintained during the period of incubation, preferably above 70°F. However, with some bulbs the incubation period can be eliminated with safety under good growing conditions and they may be planted immediately.

Hayward (12) scored bulbs of *Lycoris* in September and obtained up to a sevenfold increase by the time of the blooming season in the following June. He considered this to be about three times the normal increase.

Leaf scale incubation from scooped bulbs. This method has been used to a limited extent for propagating hybrid amaryllis, but is probably largely of theoretical interest since its use requires more skill than crown cuttage and demands somewhat higher incubation temperatures. It should be possible to use this with many amaryllids. The method has been described by Luyten (18). Good sized bulbs are scooped accurately, removing only the basal plate. Care must be taken with this operation since the meristematic tissue does not extend more than one third to one half centimeter from the basal plate. The bulbs are then cut in half lengthwise and the individual scales are then removed and placed at an angle in the rooting medium, keeping the convex side up. An incubation temperature of 25° to 28°C. must be maintained for several months.

Incubation of excised root plus bulb fragment. Heaton (14) has described a method of rapid vegetative propagation which has the advantage that the flowering of the mother plant is not necessarily hindered. Just before the period of active growth when the new roots developing from the bulbs are about three or four inches long, they are carefully excised with a sharp knife together with a portion of the basal plate of the bulb. These portions, when potted carefully in small pots and treated as young seedlings, start growth in six or eight weeks. Perfect drainage in the pots is necessary for success and the watering must be done carefully. A ten or twenty fold increase may be obtained in one season by this method with plants of *Clivia*.

Crown Cuttage. The recent introduction of this method of artificial propagation by Traub (28, 29, 30, 32, 33, 34) and Heaton (13a) has led to its application by commercial growers of certain amaryllids. Several advantages may be claimed for the method. It may be performed rapidly by persons having little skill or experience and lower temperatures are required than are needed for the incubation of leaf scales. In Florida lath sheds are entirely adequate. The method has been used with excellent results at the U. S. Plant Introduction Garden in working up stocks of such genera as *Sternbergia*, *Amaryllis*, *Lycoris*, *Phaedranassa* and *Narcissus*.

Bulbs should not be made into crown cuttings too soon after flowering or the scale leaf portions may die off. August or September is considered a suitable time for cutting of bulbs of amaryllis in Florida and later propagation has not been satisfactory. The bulbs are cut vertically, dividing them into quarter, eighth or sixteenth portions. These pieces are then separated into smaller portions along the scale leaf separations, taking care that each portion has a piece of the basal plate. The separated scales may also be cut into portions taking care that each has a piece of the basal plate attached. A single bulb can often be made to furnish nearly a hundred divisions. The cuts should be at right angles to the flat leaf blades with flat-bladed plants such as *Phaedranassa*. For limited propagation of a single rare bulb without disturbing flowering, a slice may be taken from one side of the bulb.

Coarse sand and peat in equal parts provide the best medium for incubation, but sand is satisfactory. The reaction of the medium should be circumneutral or only slightly acid and Traub (32) found the addition of some quarter inch mesh rock helpful. The cuttings are handled in flats for greatest convenience. The upper ends of the scales should be above the surface. Good drainage is essential, and failures are generally caused by either excesses or deficiencies of moisture. In Florida the flats are kept in the open from November to February and then moved into a lath house with half shade.

Hume and Watkins (15) found that crown cuttage was far more effective for multiplication of species of *Zephyranthes* than scooping or basal incision. The bulbs were cut in halves, quarters or eighths, depending on the size and were planted for incubation in cleaned washed sand in April. However, the treatments by scooping or notching improved the condition of the bulbs by aiding rooting, although few offshoots were secured.

Crown cuttings of *Hemerocallis* are successful (25, 33, 34) provided that no more than four to eight sections are made, although pieces as small as 1/32nd of the stem will occasionally sprout under favorable conditions (Plate 249). The crown of this plant thus behaves much as the bulbs of amaryllids. Crown cuttage may be performed at different seasons with this plant, but is generally best carried out at the beginning of active vegetative periods. The cuttings are incubated in sand and peat or in sand alone, although large divisions such as halves of the crown can be planted in outdoor nursery beds if they are given favorable conditions.

Crown cuttings may be made on plants left in place in the nursery row, but apparently the advantages are somewhat doubtful with many varieties (27). Still another variation is possible with outdoor plants. Leafy crowns may be removed with a small piece of the root attached, and this cutting may be placed in a rooting medium. New buds often arise where the crowns are removed. There are marked differences in the response of different clones of daylilies to all of these intensive methods of vegetative propagation.

PLANT GROWTH SUBSTANCES

Oddly enough, in spite of the recent popularity of this field of investigation, almost no information is available regarding the effect of growth substances and vitamins on the behavior of amaryllids under artificial methods of propagation.² Doubtless certain growth-regulating responses could be obtained. One commercial grower of daylilies has stated that a commercial preparation containing both plant growth substances of the auxin type and certain vitamins was useful in starting crown cuttings under his growing conditions. Evidence to substantiate this observation has not been obtained from other sources thus far.

SIZE OF VEGETATIVE UNIT AND GROWTH RATES

Virtually no experimental data is available on one of the most important questions related to the propagation of amaryllids by artificial means, namely: in working up a stock rapidly, are fewer, relatively large vegetative units more or less efficient than numerous smaller units of the same plant? Probably the answer will depend on the growing conditions which are to be provided. Even under the best conditions, the hazards to the young plants increase greatly with extensive subdivision of the vegetative parts.

British daffodil specialists have had some difficulties in attempts to increase stocks of rare and valuable sorts by artificial means. Correspondence with several of the largest growers of daylilies in the U. S. A. has revealed that they have found little real saving of time in production of these plants by intensive methods of vegetative multiplication and are now relying largely on special preparation of the soil together with ordinary methods of division. On the other hand, crown cuttage is remarkably effective in speeding up propagation of such plants as *Sternbergia* or hybrid amaryllis. Apparently some careful quantitative experiments are now needed to determine the plants which will respond favorably to artificial methods of propagation and also to what extent the vegetative units should be subdivided.

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² See *Herbertia* 5:199-200; Plate 74. 1937 for some preliminary experiments.

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RAPID MULTIPLICATION OF LYCORIS AUREA

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At the request of a florist-grower, stem cuttage, as a means of rapidly increasing *Lycoris aurea*, was attempted in the autumn of 1942.

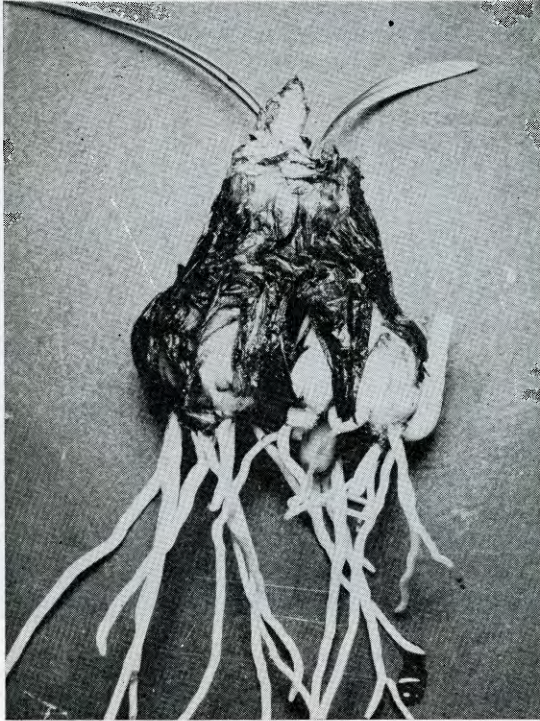


Fig. 105. *Lycoris aurea*: bulb nine months after cutting to induce bulblet formation.

This gardener had acquired a large stock of the golden Hurricane Lily and was anxious to learn if it would be possible to build up a commercial supply by vegetative means.

Twelve flowering bulbs were received from this grower in September 1942 and were divided into three lots. The bulbs of the first lot were cut into small pie sections as suggested for amaryllids by Traub (3, 4, 5, 6) and Heaton (2), and for *Lycoris radiata* by Hayward (1). The bulbs of the second lot were cut after the method described on page 27 of the writer's bulletin on the propagation of ornamental plants (7),—"several longitudinal *upward* cuts are made through the center of the bulb, about three-fourths of the way to the neck. This bulb, intact, but with many longitudinal cuts, is planted in a box of . . . sand to about three-fourths its depth." The bulbs of the third group were planted in the same flat as controls, and the sand was kept on the dry side, only sufficient water being added to keep the medium from becoming powder dry. Leaves began to emerge in the early winter and these functioned in a normal way during the growing season.

It is evident that *Lycoris aurea* differentiates its flowers during the spring before the rest period as blossoms were forced from those bulbs that were not too badly mutilated.

The illustration, Figure 105, was made from a photograph taken in June (1943), and the bulbils were divided and potted separately in three-inch clay pots. These pots were plunged in the sand of a lath house bench and were watered in the usual way. A careful count made eleven months after cutting, revealed that there were 90 healthy, growing bulbs from $\frac{1}{2}$ to $\frac{3}{4}$ of an inch in diameter.

Apparently the Hurricane Lily, *Lycoris aurea*, responds well to stem cuttage and the technic should have commercial possibilities.

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5. AMARYLLID CULTURE

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

THE RICE HYBRID AMARYLLIS

ERNEST BRAUNTON, *California*

Every year, during the "merry month of May," all amaryllis fans and admirers of high color display in broad acres of flowers visit the bulb farm of W. E. Rice, near Los Angeles. Really it is a dozen miles from that metropolis, near the little city of Downey.

There the Rice's have 20 acres devoted entirely to bulbs. Mrs. Rice looks after selection of seed parents and supervises other technical work. They make a perfect working team. Five acres are given over entirely to hybrid *Amaryllis* (See Plate 250), and also two smaller fields where selections for color are being segregated, some of them named varieties. The two most outstanding Rice contributions are no doubt *Lady Helen*, a deep blood red, and *W. N. Campbell*, equally red and white, striped, both of large size and very full petalage.

Those of us who have watched Mr. Rice's notably successful career with *Amaryllis*, believe it comes largely from proper preparation of land and feeding. Of course, the naturally sandy loam is a big asset, but it has been tilled and enriched until it is in ideal condition for any crop.

On the main field were spread twenty-five tons per acre of dairy manure, disced in and worked over several times. Then furrows eight inches deep and two feet apart were made and a light cultivation given furrow bottoms to make a soft bed. A special machine was run over the field to make a mark in the furrows every four inches. On each mark a man dropped a bulb while another roughly covered them. Then a tractor was run between rows to cover bulbs and leave a deep furrow for irrigation.

After new growth was made commercial fertilizer, 12-16-12, was applied—two tons to the acre. This carried them over to the following spring. However, much water and cultivation was given, the latter mainly for weed control. In autumn four inches of rabbit manure was applied and left for winter rains to carry down, a heavy feed that brought equally heavy floral response.

In the first flowering season each bulb and its major offspring sent forth a flower spike, great numbers were more than three feet high, on sturdy stalks. A number carried six flowers to the spike and some flowers had eight petals each.

It is believed that this main bed is one of America's largest devoted to a single strain of *Amaryllis*. The colors range from pure white to nearly black—the latter named *Zulu* by Mr. Rice.

This high-grade stock did not come into being without preparation. It came from seeds selected from the cream of 80,000 bulbs, many of them purchased from both amateurs and professional growers. Seeds



Plate 250

The Rice Hybrid Amaryllis

are sown in beds, covered with shading material, and after germination are left in place for one year, when they are transplanted to more permanent quarters. A selection of new and better types is constantly going on. Excellence, and not size, is the Rice watchword.

NOTES ON AMARYLLIS

L. S. HANNIBAL, *California*

From time to time, like most collectors, the writer has added various species and hybrid *Amaryllis* to his collection, but the San Francisco area cannot be considered as subtropical, being 200 miles North of the citrus belt, thus all specimens do not prove up entirely satisfactorily. In some cases outdoor plantings are possible, but normally an unheated glass house is required. Even here sub-tropical species such as *Amaryllis rutila* and the varieties *fulgida* and *crocata* seldom bloom, and trouble from bulb rot is often experienced during the cool moist winters. However, seedlings of the latter species which were raised from seed imported from Sao Paulo are hardier and seem more promising. Hybrids such as the *Garfieldii* hybrids and a Hayward Dutch-white X *fulgida* also seem to require warmer and drier winter conditions. So far they have been shy bloomers, but the *crocata* blood in the *Garfieldii* hybrids tends to induce a production of numerous offsets—perhaps sufficient bloom can be obtained by sheer mass of bulb population.

In contrast *A. aulica* var. major does well here and seems quite at home. Its stiff rigid bloom is quite striking when it occasionally flowers during early spring. The smaller variety *robusta* is either a very shy bloomer or else it desires a warmer latitude, as I recall it has been reported as doing well in Florida. Hybrids of *A. aulica* flower easily, but the bloom are of little value due to excessive green in the throat.

