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DEDICATED TO

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INTRODUCTION

It is a signal honour, yet one not undeserved, that this volume of Herbertia should be dedicated to the Amaryllidaceae of Southern Africa. From the earliest days of botanical exploration at the Cape of Good Hope, more than 250 years ago, South African Amaryllidaceae have been among the foremost favourites in cultivation oversea. That they have made notable contributions to horticulture is obvious from their sustained popularity.

Although few of the South African species approach the true *Amaryllis (Hippeastrum)* in size of flowers, what the majority lack in this respect, they amply make up in artistic effect. The genus *Nerine* soon came into prominence by reason of the outstanding species *Nerine sarniensis,* which was one of the first to meet the collectors eye on the Cape Peninsula. *Callicore rosea* Link, the misnamed Cape "Belladonna Lily", and *Crinum longifolium* Thunb., were also early in cultivation in Holland and elsewhere. Later various species of *Haemanthus* and *Cyrtanthus* and *Vallota speciosa* D. & S. "George Lily" etc., began to find a permanent place in European gardens, until today there can be few countries in which South African Amaryllidaceae are not represented in cultivation.

Evidence of appreciation of the family in South Africa is not lacking, but unlike many oversea gardeners, few local gardeners have devoted serious attention to the fascinating study of hybridisation. It is confidently anticipated that time will show considerable advance in this direction, encouraged by the valuable information contained in Herbertia.

This is not the first volume of Herbertia in which South African Amaryllidaceae have been prominently featured. In the preface to volume 3 (1936) it was observed by the editor that "Messrs. Dyer and Compton in South Africa are opening up a wonderland of Amaryllid species". In that volume the former botanist contributed an article entitled "An Introduction to the South African Amaryllidaceae", while the latter gave a systematic list of the "Amaryllidaceae Native in the Union of South Africa". Several short articles on various South African species have appeared in the two subsequent volumes.

The dedication of this volume of Herbertia to the Amaryllidaceae of Southern Africa will undoubtedly stimulate greater interest in our wonderfully rich flora. In popularising Amaryllidaceae throughout the world, the American Amaryllis Society is to be congratulated on its broad vision and enterprise.

(Signed) W. R. Collins

Minister of Agriculture and Forestry,
Union of South Africa

Pretoria,
5. 5. 1939.

INLEIDING

Dit is 'n besonder, dog nie onverdiende eer dat hierdie boekdeel van Herbertia aan die Amaryllidaceae van Suidelike Afrika opgedra is. Vanaf die vroegste tyd van plantkundige ondersoek aan die Kaap die Goeie Hoop, meer as 250 jaar gelede, is die Suid-Afrikaanse Amaryllidaceae onder die mees gewilde plante wat in die buiteland gekweek word. Die feit dat hulle merkwaardige bydraes tot tuinbou gelewer het, blyk uti hul voortdurende gewildheid.

Hoewel min van die Suid-Afrikaanse soorte ten opsigte van die grootte van die blom met die egte *Amaryllis (Hippeastrum)* vergelyk kan word, vergoed die kunsvolle vertoning wat die meeste van hulle maak, vir tekortkoming in hierdie opsig. Die geslag *Nerine* het gou bekend geraak as gevolg van die mooi soort *Nerine sarniensis,* wat een van die eerste plante was waarop die oog van die versamelaar in die Kaapse Skiereiland geval het. *Callicore rosea* Link, die verkeerd genoemde Kaapse "Belladonnalelie", en *Crinum longifolium Thunb.,* is ook in Holland en elders gekweek. Later het verskillende soorte van *Haemanthus* en *Cyrtanthus* en *Vallota speciosa* D. & S. "Georgelelie" ens, 'n blywende plek in Europese tuine begin inneem, totdat daar vandag seker min lande is waar die Suid-Afrikaanse Amaryllidaceae nie gekweek word nie.

Daar is geen gebrek aan blyke van waardering van hierdie familie in Suid-Afrika nie, maar, in teenstelling met baie tuiniers in die buiteland, bestee min plaaslike tuiniers ernstige aandag aan die boeiende studie van kruising.

Ons vertrou dat daar met verloop van tyd heelwat vordering in hierdie rigting gemaak sal word, gedeeltelik as gevolg van die waardevolle inligting wat in Herbertia vervat is.

Dit is nie die eerste boekdeel van Herbertia waarin Suid-Afrikaanse Amaryllidaceae op die voorgrond gebring word nie. In die voorwoord van boekdeel 3 (1936) merk die redakteur op dat mnre. Dyer en Compton in Suid-Afrika 'n worderland van Amaryllidaceae onder die aandag bring. In dié boekdeel het eersgenoemde plantkundige 'n artikel getiteld "An Introduction to the South African Amaryllidaceae", bygedra, terwyl laasgenoemde 'n stelselmatige lys van die Amaryllidaceae wat in die Unie van Suid-Afrika inheems is, gegee het. Etlike kort artikels oor verskillende Suid-Afrikaanse soorte het in twee latere boekdele verskyn.

Die opdraging van hierdie boekdeel van Herbertia aan die Amaryllidaceae van Suidelike Afrika sal ongetwyfeld groter belangstelling in ons wonderskone flora opwek. Ons moet die "American Amaryllis Society" gelukwens met sy wye insig en ondernemingsgees, wat Amaryllidaceae dwarsdeur die wêreld gewild gemaak het.

W. R. Collins,

Minister Van Landbou en Bosbou,
Unie Van Suid-Afrika

Pretoria,
5. 5. 1939.

PREFACE

South Africa will forever be closer to us thanks to the splendid cooperation of a distinguished group of men and women of the Union—W. R. Collins, Dr. R. A. Dyer, Mrs. Bolus, Prof. R. H. Compton, Frances M. Leighton, Winsome F. Barker, R. H. Marloth, E. P. Phillips, L. B. Creasey, I. C. Verdoorn, Edith L. Stephens, G. Milne-Redhead, Cythna Letty, Gladys I. Blackbeard, K. C. Stanford, John Martley and Mrs. J. W. Archbell. They have all wholeheartedly given effort and time, and they have without doubt made this, the South African Edition, one of the most outstanding issues of Herbertia. To all of them we send our heartfelt thanks for this wonderful demonstration of international good will. Dr. Dyer refers to the article by Gladys I. Blackbeard, and the work of John Martley, Mrs. Archbell and others in the "Foreword" immediately following. In this brief Preface we can no more than mention the others.

Miss Cythna Letty contributes the beautiful cover design featuring Cyrtanthus Tuckii var. transvaalensis. This portrays the highly decorative value of Cyrtanthus, and will be an inspiration to all.

The reader will linger long over the valuable articles by Frances M. Leighton on the history of botanical exploration for amaryllids in South Africa, the distribution of amaryllids as related to rainfall, and the review of the important Genus Agapanthus that has been so long neglected.

Dr. Dyer contributes the very valuable revision of Cyrtanthus, the most important Genus among the amaryllids of South Africa in number of species, and