Amaryllis Johnsonii is also quite hardy and will do well in outdoor locations, even in heavy clay soils. Last year the writer imported several *A. reginae* bulbs from Austin Smith of Costa Rica. These turned out to be very hardy, and very similar to *Johnsonii*, the only distinction being that the stigma lobes are slightly longer and the flowers appreciably fragrant. The bulbs seem stoloniferous when planted deep. Could this be a *Johnsonii* variation?

Amaryllis belladonna Linn. (syn. *Hippeastrum equestre* Herb.) from Florida and Cuba is another that objects to wet conditions in the winter, but as this species is very variable in source and form, it has not been difficult to locate a few hardy specimens; even so members of this group seem to be shy bloomers for this area.

Amaryllis solandriiflora var. *conspicua* (See Fig. 106) does fairly well in central California. The plant seems to be nearly sterile due to climatic conditions, but fortunately the writer succeeded in having one bloom take *Johnsonii* pollen. The half dozen seedlings which resulted seem quite hardy and show growth characteristics favoring one parent or the other.

Apparently Luther Burbank obtained some of Nehrling's fragrant Hybrid *Amaryllis* seedlings, and in turn hybrids of these were part of

the foundation stock of Hermon Brown's beautiful, and fortunately very hardy strain. A number of these have the almond fragrance which is so characteristic of *Solandriflora*. Of the hybrids, those of Mr. Brown and the late Mr. Diener seem to be the hardiest here. Some of the types such as the Mead strain, which do so well in Florida, find our wet winters and dry summers, (with the hot days and cold nights) anything but favorable.



Fig. 106. *Amaryllis solandriflora* var. *conspicua*. Photo by L. S. Hannibal.

Amaryllis psittacina and the variety *decorata* seem fairly hardy and grow quite readily, but rarely bloom. The same applies to *A. solandriflora* var. *candida*. These are all warm climate plants, and all require glass the year round, although such is not the case further south.

In 1941 Herbertia Dr. Traub asked for information on the linear-leaved, small-flowered *Amaryllis* such as *Amaryllis advena* var. *miniatus* which is extremely hardy. *Amaryllis pratense* is likewise quite hardy, in fact it has been reported resistant to 12 degrees F. and grows best

when *Narcissus* culture is used in a well drained sandy soil. Summer heat checks all growth.

Amaryllis bicolor comes from northern Chile where temperatures range from 70 to 90 degrees F. the year around. It has not been a success as it needs too much heat, as well as a well drained, nearly dry, sandy soil. The same applies to a small yellow-orange variety that came from Dr. Reed's collection at Valparaiso [See Plant Hunters of the Andes. T. H. Goodspeed (1941)]. The writer also has one or two other linear-leaved specimens that have not been identified as yet, but they do seem hardy.

At best one can expect the most promising results in this group to come from material that is found in Southern Chile, or the high mountains. Due to little seasonal change in temperatures any material from Valparaiso, or north of there, is likely to be found quite temperamental in growth habits, and as any collector will soon learn when he deals with amaryllids—if natural environment can't be approximately duplicated one is likely to come out on the bad end of the deal.

To obtain flowers from reluctant bulbs often requires more than a general knowledge of the bulb's growth requirements. Often somewhat previous to a bulb's normal flowering period a dormancy or rest period is essential, which represents the formative period for the bud and future foliage development. Whether it be *Narcissus*, Hybrid *Amaryllis*, *Nerine*, or a score of other well known genera the same generalities apply: a prolonged rest period in the specific temperature range, as desired by the bulb in question, is most effective in promoting early bud growth, and rest period in the proper season when temperature and humidity conditions, especially the former, approach the range which is normal to the requirements of final bud development, will lead to flowering. Many species will tolerate a longer than normal rest period and produce very fine bloom, but few deciduous bulbs will respond with flowers if the rest period is shortened, or if temperatures drop much below the bulb's accustomed range, for in either case proper bud formation cannot take place and we usually have no bloom at all, or a very poor aborted bloom.

Root disturbance can be cited as another reason for poor flowering response. Many bulb species, even if they appear dormant, often continue active root growth while top growth is absent. We can only surmise that bud development is affected by root destruction, not with every species, but often enough to make it desirable to avoid as much root disturbance as is possible during transplanting time. There are other factors such as the red rust, bulb fly, poor drainage, etc. which check bloom by bulb destruction; however, these secondary effects are usually overcome by proper culture for normal plant development. It is the failure to understand, or to provide proper conditions which gets the collector "down" when a bulb fails, for success depends upon providing the proper environment.

NOTES ON AGAPANTHUS CULTURE

J. N. GIRIDLIAN, *California*

The only species of *Agapanthus* that is well distributed in this country is *A. Orientalis* (syn. *A. umbellatus*) and its varieties. This species was introduced many years ago and is known as the Blue Lily-of-the-Nile. In most parts of the country it is grown as a house plant, under glass or in the conservatory in large tubs or pots. In the South-east and Western Coast it is grown in the open, and in Southern California it is one of the most popular perennials. There is hardly a home that does not boast of one or more plants.

My experience with *Agapanthus* is confined to my own garden and what I have observed in the local gardens in Southern California. Here they are grown in huge beds, borders and as single specimen plants. Once they are planted they seem to be as permanent as a shrub and each year they grow in size and beauty. I have seen them growing in beautiful estates where they are given the best of care and in the homes of the humble where they are hardly noticed until they are in flower, and I must admit that the latter grow and flower far better. Here seems to lie the key to the successful culture of *Agapanthus*, and I have followed it for the past seven years with very satisfactory results.

In my garden the main planting is in an out-of-the-way place back of the glasshouse where they are not apt to receive any care except what I deliberately give them. Here they are allowed to more or less shift for themselves. They were planted here as seedlings, in double rows with the rows three feet apart and the plants six inches apart in the row. The soil is rich and heavy and when dry it is hard as a brick. Since setting them out six years ago they have never been cultivated, and watered by overhead sprinkling but once each summer which is the full extent of the watering they have received except our seasonal rain-fall in the winter. They have never been fertilized or, after the first year, weeded. This latter has never been necessary since the plants have grown so tall and heavy that weeds simply do not get a foothold. This would seem to paint a picture of a neglected garden with sickly looking plants but the contrary is true. The plants that I have placed in my perennial border receiving the regular garden care with cultivation, and sprinkling at least twice a week, are no better looking and certainly do not flower half so well. This past season the average height of the flower stems was over five feet with many of them over six and one measured eighty inches high.

Agapanthus produce a prodigious amount of thick, fleshy roots that lie just under the surface and any digging and cultivation is sure to damage them. This may be one reason for their optimum development in my garden. Also, in line with many South Africans, a good baking in the summer sun seems to ripen the plants to productivity. Any stimulant either in form of water or fertilizer which encourages foliage growth seems to be at the expense of flowers. Of course eventually there will come a time when the soil around the plant will be depleted of all food available to the plant and it will fail to bloom, but that will take

about ten years and until then it is a good policy to use very little if any fertilizer. Of course one must use some good judgment. In very poor or very sandy soils more water and food will be beneficial. Also when grown in containers an annual or semi-annual application of liquid manure will be found necessary as the soil will leach out.

There are many new species and varieties available now and although some of them are very different from the common varieties the cultural requirements seem to be fairly alike for all except the species that are deciduous. These are totally dormant during the winter even in our warm climate and do not start to grow until after our rainy season is nearly over. They should be well watered until after they are through blooming, particularly *A. pendula* which blooms a month later than the others and well into August. Unless watered well the flower spikes do not seem to develop to their full stature, and the florets are smaller.

I think that the deciduous species are the answer to the commercial florist's dreams, and the logical species to grow in cold climes. They are naturally hardier than the evergreen kinds, but they have the advantage that they may be grown in the garden and lifted and stored during the winter the same as is done with Dahlia tubers. Then the gardener may plant them out in the spring and they will grow and bloom as if nothing had happened. The florist can plant these under glass and force them into bloom. They may also be placed on the store counter and sold as dormant bulbs.

Some of the varieties seem to require special treatment to get the best results. The variegated variety seems to develop the variegation best when planted in the shade. The double flowered variety should not be watered overhead when in flower. The doubling is so complete and the petals so dense that any moisture penetrating into the flower does not readily dry out and causes rot and the flowers fail to open.

Propagation of selected clones is by vegetative means, the simplest way being to break up the old clumps to single plants. Otherwise the best and most interesting way is to grow them by means of seeds. Fresh seeds germinate readily and some flower the second season and nearly all the third. I have been told of *A. africanus Moorianus* var. *minor* blooming the first year from seed. The seeds may be placed in pots or flats very thickly and left in the same container the first year. One year old plants are very easy to handle. These have formed large enough rhizomes so that the percentage of loss in transplanting is negligible.

The breeding of new varieties in this field has been sadly neglected. With the new and varied species now available the possibilities of breeding is unlimited. We need longer blooming season, wider color range, twice blooming habit, compact growing plants, large individual flowers for corsage use, thin and graceful stems for cut flower use, and many, many more desirable qualities that are not too hard to obtain. Purple, lavender, pink, sky-blue and even yellow are not beyond the realm of possibility. We already have creamy whites and by selection yellow color should not be far off. We need graceful, dwarf plants whose flowers are in good proportion for the use of people that do not have

much room to spare in their window gardens. Also by selection the breeder should be able to widen the sepals and petals until the flowers are more nearly like the hybrid *Amaryllis in shape*. As for cross pollination, just plant your selected parents close together and the bees will take care of it for you.

NOTES ON TULBAGHIA VIOLACEA

J. N. GIRIDLIAN, *California*

Tulbaghia violacea (See Plate 166, HERBERTIA 1939) has proved itself to be well suited to the warmer sections of the United States. At least it has been successfully grown all along the Gulf and Pacific coast states. This is not to be taken as meaning that it will not succeed in other parts of the country. Although I have not found out just what its limit of endurance to cold is, I have reason to believe that it is much more hardy than is commonly supposed. This is simply because it is quite new and has not been given a sufficient trial. There is a prevalent idea that anything South African is very tender and the gardeners in our colder states do not take any chances. This assumption is not necessarily true. Like some of our own California natives, some of the South Africans that grow in high altitudes are subjected to occasional severe frosts, and will succeed in colder sections.

I also believe that there must be other *Tulbaghia* species that are hardy but which are not in cultivation in this country. This is not because we have not tried to obtain them. It seems that even in South Africa *T. violacea* is the one species commonly cultivated. While nearly anyone will send seeds of this species no one seems to be able or willing to send seeds of the other species. I suppose that the twenty-four or more species reported exist mainly in herbariums as dried plants. This situation is to be regretted because I understand that many of the species lack the *Allium* odor, that is the only drawback to the universal culture of *T. violacea*, and some are even fragrant.

I had my first experience with this plant some fifteen years ago. A packet of seeds was sent to me. They sprouted readily and flowered the second season. Ever since I have been doing my best to have everyone grow it. I have grown it under many varied conditions without any failure. If there is any flowering plant that is so easy to grow and has so many good qualities to recommend it I would like to know what it is.

Ideal conditions for its culture seem to be constant moisture, full sun, a soil rich in humus and an annual top dressing of manure. However it will succeed surprisingly well under adverse conditions. It will grow to perfection in any kind of soil if other conditions are good. It will grow and flower constantly under the driest conditions, although naturally the plant will not have a luxuriant look. Just to illustrate how much drought they can stand—they may be dug out of the ground, divided, the tops cut off, dried off and left in that condition in a shady place for several months, but they will start to grow immediately upon planting. For purposes of selling at store counters this is a good quality.

They will reward the gardener for any extra care in their cultivation by luxuriant growth and more flowers. The best clump of plants I have is from a six year old seedling in a rock garden. It is on the east side of a house where it receives afternoon shade. This clump is now two feet across and is never without flowers.

A single plant in an isolated spot will not set seeds but when planted in groups large quantities of seeds will be produced. If allowed to ripen and scatter, these seeds will sprout readily and cover the ground around the plant with a grassy carpet. If wanted, these may be transplanted when large enough to handle. If not, a single application of a



Fig. 107. *Ammocharis heterostyla*. Photo by W. M. James. See page 158.

hoe will eradicate them. They do not become a pest. If the flower stems are cut off as soon as the flowers fade the plant will look much neater and twice as many flowers will result.

In the garden *Tulbaghia violacea* may be planted in rows, beds, or singly. If planted eight inches apart they will cover the ground in about three years. They may be left in the same location for many years as they do not exhaust the soil if an annual feeding is given. They make good pot plants when good drainage is provided.

The most pressing need of this plant seems to be a suitable common name. The botanical name is not attractive and means nothing to the average person. The common name "Pink Agapanthus" does not fit the plant. It is neither pink nor does it resemble *Agapanthus* very closely. It is more often associated with the Alliums. It is hoped that one of these days someone will suggest a name that will do the plant justice and will help popularize it.

AMARYLLIDS AT RANCHO RINCONADA, 1942-1943

W. M. JAMES, *California*

Ammocharis Heterostyla. This is the first *Ammocharis* I have seen in bloom. Although the flowers last only a few days, they are pretty and have a delightful fragrance. They are white the first day, changing to a dark pink in a day or two—one and one-half inch in diameter with a tube two inches long, one-eighth inch in diameter, with the anthers hung across the opening of the tube and the stigma at least three-fourths inch below the anthers. The flowers in the picture (Fig. 107) appeared



Fig. 108. *Nerine masoniorum*. Photo by W. M. James.

in early fall just before the leaves started to dry up and are on very short pedicels in an umbel of four to six, on a stem about two and one-half inches long.

The leaves are green, more or less flat, somewhat sickle-shaped and arranged in two rows, one on each side of the center of the bulb. The picture (Fig. 107) shows the distinctive manner of growth fairly well.



Upper, Nerine falcata; lower, Nerine flexuosa
Photos by W. M. James

More Nerines. Late last summer I had the pleasure of seeing four new (to me) *Nerines* bloom—*Nerine Masoniorum*, *N. lucida*, *N. flexuosa* and *N. falcata* (Plate 251, and Figs. 108, 109).

N. Masoniorum is a delicate little one, with thread-like leaves (Fig. 108) and is very similar to *N. filifolia*, except that it is smaller in all parts. It multiplies rapidly by offsets and sets seed very freely.

I understand that *N. lucida* is from or near the Karoo where there is only about five inches annual rainfall which comes in the summer. Last summer the flowers lasted about the same length of time as those of the other *Nerines*, but the seeds matured much quicker, were planted immediately and were germinating almost before the seeds of *N. flexuosa* and *N. falcata* had fully matured.

All three bloomed in late summer, about one month before the English hybrids. The flowers are on comparatively long pedicels in very large umbels. The outer flowers of some of the umbels had ripe seeds before all the flowers in the center of the umbel had opened.

N. lucida has pink flowers about two inches in diameter in an umbel of twenty to forty on a short stem. The stem slips out of the bulb very easily and I believe in its native habitat is blown along the ground scattering seed as it rolls along. Although the flowers are not as bright or showy as are those of other species and hybrids, they are attractive in themselves (Fig. 109).

N. flexuosa and *N. falcata* are found farther east than *N. lucida* where there is more rainfall. The leaves grow during the summer and the bulbs are dormant during the winter. In their native habitat they would receive little or no rain during their rest period in the winter.

The foliage of both is dark green, nearly flat and is arranged in two rows on each side of the center of the bulb (bifarious) and resembles that of *Ammocharis* much more than it does any of the other *Nerines* (Plate 251).

The flowers are not particularly attractive (in comparison with some of the others)—both are light pink with a greenish stripe in the center of the petal and are on comparatively long pedicels in an enormous umbel. The stems are one and one-half to three feet long and are more or less flat with two sharp edges in contrast to the round stems of the other *Nerines*.

N. flexuosa has been used as a parent by some of the English hybridists. I do not know yet whether it produces sterile hybrids or not. If the size, vigor and number of flowers of these three *Nerines* could be combined with some of the brighter colors of the other kinds, we should have some very attractive plants, and flowers.

As this copy is being mailed, in early July, *Nerine flexuosa* and *N. falcata* are in full bloom and *N. lucida* has buds which will open in a week. These bulbs were left in the open ground and received over 20 inches of rainfall during their dormant period last winter. If they will do this regularly, it will indicate that we still have something to learn about *Nerine* culture. And the ecologists will probably say that these bulbs tolerate the climatic conditions of their native habitat in South Africa rather than actually require them.

New Amaryllis Hybrids. In the summer of 1940 *Amaryllis* "Diener's Everflowering" were crossed with *Amaryllis candida*. Six plants from this cross flowered in May 1943 and show some promise.

Diener's Hybrids were used because they were the only flowers in bloom at the time. The plants used were not particularly outstanding, but were chosen from a large group of seedlings because of their early flowering from seed, vigor, habit of blooming several times a year in the open ground in Santa Barbara and the large bulb increase.

The new hybrids show some desirable characteristics of both par-



Fig. 109. *Nerine lucida*. Photo by W. M. James.

ents. One plant had two flower stems with five flowers each of an orange shade. One of these stems was two feet tall and the other three feet (Fig. 110). Small leaves around the parent bulb indicate at least a dozen offsets. There were two plants with almost pure white flowers. The only color was in a small, short red stripe on the center of each petal deep in the throat. The white is a clear shade without a tinge of any other color. One of these "whites" had a flower stem three feet tall and small leaves indicate there should be several offsets. All flowers

were more or less intermediate between those of the two parents (See Plate 183a HERBERTIA 1940).

Trouble with seed production was encountered with this cross. To begin with, seed pods on *A. candida*, both from selfed flowers and from hybrid flowers, dropped off after they were about one-half grown. Not a single seed was obtained from *A. candida* from flowers pollinated in two seasons. This dropping seemed to be caused by an abscission layer of cells at the base of the seed pod. About half of the pods on the Dieners Hybrids from flowers crossed with *A. candida* did the same thing. And the seed pods on the new hybrids are also dropping. It does not seem to make any difference whether the pollen was from the same flower or from the flower of another plant in the same cross. However, a few seed pods are developing so that the cross can be observed for another generation.

THE LESSER BULB FLIES IN AMARYLLIDS

L. S. HANNIBAL, *California*

In a recent publication by the USDA (The Control of Insects and Mites Attacking Narcissus Bulbs, Farmers Bulletin No. 1890), a very thorough discussion is available regarding the action of bulb flies in *Narcissus*. Two types are known, the large Narcissus Bulb Fly and the Lesser Bulb Fly. In many respects their life histories are similar, but the Narcissus Bulb Fly is found in a bulb as a single maggot, while the latter occurs in a colony. The writer has not experienced the Narcissus Bulb Fly here, but from time to time the Lesser Bulb Flies can be quite troublesome, not only in *Narcissus*, but in many other amaryllids.

The larvae of the Lesser Bulb Fly very seldom infest a sound bulb—they prefer bulbs where decay is present, usually brought about by too much water or abnormal conditions for the bulbs during the dormant season. The larvae penetrate these bulbs working down the leaf stems from the soil surface. They may either stay for a short period and pupate, or they may remain there over the autumn and winter months before maturing. In either case serious destruction and decay occur in a bulb so attacked. The heart of the bulb is usually the center of activity and unless such an infestation is soon discovered the whole bulb rapidly becomes a black smelly, rotten mass. The preference for certain *Narcissus* types by the fly has long been known. The continued loss here of *Lycoris squamigera* and *Haemanthus multiflora* suggested that there possibly was a preference rating for certain amaryllids, with *L. squamigera* far in the lead. The following list gives a rough approximation of order of choice.

Lycoris squamigera
Haemanthus multiflora
Narcissus triandrus *hyb.*
N. Soleil d'Or
Lycoris radiata
Ismene calathina
Nerine *spp.*

Habranthus robustus
Phaedranassa Carmioli
Pancratum canariensis
Amaryllis hybridum (syn. *Hippeastrum*)
Haemanthus Katherineae
Narcissus, *Trumpet* types
Stenomesson *spp.*

Several means of control are possible to discourage the activity of the flies. *Lycoris squamigera* may be an excellent, but costly preferential bait, but with most deciduous bulbs that are summer resting, like *Narcissus* or *Lycoris*, deep planting and an early spring hoeing to remove the drying leaves makes it difficult for this pest to penetrate to the bulbs. If sand is sprinkled over the surface soil at the time the fly egg-laying period begins, in March, the penetration of the larvae to the bulb is retarded, but if Naphthalene flakes are worked into the sand an



Fig. 110. New Amaryllis Hybrids; Diener's Hybrids X *Amaryllis candida*.
Photos by W. M. James. See pages 161-162.

excellent barrier is formed which no fly larvae will penetrate. This latter method is applicable to pots or large acreage.

If a valuable bulb is found infested it should be cut open, washed free of maggots and decay, packed with sand containing a few Naphthalene flakes, and returned to the bench for offset development. Offsets usually form very rapidly in bulbs that have the core removed. The Naphthalene prevents further decay action and repels additional fly

infestation. No sure method of elimination of the flies has ever been suggested. They prefer the cool coastal areas of California, Oregon, and Washington. Once they are introduced into an area they usually stay; however where the summer humidity is low and the temperatures soar to 95° or more, one can expect little or no serious trouble. I doubt that they exist more than 50 miles inland in central or Southern California.

LYCORIS SQUAMIGERA IN KANSAS

DARRELL S. CRAWFORD, *Kansas*

The refreshing, sparkling beauty of this hardy amaryllid in its sudden appearance in hot mid-August days is a miracle that revives the weary heart. It is never taken for granted once it is witnessed, but is awaited breathlessly each year.

Apparently the bulbs will sulk and not bloom if planted too deeply. Some planted thirteen inches deep in clay soil that baked hard in the full sun, produced short leaves, ripened off earlier and never bloomed. When these bulbs were moved to semi-shade in moist loamy soil, set six to eight inches below the surface regardless of their long necks, surprisingly profuse bloom was secured the next season.

The scapes grow six to eight inches a day to burst into flower at thirty-six to forty inches in height. Large umbels of seven to nine or more pink lilies with soft lavender tepal tips and mid-ribs continue to open for a week and last for two weeks. Tardy scapes will prolong the show several days. Protection of a shrub or tall perennial will prevent damage to the blooms from sun and wind.

Bulbs multiply rapidly, but stocks are scarce due to the very great demand. Bulbs must be lifted and divided every four or five years for they crowd and will become flat like table tennis paddles, and this condition definitely reduces the number of blooms.

The variety *purpurea* is also hardy in Kansas. It is seldom seen or offered for sale. It is similar to the type but even more beautiful. Blooms are a sky-blue exactly like the blue of *Mertensias* with a one-eighth inch border of rose-pink around each tepal and a rose-pink throat. This perfect blend makes a picture of rare beauty that will be eagerly sought when these rare bulbs are better known for blue is needed in the late summer garden. The buds are a wine red-lavender. The name *purpurea* hardly fits this amaryllid when in bloom. It is hardy here in Kansas and northward to northern Iowa at 20 degrees below zero. Abnormally wet seasons that cause dahlias and gladioli to rot do not affect either the type or the variety.

SPRING STAR-FLOWER, BRODIAEA UNIFLORA

DARRELL S. CRAWFORD, *Kansas*

Brodiaea uniflora, native to Argentina, is a charming April-flowering plant that should be better known.

Its common name, Spring (or Blue) Star-Flower, aptly describes the one-and-a-half inch pale blue stars with lavender mid-ribs that open flat at the end of six-inch peduncles. The flowers are borne singly and

remain open for several days but close at night. New ones always are ready to open as others fade. The variety *caerulea* has porcelain blue flowers, and those of variety *violacea* are violet. These latter I have not seen.

When planted three to four inches deep, it is perfectly hardy here in Kansas in sunny or shady places without protection. The grassy, narrow leaves make luxuriant four to five inch high mounds that are covered with blue stars for weeks. The foliage dies away in early summer.

As a double duty flower *Brodiaea uniflora* is priceless because it forces easily. If potted in late October one has the cheery blue stars week after week to whisper to one of Spring through November to January. All that is necessary is to pot the corms in a good soil mixture and water regularly. A sunny window is the best. There are no requirements for rooting in the dark, or for storage or growing temperatures other than those of the ordinary living room. This is ideal for the busy plant enthusiast.

In order to prolong the blooming period into February and March, a few dormant corms saved for the purpose, are added to each pot in January in spaces left for them. In April or May the growing plants should be lifted and planted outdoors to make their full growth and then to remain dormant until it is time to lift them again for potting. Thus there is no loss. The prolific increase of corms is the delight of the gardener.

Tested here six years ago for the first time, it has been my pleasure to help toward a more general appreciation of the little jewel in the Mid-West. No other plant has won such a high regard here for hardly any other gives so great a reward compared to the size of the subject and care it requires.

ALLIUM NOTES, 1943

SGT. BERNARD HARKNESS, *Chairman*
Allioideae Committee

The only contact that your Allioideae Committee chairman, who is at present with the Army Air Forces, had with the Onion Subfamily (Allioideae) of the Amaryllidaceae this past season was to observe in early August *Allium cernuum* at Watertown, South Dakota where it is fairly frequent along a railroad right of way and in sandy loam adjacent to Lake Kampeska.

In consequence he has called for contributions from all those known by him to be interested in furthering the horticultural interest in ornamental alliums. The resulting symposium will be a part of the 1944 HERBERTIA, the Allioideae issue. Undoubtedly there are gardeners whom this appeal has not reached; notes from them on their gardening experiences with alliums would be appreciated in order that we may have a broad geographical picture of the ornamental use of the genus.

At first the symposium contributors were asked to name the three best performing Alliums in their garden; with the Allieae issue in prospect the limitation to three was lifted. If the question were put to me,

I should choose *Allium flavum*, the dwarf form known as var. *minor*, for its fragrant yellow flowers in late June, *Allium pulchellum* with its cool mauve flowers in July, and grassy tufted, August flowering *Allium cyaneum* with its blue bells.

Mr. Harold Rugg of Hanover, New Hampshire writes that *Allium pulchellum* is one he likes and that he is fond of *Allium azureum*, which he has some trouble in keeping.

Mr. Montague Free of the Brooklyn Botanic Garden names *Allium neapolitanum*, *Allium narcissiflorum*, and *Allium tibeticum* as favorites.

Mr. Carl Starker of Jennings Lodge, Oregon has favored me with the following list of species which he has found to be easy and dependable and permanent with very little care:

Allium kansuense—six to eight inches high with very fine grassy foliage and lovely blue flowers in small heads. Nice in the rock garden.

Allium Moly—good in part shade, eight to ten inches. Broad glaucous foliage—somewhat like tulip foliage. Loose heads of large shining deep yellow blooms. Good in border or rockery.

Allium Farreri—Lovely in the rock garden, four to six inches. Rather broad blue-green foliage and drooping heads of wine-purple bells.

Allium neapolitanum—twelve to fourteen inches. Early and lovely, with showy pure white flowers with green stamens. Nice for cutting and a good multiplier.

Allium albopilosum—fourteen to sixteen inches. Large round heads of silvery lavender flowers, quite starry and open in effect. Especially effective and long lasting as a cut flower. Very large bulbs.

Allium triquetrum—flat three sided light green fleshy foliage and large long white bells marked with green in clusters of six to eight on a stem. Very early blooming, eight to ten inches.

Allium subroseum—charming round heads of bloom in August-September. Bright rose pink with no hint of lavender. Five to six inches.

ALLIUM AND NOTHOSCORDUM NOTES

F. CLEVELAND MORGAN, *Montreal, Canada*

[The following notes were submitted by Mr. F. Cleveland Morgan, Montreal, Canada, who is one of the outstanding plant enthusiasts in Canada. —*Bernard Harkness*]

A. albopilosum—from Persia—is rather large for the average Rock Garden but it is a handsome and striking plant. The flowering scapes rise about 2 feet and carry large globular heads of silvery lilac fully six inches in diameter. Even the seed heads are decorative and look, when dried, like an exploding bomb. The seeds are slow to germinate and the plant, unlike so many Alliums, never becomes a nuisance. It flowers about July 1st.

A. azureum (syn. *A. coeruleum*) *Siberia*. This species likes a hot dry soil and is one of the most attractive of the whole genus. The circular heads of two inch diameter are a wonderful blue and are splendid

as cut flowers for the house. They grow from 18 to 24 inches high. Flowers in June. It comes readily from seed.

A. Beesianum, *N. China*. A small species about nine inches high with small clusters of drooping blue bells carried on slender scapes. It has grassy foliage and flowers in late July.

A. carinatum (syn. *A. pulchellum*). A delicate and beautiful plant growing about 18 inches high. The flower head is not large and consists of a loose cluster. These heads are sheathed in a long spathe and as these open the rosy purple flowers appear on long pedicels. The effect is not unlike an exploding rocket. It blooms during July and August and though it self sows does not become a nuisance.

A. cernuum—*Allegheny Mts.* I mention this species more as a warning than to recommend it as a desirable plant to grow. It is by no means the least attractive of the group but spreads dangerously by seed. The plant flowers in July and the heads consist of hanging pink bells in clusters on a 15-inch scape.

A. cyaneum—*Altai Mts. Siberia*. A charming little species with wiry grass-like foliage and tiny hanging bells of a soft blue. There are a number of other species coming from China which resemble it, such as *A. Kansuense* and *A. Sikkimense*. It flowers in July.

A. flavum—*Italy*. Soft yellow bells in small umbels on one foot scapes. Spathes very long and pointed. There are two forms of this plant one flowering a little earlier in July than the other and this variety is without the distinctive spathe of the larger variety. The flowers have a delicate fragrance though the foliage if crushed gives off the characteristic onion smell.

A. Heldrichii. The darkest and richest coloured allium which I have grown—the flowers being a deep wine red. It blooms in late June and grows to about a foot high.

A. karataviense—*Turkestan*. In this species the broad glaucous leaves are themselves very decorative but after the plant has flowered they fade and disappear. The leaves grow in arching pairs and from each pair appears in early June, the flower scape carrying a large round head of greenish white. It does best in a rather light sandy loam. The mature bulbs are round and measure a good two inches across.

A. Moly—(syn. *A. luteum*)—*Spain*. The Spanish onion has butter yellow flowers in small heads on one foot scapes. The foliage is broader than in most alliums and disappears after the plant has flowered. It will succeed in semi-shade and to be effective should be grown in colonies.

A. narcissiflorum (syn. *A. pedimontanum*). This is to my mind the most charming of the family. Its eight inch scapes carry pendant bells of rosy red, not unlike a snowdrop in character. The leaves are strap-shaped and the plant increases by running underground roots. Give it stony ground.

A. ostrowskyanum—*Turkestan*. This plant has a few strap shaped leaves and the flower scapes of one foot carry clustered heads of cheerful red-violet. It is a pretty species which comes into flower about July 1st. It is best propagated from seed.

A. stellatum—*Prairie Onion*—*Western States*. Though not spectacular this is a useful counterpart to interplant with the white *N. inodorum* described below. It flowers at the same time and its rosy purple heads look well by contrast in its company.

A. zebdanense—*Armenia*. A charming early bloomer (end May) with dainty bells of white hanging in small umbels from 15-inch scapes. The foliage is fine and grassy.



Fig. 111. *Brunsvigia Slateriana*, X 0.25. Photo by J. R. Brown.

Nothoscordum inodorum (syn. *N. fragrans*). This plant makes a handsome and bold clump, blooming in late August and September when flowers are scarce. The scapes rise to 24 inches and carry flat clusters of pure white flowers. Another plant much like it in appearance and named *A. odorum* flowers in July. They both self sow readily but if the plants are cut over after flowering there is little difficulty in controlling them.

BRUNSVIGIA SLATERIANA AND OTHER SPECIES

L. S. HANNIBAL, *California*

Through the courtesy of Mr. J. R. Brown we have obtained the following information on *Brunsvigia slateriana*. The bulbs, which are only three or four inches in diameter, can readily be moved during the early Summer without impairing their flowering capacity. Fine showy, red blossoms appear in late fall and are indeed very lovely (See Fig. 111). Usually the leaves follow the flowers, but when no flower bud appears they often begin development much earlier than normal for the season. The foliage is a bright glaucous green and very undulate. Apparently seedling bulbs bloom in six or seven years from planting.

Brunsvigias are extremely rare in U. S. A., and at present are nearly unobtainable. Several parties have seedling *B. orientalis* (Linn.), (syn. *B. gigantea* Heist.), the Candelabra Lily, and similarly a few have *B. gigantea* (Van Marum) Traub, (syn. *B. Josephinae* Redoute). The flowers of these two species are bright red, but the leaves of the latter are of a glaucous, lorate type while in *B. orientalis* they are broad and lingulate. *Brunsvigia Cooperi*, a high mountain type resembles a small *B. gigantea*, is fall flowering, and has an umbel of pink blossoms. *Brunsvigia rosea* is discussed elsewhere in this issue.

HAEMANTHUS ALBIFLOS

L. S. HANNIBAL, *California*

This plant resembles *Haemanthus coccineus* somewhat in growth habit. The bulb is greenish in color, flattened, and about 1½ inches in diameter. The flower scape develops in the late fall with a small compact umbel of white blossoms. In general appearance the bloom resembles a small white dish mop. The leaves, which are contemporary with the flowers, seldom grow more than 8 inches long by 2 inches wide. Like *H. coccineus* they are without pedicels. Fine white hair covers the whole leaf area, especially on the under side. The bulbs are easily grown and produce numerous offsets. A light moist humus is required since they are strictly a shade plant—in fact, so sensitive is *H. albiflos* to sunlight that the flower scape may slowly twist out of focus if the plant is placed in the full sun to have its picture taken.

The illustration, Figure 112, is reproduced from a photograph furnished by Mr. J. R. Brown.

HEMEROCALLIS IN AN IRIS GARDEN

HUBERT A. FISCHER, *Chicago, Illinois*

For over twenty-five years our chief interest in gardening has been growing iris, during which time hundreds of varieties have passed in review. With a keen interest in a plant genus the natural sequence is hybridizing and growing seedlings. This started many years ago, and in the course of years thousands of seedlings have seen the light of day simply because of a hobby in an amateur garden. Occasionally a few were held over, only to be discarded in later years.

Limited in size as a suburban garden naturally would be, the lack of adequate space has always been a major problem. The sunniest portion was set aside as the iris garden proper, and for years this was held inviolate from the encroaching plant members of other families. Later I was horrified at a suggestion from my wife that we plant a few *hemerocallis* into this iris sanctorum, and at first I firmly resisted the idea.

The credit for our early interest in *Hemerocallis* must go to her, for, being especially fond of yellow tints in the garden, she recognized their value. Each year a few new varieties found their way into the garden and gradually spread through the perennial borders until today there are probably about one hundred and fifty varieties.

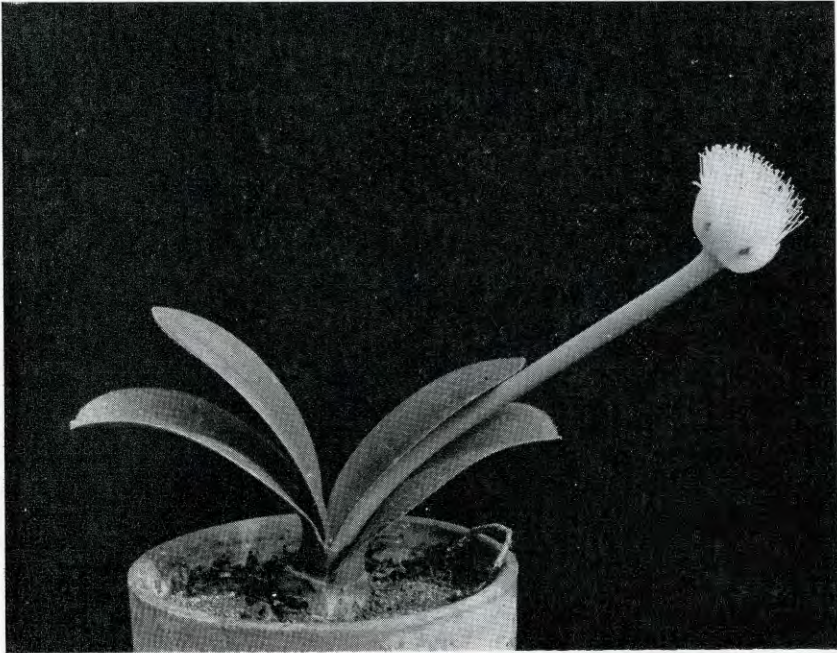


Fig. 112. *Haemanthus albiflos*. Photo by J. R. Brown.

I do not wish to create the impression that I had been indifferent to *hemerocallis*, I have always been very fond of them. My earliest recollection of this genus dates back to my childhood days, when once on a visit to the country I saw a huge patch of *Fulva Europa* growing under a tree, spilling down into the drainage ditch and up again to the edge of the dusty road—a wanderer by nature and loath to stay put. Being a city bred youngster, where picking of flowers was seldom allowed, I was amazed to learn that they belonged to no one, were growing wild, and that I could pick some of them should I care to.

My next acquaintance came years later when a friendly gardener gave us a clump of Lemon Lilies (*H. flava*). These were separated and

planted in the perennial border. The bright yellow worked in so well with the groups of iris and other plants that subsequent years saw this group multiplied into a dozen different places. Later we acquired a few plants of *Dr. Regel* and about twenty years ago we purchased *Calypso* and *Ophir*.

Today many varieties are planted throughout the borders and the corners of the iris beds have been given over to them. At first only sorts that bloomed with the iris were moved in. *Earliana* and *Auriole* are gay when the iris bloom, and *Apricot* is lovely with a planting of the iris, *Blue Triumph*. Other varieties come into bloom as the iris reach their peak. *Gloriana* bloomed very early this year, and then sent up a second group of stalks, giving us a season of six weeks of bloom. *Gayety* also bloomed with the iris this year and amazed us with fifty-four inch high stalks. The masses of large wide open primrose flowers dominated one corner of the garden, and a large clump of *Cressida* rivaled the sunlight with its vibrant color.

The close of the iris season has always left a rather empty feeling for there was really no bloom to look forward to in this part of the garden until another year. The gay colors and dancing flowers are gone and the sweet perfume on the gentle evening breeze is only a memory.

Today the picture is changed. Since the *Hemerocallis* have been moved into the iris garden, the color goes merrily on—the season is coming into its own with new varieties opening their first flowers daily. In the south border of shrubs and perennials *Highboy* nods in the breeze well above surrounding plants. *Maculata* holds its own with various tall plants and in one corner *Margaret Perry* is given ample space for her restless feet to ramble at will. *Moonbeam* with its soft coloring is lovely in the twilight. We like the night bloomers. *Hyperion* planted against a backstop of lavender phlox is a picture we wait for each year, and when *Hesperus* comes into bloom, I am sure it is my favorite. We like *Sachem* for its bright color—lovely *Antoinette* with its brown overlay. *Purple and Gold* has unusual richness of color and the large brilliant flowers of *Mrs. J. J. Tiggert* for the imposing group it makes. There are far too many to name.

At the west end of the garden where the iris seedlings beds are located is one section where the sunlight is partly filtered by the out-reaching branches of some apple trees and it is here that the *Hemerocallis* seedlings are planted. No plantings, big by the acre of thousands here—just a few hundred each year.

In all the pleasure of gardening there is none to compare with that of hybridizing and growing seedlings. The anticipation of seeing a new flower and knowing that you are the first to see it, and the thrill when an occasional plant shows merit, must be experienced to be understood. The impatience with which a promising flower is awaited usually results in just a wee bit of help for a pre-view. At this time of the year, the early morning visit to the garden—cool and moist with dew—usually favors the seedling beds first. Unfortunate the gardener who must leave for the city on these mornings.

I find that the growing popularity of the *Hemerocallis* is bringing about much the same condition as occurred with the iris many years ago. Too many varieties are being offered. Many introductions at high prices do not have sufficient merit or distinction, and in many cases descriptions are very confusing.

After reading a glowing and rather intriguing description which promises visions of a lovely pink, something on the order of a faded *Fulva Europa* is the actuality. In 1942 HERBERTIA an article by Robt. Schreiner pleads for a more simple classification with which I agree and I am certain most gardeners do also. It is desirable also to have a little more discrimination in the selection of new varieties—for I can grow mediocre seedlings myself.

We have become very fond of hemerocallis for several reasons. We love them for their bright colors—and for the various forms of flowers—the trumpet shape of *Ophir*, the full broad petalled flowers of *Dauntless*, the open flowers of *Hesperus*, the looseness of *Gayety*, the pinched and twisted petals of *Wau-Bun* and all the intermediate forms.

We like them for their freedom of bloom and their adaptability to location; their vigor and freedom from diseases. We like them because they give flowers here at a time of the year when there is a decided lack of other bloom in the garden. These features are important in the small garden where time and space are at a premium.

These lovely intruders have gradually worked their way into our iris garden and into our hearts through sheer merit. It is difficult to picture the garden without them.

DAYLILIES IN KANSAS

DARRELL S. CRAWFORD, *Kansas*

The search for ironclad perennials that stand our severe winters of sudden changes without protection, and our searing high wind's drought of summer, brought to light, among others, the dependable daylilies, *Hemerocallis*.

Many daylily clones are evergreen all winter without benefit of a mulch. As a rule, we, in Kansas, give no mulch or other winter protection. We do not have time to bother with clones that can not survive untended. Beginners and busy amateurs usually do not have time and money to waste on short lived clones. Our garden is on a northwest hill slope. The water drains off rapidly and the hill is swept by winter blizzards and summer blasts—"blows" lasting for two to three weeks. We must not forget that the Indian meaning of the name, Kansas, is "Land of the South Wind."

The gardeners in this area, as a rule, are not acquainted with such well known clones as *Ophir*, *Cressida*, etc., and grow only *Hemerocallis fulva* and *H. flava*. Most of them do not realize the enjoyment that is in store for them in the newer "reds" and "purples."

Vulcan attracts visitors who are fascinated by its deep maroon-mahogany-like blooms with golden cup.

Hankow is a giant with 6½ to 7" blooms. Visitors as a rule prefer it next to *Vulcan*. It gives the impression of a salmon-scarlet star with petals boldly outstanding like the three-bladed propellers of a bomber. A vigorous, heavy plant, scapes up to 42".

Dawn satisfies beginners for the change it represents from usual yellows. It has dull brick-red petals and brighter sepals. Segments are narrow and it tends to fade in the late afternoon.

The gracefully blended rosy star of *Fulva Rosea* is a favorite, but it may be a disappointment to some amateurs who expect too much from the fancy "build-up" in catalogs.

Peachblow seems too dainty and delicate for our climate in summer. Plants are small, dwarf. Blooms are pastel pink, a hazy rose-orange with coral eye-zone.

Lady Hesketh will never be popular here for it closes too early on hot summer days—by 10 a. m.

More clones like *Dauntless* with thick, heavy, heat resistant segments are needed for our Mid-West. It is ruffled and scented, creamy yellow, with a hazy bronze band.

Hyperion is of a heavy texture that resists our winds—a large refreshing, clear lemon yellow.

Nebraska (Sass) ranks with the best of the tall types. It can stand the abuse of wind and sun. The blooms are ruffled, tubular, 6", solid, rich cadmium-yellow. The mid-rib is palest pink with a suggestion of pink at tips. Over all the golden yellow, near orange, glows like the sunrise.

Golden West (Sass) produces giant tubular blooms that sparkle with gold dust. It is scented and remains open until midnight.

Hesperus (Sass) is another first class yellow.

Sunny West (Sass) produces open, star-shaped, pale yellow blooms of fine leathery texture; sun resistant, excellent for cutting.

White Lady (Sass) is a step nearer to white; a very pale creamy whitish yellow; scapes to 40" tall; July-August. Here it is a shade whiter than Mr. Sass' *Moonbeam*, which is a wonderful pale yellow giant. *White Lady* is popular with gardeners who do not care for bright tones. The roots are creamy, nearly white, unlike any others. It makes sturdy, heavy plants typical of Sass' hybrids, and is a persistent bloomer. We set plants of it in June which flowered three weeks later.

Starlight (Nesmith) is too fragile here. It burns and curls up quickly in the sun.

For early bloom the new *Judge Orr* promises to beat *Earliana*. It is a soft orange, medium size, late April.

Crown of Gold (Nesmith) is happy here. It is a wonderful ruffled, golden orange bloom, in late May. Gold dust is so heavily overcast that many touch it to see if it might rub off.

Linda wins everyone's heart with her creamy sepals and buff creamy petals warmed by a deep rosy brown eye; early June.

J. S. Gaynor attracts and deserves much attention. It appears like a 6" dove fluttering in the breeze. It is scented; orange-apricot without marks; late June to July.

Stalwart is a blend of bronze-gold. Petals are ruffled with red-bronze eye blended to yellow throat. Sepals are recurved, and petals are upturned like the ears of an alert puppy.

Enchantress is liked for its shy, half open tubular blossoms. Petals are faintly pink with brushings of bronze in the eye zone on creamy lemon.

Mikado and *Imperator* are reliable, and are recurrent bloomers, often blooming for the third time in October with *August Pioneer*.

Amaryllis and *Golden Dream* are similar to their soft, yellow blooms. They encourage beginners to try other and newer clones. Of the other older clones grown here, over 100 clones, many are so well known that we will not mention them at this time.

Olivia, *Halliana* and *Green Light* of Mrs. Popor are good but there is nothing unusual, except *Olivia*, a large 5½" orange-yellow. The petals are ruffled, broad, and tinted pink with lavender eye-zone.

Hybridizers should pay some attention to the requirements of the Mid-Western climate. Mr. Sass has made a good start that should encourage others to experiment along similar lines.

DAYLILIES IN SOUTHERN CALIFORNIA, 1943

C. S. MILLIKEN, *California*

The writer is contributing a few notes on the performance of some of the comparatively new daylilies which he has observed here in Southern California this year, and with these newer ones includes a few which are not so new but which in his opinion are still in the top class. There are many others which he is either growing or which he has seen rather casually elsewhere but which for one reason or another he will leave for another time. The list is arranged alphabetically.

Afterglow (Stout) is one of our favorites. Its soft coloring is unmatched by any other variety which we have seen. *Caballero* (Stout) and *Carnival* (Traub) are both splendid bi-colors, the former the brighter, the latter the deeper; vigorous plants; large flowers (6 inches).

Dominion (Stout) is a rich red that needs partial shade here and it fades in bright sunlight. The very broad segments and soft coloring of *Duchess of Windsor* (Traub) place it among the finest. *E. W. Yandre* (Hayward) is also one of the finest. The coloring is pleasing and the very flat form exceptional. We like it very much.

George Kelso (Traub) seems to us to be one of Dr. Traub's best. The soft coloring and the crisped segments contribute to its pleasing effect. *Golden West* (Sass), we think, possesses many of the desirable characteristics of a superior daylily. *Hesperus* (Sass) is very large and impressive. *Jubilee* (Stout) is one of the best of the banded daylilies; the coloring is clear, size, shape and carriage pleasing. The bright color and large spreading flowers of *Mrs. J. J. Tigert* (Watkins) have made this very popular with our friends. *Patricia* (Stout) is not new, but always a joy. Certainly one of the very finest. *Port* (Stout) has small flowers but they are bright and interesting.

Red Bird (Stout) is very bright. There is some question, perhaps, regarding the vigor of the plant. *Rosalind* (Stout selection) does well and will be generally liked. *Rosy Day* (Nies) is attractive and a wonderful performer. *Ruby Supreme* (Wheeler) is a prize winner if there ever was one. It is outstanding. For a rich dark red *Sachen* (Stout) is destined to become standard because of its fine uniform color for it fades but little even in our hottest sun.

Star of Gold (Sass) is a large flower, earlier and lighter yellow than *Hesperus*, equally tall; its evergreen foliage is in its favor in California. *Sweetbrier* (Nesmith) is a very fine large flowered rosy-pink and a vigorous plant. It is destined to be very popular. *Theon* (Stout) is certainly a very deep red-purple which holds its color well. *Triumph* (Stout) is at the top of the orange colored daylilies which we have seen here. We like the bright color and the pleasing shape of *Vulcan* (Stout).

DAYLILIES IN NORTH CENTRAL TEXAS

MISS W. M. KELL, *Texas*

The size and strength of clones from different originators varies greatly. Many of newer clones that are recommended for planting in shade do not respond in dry shade. However, if planted in rich, moist soil and left until well established, they will perform satisfactorily.

Many of the newer clones may be useful for hybridizing but are of little use in amateur gardens. Many are still confused in the trade as to the true name. One often secures plants with two different clones in the same clump. However, the progress in producing new daylilies of garden value is of great value to Mid-West gardeners. The American Amaryllis Society is to be congratulated in sponsoring the rigid evaluation of daylilies. This is a real service that all will appreciate.

Below, the writer lists the clones that have flowered in her garden. These are grouped under two headings:

(1) *Clones flowered for two seasons: Antoinette* (Hayward), evergreen, strong growing; a choice flower, height above average; 1st. bloom May 26, 1941; 1st bloom May 16, 1942. *Duchess of Windsor* (Traub), evergreen, strong growing, choice flower, height above average, 1st. bloom June 20, 1941; 1st. bloom June 7, 1942. *Chengtzu*, evergreen, strong growing, flower small but a new color; valuable for breeding; rapid spreading by stolons is objectionable; 1st. bloom July 1, 1941; 1st. bloom June 23, 1942. *Florida* (Hayward), partly deciduous, medium grower, flower small, low height. 1st. bloom June 13, 1941; 1st. bloom July 2, 1942. *Granada* (Traub), evergreen, strong grower, choice flower, height above average. 1st. bloom June 1, 1941; 1st. bloom May 31, 1942. *Hesperus* (Sass), deciduous, medium grower, good yellow, larger and more irregular than *Patricia*; height above average. 1st. bloom July 2, 1941; 1st. bloom June 25, 1942. *Golden West* (Sass), evergreen, strong grower, choice yellow, very tall. 1st. bloom June 6, 1941; 1st. bloom June 2, 1942. *Ralph Wheeler* (Hayward), evergreen, medium grower, choice flower, 1st. bloom June 20, 1941; 1st. bloom June 6, 1942. *Vulcan*

(Stout), evergreen, good grower, flower like red velvet. 1st. bloom June 26, 1941; 1st. bloom June 27, 1942.

(2) *Clones flowered for one season.* *Mildred Orpet* (Traub), deciduous, slow growing, flower has three pastel pink segments, and three soft pastel yellow. 1st. bloom June 7, 1942. *Multiflora Luna*; deciduous, slow grower; flowers small; height low. 1st. bloom June 6, 1942. *Indian Chief* (Traub), evergreen, good grower, choice flower. 1st. bloom June 25, 1942. *Marcelle* (Hayward), partly deciduous, medium grower, choice flower; very large. 1st. bloom June 2, 1942. *Princess* (Stout), evergreen, medium grower, good yellow. 1st. bloom June 25, 1942. *Rosita* (Hayward), bloomed June 18, 1941, but died in July, 1942. *Victory Taiierchwang* (Traub), evergreen, medium grower, choice flower. 1st. bloom June 25, 1942.

CONCERNING INJURY TO DAYLILIES BY THRIPS

A. B. STOUT, *The New York Botanical Garden*

A report on the injuries to daylilies by thrips was made by the writer in 1940.* In each of the three summers since then there has been considerable of these injuries in the collection of daylilies at The New York Botanical Garden. Some of the observations on these injuries may now be recorded.

The first noticeable signs of this injury were observed during early summer in scapes that were then ready to flower. Thus it seems that the species and horticultural clones which flower first in spring escape injury. But this condition may be due to the normal period of infestation rather than to any inherent immunity of the early flowering daylilies to the attacks of thrips.

For several years the effects of infestation by thrips have been most severe and complete to plants of *Hemerocallis citrina*. The plants of this species in the collection include ramets of the clone first introduced into culture in Italy and seedlings of seed recently collected of wild plants in the Orient. All of these plants have been so severely injured that from 1940 to 1943 inclusive few if any uninjured scapes were produced during the normal period of flowering in July and early August. The accompanying illustration (Fig. 113) of a photograph obtained in 1940 shows the range of the injuries which were observed. At the left is shown a scape with the entire inflorescence undeveloped, shrivelled, and dead. In cases of most severe thrip injury many or even all of the scapes on a plant may be in this condition. At the extreme right is shown a scape which had several almost perfect flowers but the greater number of flower buds had been destroyed. In such scapes the flowers which mature are, as a rule, the more terminal ones of the primary inflorescence which develop first. The injury is often complete to entire laterals below the primary inflorescence and to those within it. These conditions indicate that the thrips feed on the more tender and least developed parts of the scapes. In cases of slight injury there are usually only vertical strips along the stem immediately above the bracts

* Journal of The New York Botanical Garden 41: 244-245.

that are rough and brown in color and composed of several layers of dead and apparently corky cells.

Plants of the species *H. fulva* which bloom in midsummer have differed greatly in the degree of injury by thrips. No appreciable injury has been observed thus far to ramets of the *H. fulva* clone *Europa*, some of which have stood close to plants of *H. citrina*; but other members of this species have been severely injured.



Fig. 113. Scapes of plants of *Hemerocallis citrina* which show stages of injuries resulting from feeding of thrips. Photo New York Botanical Garden.

During some years, and especially in 1942, nearly all plants of *H. Thunbergii* suffered severely from thrip injury, but the extent and amount of such injury to these plants has varied from year to year, especially for the members of this species that are latest to bloom.

During 1942 nearly all plants of *H. multiflora* showed much injury by thrips but in 1943 many of the same plants had little injury and flowered with profusion. Most plants of this species begin to bloom during August and the extent of the thrip injury to them has varied greatly from year to year.

It may be reported that various hybrid progenies which have in their ancestry one or more of the species *H. citrina*, *H. Thunbergii* and *H. multiflora* have, at least in some years, been much injured by thrips, and these hybrids include some of the named clones of which mention may be made of *Summer Multiflora Hybrids*, *August Pioneer*, and *Boutonniere*.

It should be mentioned that the foliage of many plants that have severe injury to their scapes and flowers remains apparently in good condition. Especially is this true of plants of *H. citrina*, *H. multiflora* and *H. Thunbergii*. Possibly close examination may reveal that the thrips do feed on leaves, and it may be that there is injury to the leaves of members of the *H. fulva* group which become rusty brown in summer.

It is possible and perhaps probable that the decay and death of foliage and buds in the crown rots observed in summer and autumn are due to a fungous or bacterial pathogen quite independently of thrip injuries. Also these appear to be quite distinct for the winter injuries which develop as crown rots in early spring.

During the time when the maximum injuries by thrips are evident in the collection of daylilies there are always numerous plants which are in excellent flowering and on whose scapes there are few or even no signs of thrip feeding. Whether such plants are immune to the feeding of thrips or have merely escaped infestation is not now evident.

At New York the extent of thrip injuries has definitely decreased as autumn advances. In 1943 no injury was observed on the numerous plants of the late-flowering species *H. altissima* or on many of the several late-flowering hybrids grown when such species as *H. Thunbergii*, *H. multiflora*, and *H. citrina* are bred with *H. altissima*. The amount of injury seemed to be much less on late flowering plants of *H. Thunbergii* which came to The New York Botanical Garden from northern Japan than it was on the members of this species which bloom earlier.

The conditions shown in Figure 114 may be explained in this connection. The photograph was taken on August 31, 1943. At the left are plants of *H. citrina* which flowered during July. Scarcely a flower had developed but the foliage remained in splendid condition. Close by to the right is a plant of *Autumn Prince* showing some of the first flowers of its period of bloom which continued until late in October. On these plants there were only a few signs of thrip injuries and these were limited to a few of the lower internodes of the inflorescences. The clone *Autumn Prince* is the propagation of a seedling selected from hybrids of *H. altissima* x *H. Thunbergii*.

In 1940 a collection of thrips was captured on the inflorescences of injured daylilies at The New York Botanical Garden and sent to Professor J. Douglas Hood of the Department of Entomology, Cornell University. His statements regarding these thrips are quoted in the

report mentioned in the beginning of this article. Four species were identified by Professor Hood but he decided that one species, *Frankliniella tritici*, is responsible for the injuries to daylilies. It is of special concern to note that this species is "abundant throughout all of eastern North America" and that it is "present from spring to fall."

There has, I believe, been no mention of thrip injuries in any of the numerous articles on daylilies that have been published in the volumes of *HERBERTIA*. Professor E. J. Kraus of Chicago University has stated in a letter to the writer that there has been considerable thrip injury in the collection of daylilies being grown under his supervision at Geneva, Wisconsin.

It is probable that thrip injuries to daylilies may now occur or later develop somewhat widely in eastern United States. In any case



Fig. 114. Left, *Hemerocallis citrina* plants that flowered in July, thrips injury so severe that few flowers developed, foliage in excellent condition; right, plants of late-flowering Autumn Prince, scapes show mere traces of feeding by thrips. Photo New York Botanical Garden Aug. 31, 1943.

various aspects of the matter now merit some attention. At the present time information may be reported and assembled on the geographic range of the injuries and their severity in different areas. Attention may well be given to the identification of the one or more species of thrips that are involved. It will be important to learn the facts regarding the life cycle of these thrips in respect to their multiplication, feeding habits, and possible migration from other plants to daylilies. Such information will have a very direct bearing on the evaluation of daylilies which are immune or which escape infestation. Another matter that may become of concern is that of effective methods of reducing infestation by the use of dusts or sprays of rotenone, pyrethrum and tartar emetic.

DAYLILY RESPONSE TO LOW TEMPERATURE

J. MARION SHULL, *Maryland*

For the first time in many years of experience with *Hemerocallis* it has been possible to make notes on their behavior under continued abnormally low temperature.

First, a resumé of the weather for the period involved. June, 1943 had broken all records for excessive heat, some 16 days or more of unbroken daily maxima in the 90's, then following a light rain, the last day of the month was ushered in at the relatively low temperature of 64° and failed to rise above 70 all day. The morning of July 1 came in at 54 and did not rise above 70. July 2 likewise began at 54 with a maximum of 74, and on July 3 the corresponding figures were 58 and 76. On the 4th of July morning temperature was again at 64, with an evening temperature of 75.

The reaction to these five days of extremely low temperatures for the time of year, was pronounced and various. All growth was slowed. Development of buds was delayed so that volume of bloom fell off progressively from day to day, and slower growth of buds ready to bloom resulted in smaller flowers. But the most startling reaction was in the realm of color. In general, all brilliant colors were dulled, all dark colors very much lightened, while on the contrary some delicate colors were darkened.

More specifically, such clones as *San Juan* and *Vulcan* lost all their luster and nearly half their depth of color. Dr. Traub's *Dr. Stout*, that normally presents a rich orange yellow brightly overlaid with red, and with nearly solid red sepals, lost all its red overlay and became a simple orange yellow. *Mikado's* rich red eye spot was reduced to a distal half moon with the light throat correspondingly enlarged. *Iris Perry*, normally acceptable as a smooth orange, the eye barely perceptible, was splotchily darkened with dull red and displayed a pronounced dirty red eye. Similarly, orange and yellow seedlings descended from *Iris Perry* as one of the grand-parents, showed pink flushing not previously seen in them.

Similarly darkened was a lovely seedling of my own, with enchanting pale iridescent flesh tones under normal conditions. Under the influence of cold it came with an overlay of dirty pink that completely spoiled its charm—was about three times darker than it should be.

By July 4th slowly rising temperature had restored some of the brilliance but not yet the depth of color. By the 5th they were good again but not until the 6th, with maximum temperatures going above 80 was the full richness and brilliance again attained. Size of flower had also returned despite a definite lack of rain, suggesting that active growing temperature at night, or as buds are approaching the time of actual flowering, is probably a leading factor in the determination of ultimate size. Size is of course largely varietal but any one long familiar with a daylily garden has noted that size also fluctuates from day to day in the same varieties, and without any very apparent reason.

WINTER INJURY TO DAYLILIES

J. S. COOLEY, *Senior Pathologist,**U. S. Plant Industry Station, Beltsville, Maryland*

The winter of 1942-43 was unusually severe on daylilies growing in the vicinity of Washington, D. C. A description of the injuries sustained may be useful in diagnosing the diseases and environmental disturbances of this group of plants. Some observations of the writer on winter injury and transplanting were published in *Herbertia*, Volume 8*. Injury from cold may be considered as of two more or less distinct kinds; (1) Frost injury, the manifestation of which is dead tips and margins of the young leaves; (2) Winter injury proper, in which the crown is affected by adverse winter weather to such an extent that it is killed or is so injured that it is unable to produce normal shoots during the growing season following the injury.

The injury to the tops which we are designating as frost injury was especially prevalent in the spring of 1943 when freezing weather prevailed after young shoots had started growth. Some varieties are much more susceptible to this type of injury than others. The dead margins and tips of the leaves give a tattered and disheveled appearance to the plants in early spring. In a short while however new leaves cover up the disfigured ones and the plants look normal and healthy.

Where there is winter injury to the crowns a more serious and lasting condition prevails than where the trouble is confined to frost injury of the leaves. Crown winter injury may be manifest by stunted shoots, by spindling shoots, and by the death of the whole crown. In the stunt type of injury the shoots show short twisted, crinkled, abnormal leaves which give a dwarfed or stunted effect. The affected shoots seldom produce bloom scapes the summer following the injury, and the few that are produced are short and appear abnormal. The general appearance of the abnormal plant suggests effects of severe attack by an active pathogen (Plate 252).

The spindling shoot type of winter injury to the crown is well described by the name. Instead of one or more heavy, vigorous shoots, the plant produces a number of weak, spindling shoots. In severe cases an affected clump resembles a clump of grass. Plants affected with this type of injury likewise do not bloom until they recover enough to produce normal shoots. This spindling shoot type of winter injury is especially prevalent in certain varieties.

Both the stunted and the spindling sprout types of winter injury have been under observation for several years and it has been ascertained that recovery may be complete from each type. The fact that plants thus injured have completely recovered by the second or third summer after the injury and then perform normally again is good evidence that the trouble is not due to a virus even though some of the symptoms might suggest such causation. Usually those varieties that are susceptible to winter injury of the crown are also affected by the frost type of injury to the foliage.

* Some experiences in daylily propagation. *Herbertia* 8:121-122, 1941.



Hybrid daylily seedlings: left, stunted plant resulting from winter injury in crown; right, normal shoot not injured at crown arising from the same clump.

Another aspect of winter injury that has caused some of us much loss is the injury to newly transplanted plants or to plants that were too small at the advent of cold to withstand the adversity of winter weather. Sometimes such plants are killed outright; at other times they are affected by one of the manifestations of winter injury described above. Much of this type of injury is preventable. The prevalent idea that daylilies may be divided and transplanted at any time needs to be modified. The question then arises as to what is the proper time to transplant daylilies so as to have the minimum of casualties from winter injury. If transplanting is done at a time when there is relatively little root activity one would expect the least shock to the plant. It is also well established that many plants when newly transplanted will be affected by winter injury while well established plants are unaffected; also a small weak plant transplanted even in mid summer may succumb as a result of winter injury. When transplanting is done too late in the fall for the plant to become well established before cold weather even strong plants may die as a result of winter injury. Repeated observation of the root development at various times during the growing season indicates that there is a cessation in root activity about the time blooming is over, followed by a period of rapid root development in the early fall. The root development of established plants continues well into the winter whenever the soil is warm enough and aeration favorable for growth to take place. This post bloom period of lessened root activity, prior to the resumption of rapid root development, would seem to be the proper time to transplant. The practical experience of the writer has confirmed his theoretical deductions in that more satisfactory results were obtained from transplanting just after blooming was over than at any other time. The most satisfactory time to divide and transplant the late blooming varieties of the multiflora type has not been determined by the writer. It may be that early spring would be a more satisfactory time for transplanting these varieties than after blooming since this would be too late for much root growth to take place that fall.

The practical question arises as to whether or not anything can be done about winter injury to daylilies. We cannot modify the temperature, but certain procedures may modify growing conditions to such an extent as to prevent or lessen the injury due to winter weather. The observation has been repeatedly made that winter injury to the crowns is most severe where the soil is excessively moist. In some cases plants growing in a slight depression had every shoot deformed whereas the same variety growing nearby on slightly higher ground had very few abnormal shoots. It follows therefore that conditions can often be made less favorable for winter injury by bedding up the row or the area where the plants are to be set 5 or 6 inches above the general level, particularly if the soil is retentive of moisture. Transplant in mid-summer or early fall rather than in late fall or winter. Even the wounding or disturbance produced by digging off part of a clump in early winter has caused serious winter injury to the whole clump. Where small plants result from splitting the shoots, it is safer to grow them in a greenhouse or cold frame for the first winter than to expect them to withstand outside conditions.

NOTES ON BOMAREAS, 1943

W. M. JAMES, *California*

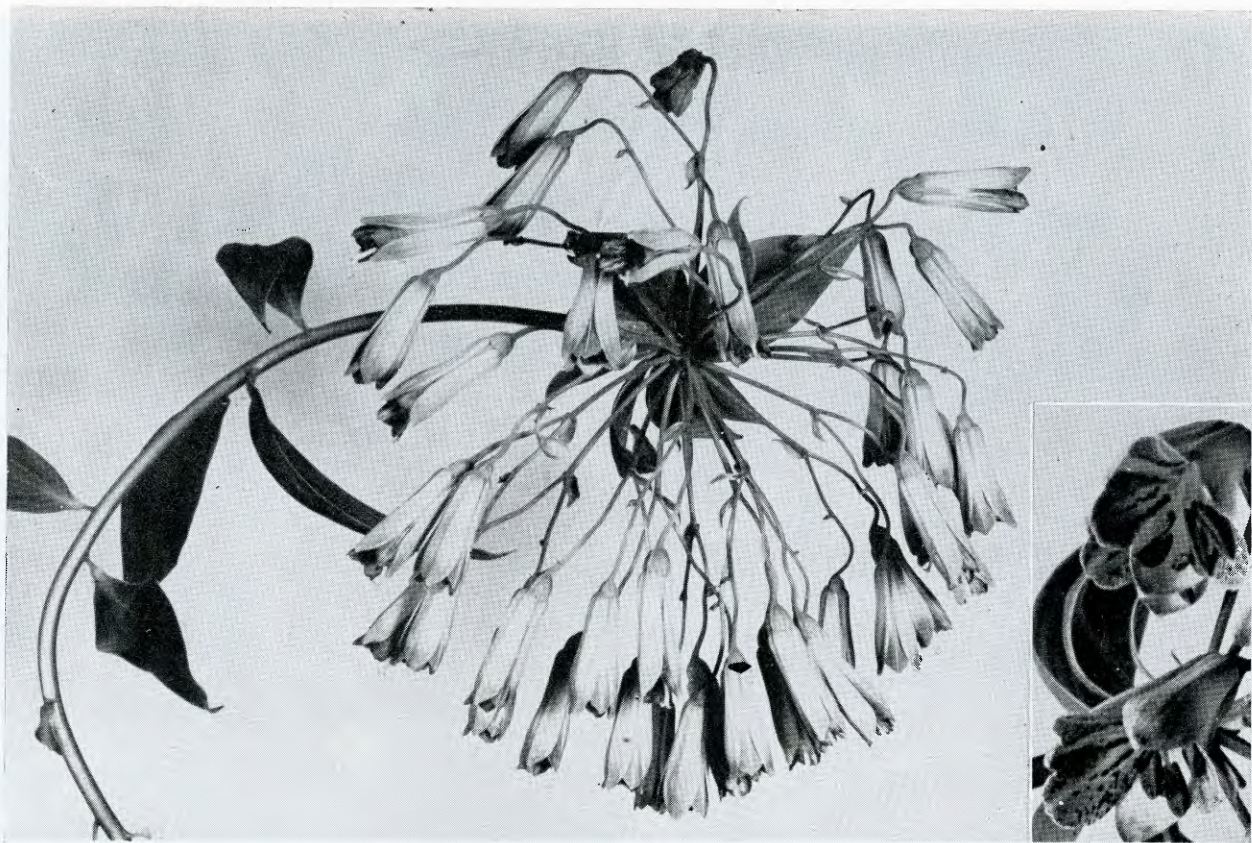
Bomarea edulis. The flowers are almost tubular and average three-fourths inch in diameter and one and one-eighth inches in length, including the ovary. The color is a combination of pale coral and green; the outer segments of the flower being pale coral outside and white inside tipped with green on both sides, and both sides of the inner seg-



Fig. 115. *Bomarea Lehmanii*, flowers and fruits. Photo by W. M. James.

ments are the same color green as the leaves with short purple stripes on the inside. The anthers are greenish blue and the pollen purple. (See Plate 253).

The tubers are distinctive as compared to any others I have seen. Instead of being long, slender and easily broken when dug or divided, *B. edulis* tubers are short and thick—almost egg-shaped—and dig very easily.



Bomarea edulis, inflorescence about six inches in diameter, in natural position; in right corner, flowers slightly larger than natural size to show spots inside flower. Photos by W. M. James.

Bomarea Lehmannii. The flowers are about the same shape as *B. edulis*. They average one-half inch in diameter and one and one-fourth inches long. The color is a brick red outside (not very bright) and orange inside, with dark red spots inside. The anthers and pollen are dark blue and the seeds are a brilliant orange scarlet. (See Figure 115).

These pictures are of flowers taken from plants received from the U. S. D. A. several years ago by Las Positas Nursery. The color descriptions are my own and might not correspond exactly with those of other people. I have noticed quite a variation in color sense. When compared with *B. Caldasiana* and *B. acutifolia*, the flowers of *B. edulis* and *B. Lehmannii* appear dull and not as showy. However, they are a big help in becoming acquainted with the genus.

THE ARBUCKEL HYBRID AMARYLLIS

GEORGE W. ARBUCKEL, *New Jersey*

The writer is an amateur breeder of hybrid *Amaryllis* and has been active in this field for some years. He has now close to 250,000 bulbs of Giant New Jersey hybrids, the bulbs ranging from small to very large.



Fig. 116. *Arbuckel Hybrid Amaryllis*; Miss Arbuckel in background.

These were all grown from seeds secured as a result of hand pollination. The size of the flowers can be judged from Fig. 116 that shows some of these hybrids. All of the bulbs were grown as a hobby here in the North.

The important point to bear in mind is that these have been grown in the North with only a four months' growing season as compared with at least double this period for growth in the South. These results should encourage others in the North to try hybrid *Amaryllis* as a hobby. If a sufficient number of northern amateurs could be enlisted, then there would be the stimulus of a friendly rivalry that would accelerate progress in this field. So far the southern *Amaryllis* breeders have had hardly any competition. Other reports on the writer's results with hybrid *Amaryllis* will appear in future issues of HERBERTIA.

AMARYLLIDS ON WREATH

In the August 20, 1942, Florists' Review, pages 23-24, appears an excellent illustration of the use of an amaryllid as a cluster on a large gladiolus wreath. The explanatory note follows: "A cluster of pink amaryllises [*Brunscrinum Howardii*, syn. *Amarcrinum Howardii*] now seasonable novelty flowers on most larger wholesale markets, can be used to splendid effect on a large wreath. * * * Here the wreath is made solid of gladiolus florets, pink, lavender or white being appropriate with the cluster flowers. An innovation in the cluster is the use of the [gladiolus] stems cut from the flowers, wired and inserted as a separate unit to give a more artistic effect to the design. Huckleberry is used among the amaryllises."

THE BOBOLINK DAYLILY

R. W. WHEELER, *Florida*

The new Daylily, *Bobolink*, is a hybrid combining Purple and pale Gold Yellow in a striking bicolor. It flowered for the first time in 1943 at two years old. Its seed parent was the rosy red, strong growing, semi-bicolor *Elizabeth Wheeler*. The Purple of the petals of the *Bobolink* Daylily is between Pansy and Heliotrope of the Standard Color Card. The flower is compact, medium in size with wide, well open segments. The petaline-segments are creped and frilled. The flower scapes are 3½ feet tall, and do not lean. The plant is vigorous in growth, multi-flora in habit and in Florida it is evergreen and a recurrent bloomer. (See Figure 95).

6. SOCIETY'S PROGRESS *

THE SECRETARY'S MESSAGE

The 10th. Anniversary Edition of HERBERTIA comes forth as a tribute to your Society's continued determination to carry on at least a possible minimum of its activities in war time, and to the unflagging enthusiasm and inspiration of its editor, Dr. Hamilton P. Traub now with the United States Department of Agriculture at Salinas, Calif.

The year has seen changes in the Society, its incorporation in California, the resultant necessity for transfer of the active secretarial duties to that state, where the work has been undertaken by Mr. Lester S. Hannibal, a confirmed believer in the future and investigator of the past of our most interesting family of plants. Mr. Hannibal becomes executive secretary with this issue, and all matters of dues and advertising in HERBERTIA are being handled by him.

Your secretary has been virtually obliged to suspend horticultural operations for the last few months because of the absolute inability to obtain garden labor for this business, and has been engaged in journalism on the staff of an Orlando newspaper for more than a year. He hopes this situation is only temporary and that conditions will soon permit his return to full time occupation with his plants and bulbs at the end of the war.

Because of the press of outside affairs, the secretary fears he has been sadly remiss in the affairs of the office, and in assisting the editor in his yearbook preparations, but has honestly endeavored to spare every effort toward these purposes that it was possible to give. The Society has continued to grow. Its financial condition under war time emergencies has been favorable to date, and the accumulations of daily mail have been actually stupendous. Thanks are sincerely extended to all correspondents who have been most patient while realizing "there's a war on."

The Society cannot boast of its usual shows this past year. Nor has the ordinary visiting of members to each others gardens at blooming season been possible because of travel difficulties. Foreign mail has been extremely irregular or almost non-existent. This situation shows no sign of improvement, and the Society's operations seem headed for purely domestic boundaries, except for the help extended by our many British friends, as long as the war lasts. The kindness and interest of the contributors and all our many other friends has been heart-warming, and we appeal for their continued cooperation and charitable acceptance of the difficulties under which the Society continues to operate.

We move forward, bearing the torch of plant science and garden beauty. It is a noble effort and needs no apologies in the ugly days of

* The material in this section was prepared by Mr. Wyndham Hayward, Secretary, Mr. L. S. Hannibal, Executive Secretary, and Mr. W. M. James, Chairman of the Trial Collections Committee. We owe these gentlemen a debt of gratitude for their contributions toward the advancement of the amaryllids.—
Hamilton P. Traub.

world conflagration. As long as we can carry on the spark of hope for better things, there will be something to look forward to, in the days of peace again.

With every wish for your safety and well being, I send a greeting to all members in every land, and especially to the members now in the armed services.

*Winter Park, Florida,
December 22, 1943*

*Wyndham Hayward,
Secretary*

EXECUTIVE SECRETARY'S MESSAGE

The year of 1943 has been indeed a very busy one. Directly or indirectly war work has cut heavily into the time of both members and officers. Many of the members are connected with agricultural or horticultural pursuits, and the present "Food for Freedom" effort has diverted the attention of these members from flowers to the practical phases of food crops. Almost all report their gardens lie half attended, some even full of weeds, since help is unobtainable and time is so limited. These conditions are not normal, but serious as the problems of the "home front" appear we should not complain. Such are secondary to the chief objective of defeating the common enemies of civilization. We owe our freedom to those who are in the armed services of the United Nations. To our members so engaged we particularly send greetings and best wishes.

The influence of the war has been reflected in the Society and several adjustments have been made during the recent year. Somewhat unanticipated we have had a marked membership increase. Both Mr. Hayward, our secretary and Dr. Traub, our editor, are in positions that demand their full time. The many hours which they so generously devoted to the Society in the past are no longer so readily available. The increasing loads of correspondence have been a real problem. To lighten this burden the work has been redistributed. The American Amaryllis Society is now incorporated under the laws of the State of California.

A Narcissus Committee has been appointed. With the able assistance of the Committee we plan to build up the Narcissus fraternity to a degree comparable to the Daylily group. We already have a large number of Narcissus enthusiasts and breeders among our membership, but more are welcome. The Atlantic and West Coast are ideally adapted to Narcissus culture, and although most local breeders and amateurs have not progressed beyond the F-1 or F-2 stage, they already promise keen competition to our English, Irish and Australian friends.

HERBERTIA for 1944 will feature the Allium group. We would appreciate receiving contributions for publication particularly pertaining to this group both from the standpoint of ornamental flowers and as an agricultural product.

Importation of new plant material has been neglected for some time. The society wishes to call attention to the fact that there are many Amaryllids in South America and North Africa that we have

never seen in cultivation. We are particularly anxious to import new material and to obtain descriptions of some of these relatively unknown or obscure plants. To facilitate these matters the society has made arrangements with the United States Department of Agriculture to permit entry of research material. Those interested in cooperating are asked to contact this office.

Dr. Traub's time is essentially taken up with his research work at the Guayule rubber project, but his interest in amaryllids remains steadfast. On Sundays the first place to look for him is in the garden. The efforts he puts in as editor of the journal is long and painstaking, but it is well spent for it is reflected not only in our increasing membership but likewise by our standing in plant science circles.

On behalf of the Society the Secretary wishes to thank all who have contributed material for publication or advertising, or have assisted in the various branches of the organization. The present stress and inconveniences caused by the war will eventually pass. We appreciate and need your support for the coming year. The success of the organization depends upon the mutual services rendered between members and headquarters. May we ask your assistance in locating new members.

Concord, California,
November 15, 1943

L. S. Hannibal,
Executive Secretary

EXECUTIVE SECRETARY'S MAIL SACK

War, in spite of its tragedy, records some humorous occurrences. We quote from John Steinbeck's syndicated article which appeared Oct. 14, 1943 regarding the floral tributes thrown by enthusiastic Italian crowds to the American and English troops during their early conquest of Italy. "One of the most ridiculous and most dangerous occupations was the investment of the Island of Ischia. There the people casting about for some floral tribute found that the most promising and prominent thing available was the pink Amaryllis [= *Brunsvigia rosea*, Cape Belladonna]. Other material would have been more suitable, since in the hands of an enthusiastic Italian crowd these plants became almost a lethal weapon. A reasonable-sized bunch of these flowers with big thick scapes may weigh four pounds. In a short drive through the streets of the City of Ischia, some of the troops were nearly beaten to death with them, while one naval officer was knocked clear out of a car by a well aimed bouquet of these overly fragrant blossoms. His friends proposed him for a "Purple Heart" and wrote a report on his bravery in action: 'Under a deadly hail of Amaryllis [= *Brunsvigia rosea*] the Lieutenant Commander fought his way through the street, although badly wounded by this new and deadly secret weapon.' "

Miss K. C. Stanford in the Union of South Africa is attempting to collect a few of the *Brunsvigia spp.* for the society. She reports that both collectors in the field and paper cartons for shipping are hard to locate.

Our Editor, Dr. Traub, has had several interesting experiences with Daylilies on the Pacific Coast. The cool nights tend to wash the colors out of the reds, but he reports some of the lighter shades are superb, especially *Mildred Orpet*, *Duchess of Windsor*, *Waubun* and *Patricia*. This gives a new angle for breeders to work on: The stabilization of colors for those who live in the cooler areas of the U. S. A., which would be a great asset.

In the coffee room of the Santa Lucia Inn of Salinas, California, the writer noticed a number of excellent lithographs taken from the pages of prominent early botanical publications such as Redoute's "Les Liliacees." Inquiry as to the source of these prints was of no avail, but if anyone could tell us where similar prints could be found we would greatly appreciate it. The society eventually desires to build up a reference library and anything of this nature is highly desirable.

Mr. Fred M. Danks of Australia reports that several breeders there are still working with *Brunsvigia multiflora hybridum* and that they have developed wine and scarlet colored "Cape Belladonnas."

Jean Gattefosse of French Morocco writes that he is continuing his native *Narcissus* studies and that he is collecting material for the Arnold Arboretum.

Dr. T. H. Goodspeed of the Botanical Dept. at the Univ. of California at Berkeley has returned from an extended tour throughout South America. He sent several Amaryllids back to the Botanical Garden during his trip—one species of *Amaryllis* was reported as partly yellowish. This turned out to have less yellow than anticipated, but it is well worth mentioning since it belongs to the Aulicum group and keys out to be near *Amaryllis Forgetii* (Worsley) T. & U. (HERBERTIA P. 54, 1939). A very short tube makes it of unusual interest. We hope to hear from Dr. Goodspeed regarding this find.

Cecil Houdyshel writes: "The fragrant *Amaryllis solandriiflora* hybrids have been grown for nearly 40 years, and probably much longer. In 1904 (or 1906) John Louis Childs mentioned *Solandriiflora* var. *conspicuum* in the Amaryllis number of the Mayflower Magazine. I tried to find a bulb for a number of years and finally bought one, which later turned out to be a hybrid. This was from the son of C. M. Hovey who had a Childs Nursery branch at Pasadena 35 years ago. About 1912 I remarked to Luther Burbank that the color, type, and fragrance of some of his hybrids showed *solandriiflora* in their ancestry. He had not previously heard of the species. Mr. Burbank is said to have obtained some stock from an early California breeder, Comparé, who apparently used *Solandriiflora* or *Solardriiflora* var. *conspicua* (commonly called *Ambiguum*) in his hybrids."

In looking up Nehrling's writings in his almost forgotten book "Die Amaryllis" we find that the firm of Haag and Schmidt imported in quantity a number of *Amaryllis solandriiflora* var. *conspicua* from Costa Rica in 1870. Nehrling received his bulbs in 1896 and produced

a number of hybrids, but as var. *conspicua* was known to Herbert in 1835 it is possible that some hybrids had very early origin. This beautiful strain has the distinction of being very fragrant, with a suggestion of bitter almond.

The society is very anxious to locate new plant material which is to be used for research and breeding purposes. Members outside of the U. S. A. are requested to contact the Executive Secretary at Concord, California, or Mr. W. M. James at Ojai, California, and plant import tags will be sent immediately.

Speaking of *Narcissus*, Frank Leach recently showed the writer a little volume entitled *Narcissus-Daffodils*, by A. M. Kirby, published in 1914. Under *Tazettas* he lists 34 all yellow varieties, 37 bi-colors, and 5 all whites. Apparently these were mostly available in Holland gardens, but a number had been imported into the U. S. A. What has become of this group? Like the Dinosaur has this become a nearly extinct race? Mr. Arno H. Bowers and the writer have located only 7 types. These are essentially all near whites. "Bazelman Major," "Gloriosus," "Grand Monarch," "Grand Primo," "Grand Primo Citronier," "Jaune Supreme," "Queen of the Yellows" and other popular forms of 30 years ago are apparently unobtainable. We realize that wars and severe winters have taken their toll, but it seems incredible that these plants could vanish so soon. It appears highly advisable that some action should be taken to locate and preserve what few specimens that may remain before they are lost completely to us.

L. S. Hannibal,
Executive Secretary

October 30, 1943

REPORT OF THE TRIAL COLLECTIONS COMMITTEE

Due to the present emergency the number of accessions has reached an all time low. The few items received however are very choice.

Members are urged to remember the Society with sample lots of seeds and bulbs of rare, new or unusual amaryllids which they may come upon anywhere.

The following Hybrid *Cyrtanthus* produced by Mrs. J. Norman Henry, Gladwyne, Penna., and introduced in 1943 (see description under "Registration of New Clones" elsewhere in this issue) have been donated to the Society for distribution as soon as sufficient stock has been propagated:

- A-312—*Coral Reef* (H-1)
- A-313—*Fairy* (H-2)
- A-314—*Venus* (H-3)
- A-315—*Red Gem* (H-4)
- A-316—*Topaz* (H-5)

Rancho Rinconada,
Ojai, California,
November 15, 1943

W. M. James, Chairman,
Trial Collections Committee

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Founded 1933; incorporated 1943

1943-44

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HEMEROCALLIS JURY FOR EVALUATING DAYLILIES—Dr. Kenneth Post,
Acting 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. MacDaniel, 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.

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 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.

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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). DEDICATED TO HENRY NEHRLING. 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). DEDICATED TO THEODORE L. MEAD. 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). DEDICATED TO ARTHINGTON WORSLEY. 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). DEDICATED TO WILLIAM HERBERT. 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). DEDICATED TO ERNST H. KRELAGE. 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 Alstroemerid 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-five illustrations—17 plates and 18 figures—and a total of 243 pages.

Volume 10 (1943). 10TH ANNIVERSARY EDITION. Dedicated to Elizabeth Lawrence, the outstanding authority on the use of amaryllids in the garden, who contributes a summary of her work in this field. This volume contains the review of *Agapanthus* and *Tulbaghia*, by Dr. Uphof; an article on *Brunsvigia rosea* and hybrids by Mr. Hannibal; a symposium on *Narcissus* breeding by Messrs. Powell, Reinelt, Berry, and Reynolds; a review of amaryllid chromosomes by Dr. Flory; articles on hybrid amaryllis, daylilies, and many other important articles on amaryllids. Thirty-eight illustrations—18 plates and 20 text figures—and a total of 225 pages.

The prices of the above described volumes are based on the available supply:

- Volume 1, 1934, supply exhausted.
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Make checks payable to the American Amaryllis Society, and send orders to the Executive Secretary,

Mr. L. S. Hannibal,
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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—

*L. S. Hannibal, Executive Secretary,
Concord, California*

7. THE BUYERS' GUIDE

THE BUYERS' GUIDE, 1934-1943

Dear Friends:

HERBERTIA has now entered its 10th year and has established a reputation for quality that is ever gaining new friends and members among those interested in plant science. From comments received we feel that definite progress has been and is being made in popularizing the Amaryllidaceae — more in the last 10 years than has been accomplished since Herbert's time.

During the depression in 1934 the launching of a plant science publication dealing with the Amaryllidaceae was definitely a venture. Excluding the Genus NARCISSUS, this Family has been long neglected. Only persons with faith in the future would undertake such a venture. The deep conviction of the sponsors that a publication such as HERBERTIA was desirable, was the deciding factor in launching the undertaking. These founders anticipated that the year book would be a means of reaching new contacts and do much to popularize and advance the knowledge of the Amaryllis Family as a whole. These objectives have definitely been realized, and in turn the advancement of studies of hybrid AMARYLLIS, HEMEROCALLIS, and species in many other genera has made it possible for the grower to place new varieties of better quality on the market.

Thus our advertisers' patronage of HERBERTIA in effect has tended to improve the variety and quality of their products. To say nothing of the inspiration and entertainment that HERBERTIA provides to the many amaryllid enthusiasts. It is a mutual gain to advertiser and customer alike. Please patronize the advertisers. Their patronage of HERBERTIA has been one of the factors that made the Society a reality. Do not postpone the matter — write to the advertisers now.

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THE AMERICAN AMARYLLIS SOCIETY

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ERRATA

YEAR BOOK AMERICAN AMARYLLIS SOCIETY, 1934

[HERBERTIA, VOL. 1, 1934]

- Page 15; line 21 from bottom, for "Alexander" read "Arthington."
- Page 47; second column, line 28, for "*Daones*" read "*Doanes*."
- Page 61; line 25 from bottom, for "of" read "or."
- Page 82; line 11 from bottom, for "William" read "William."
- Page 87; line 11 from bottom, after the words "They should" insert
the word "not."

YEAR BOOK AMERICAN AMARYLLIS SOCIETY, 1935

[HERBERTIA, VOL. 2, 1935]

- Page 85; second column, line 7 from top, for "*entrerrian*" read
"*entrerriana*."
- Page 112; line 11 from bottom, for "formation" read "information."

HERBERTIA, VOL. 3, 1936

- Page 68; under "Amموcharis," the 3rd. species, for "*Traveliana*"
read "*Taveliana*."
- Page 96; add legend "*Amaryllis reticulata* var. *striatifolia*" at bottom
of Plate.

HERBERTIA, VOL. 4, 1937

- Page 22; delete "azaleas, camellias" at the beginning of 15th. line
from top (text).
- Page 24; 2nd. column of table, 9th. entry from top, for "*C. angustifolium*"
read "*C. angustifolium*."
- Page 63; 3rd. line from top, for "*Institute*" read "*Institution*."
- Page 63; 13th. line from top (text), for "are" read "is."

- Page 63; 14th. line from top (text), for "most" read "more."
 Page 64; 17th. line from bottom (text), for "immorality" read "immortality."
 Page 79; 2nd. and 3rd. lines from top (text), delete "illustrated in Plate 48."
 Page 157; Plate 66, credit line, for "Max Hoeber" read "Max Loebner."
 Page 161; 2nd. line from top (text), for "Plate 56" read "Plate 60."
 Page 177; 1st. line of table, following "GILLIESIEAE" insert "0" under "No. of species," and insert "—" under "Basic. Chrom. no." and "Range (2n.)"
 Page 177; 7th. line of table, for "GILLIESIEAE" read "GALANTHEAE," and delete "O" and two "—" following.
 Page 189; 2nd. line from top (text), for "seeding" read "seeing."
 Page 206; Plate 76, for Figs. "8a" and "8b" read "8" and "9" respectively.

HERBERTIA, VOL. 5, 1938

- Page 7; 10th. line from bottom, for "Sept. 7" read "Aug. 7."
 Page 16; 4th. line from bottom, delete "only."
 Page 18; 9th. line from top, after "his son" delete the rest of the sentence and read "and since that day he entrusted to him the leadership of the firm in full confidence."
 Page 21; 13th. line from bottom, delete "Most of them bear names given by the firm" and substitute "To most of them the firm's authority as raiser is added."
 Page 26; 7th. and 8th. lines from top, for "Duc van Tol" read "late."
 Page 39; 17th. line from top, for "autoocracy" read "autarcy."
 Page 43; 4th. line from top; delete "try" and insert "conserve and."
 Page 82; 5th. line from top, for "amaryllis" read "amaryllids."
 Page 112; 10th. line from top, for "Andronecium" read "Androecium."
 Page 113; 17th. line from bottom, for "tepels" read "tepals."
 Page 115; 1st. and 2nd. lines from top, for "35" read "38" in each case. 5th. and 8th. lines from top, for "34" read "37" in each case.
 Page 118; last line bottom of page, change "28" before "*viridiflora*" to "27," and in place of "29. *tucumana*" read "30. *Haywardii*."
 Page 121; 14th. line from bottom, for "1943" read "1843." 15th. line from bottom, for "*vicolor*" read "*bicolor*."
 Page 123; 4th. line from top, for "Peoppig" read "Poeppig."
 Page 124; 24th. line from top, for "*ambiqum*" read "*ambiquum*."
 Page 128; 26th. line from bottom, for "*equistris*" read "*equestris*." 29th. line from bottom, delete "Leopoldia."
 Page 131; 2nd. line from bottom, foot-note 2, for "*breviflora*" read "*reticulata*."
 Page 136; 5th. line of text from top, for "*Eurora*" read "*Europa*."
 Page 167; title at top of page, for "STENOPETATA" read "STENOPETALA." 17th. and 18th. lines from top, for "*stenopetata*" read "*stenopetala*."

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HAMILTON P. TRAUB

SALINAS, CALIFORNIA

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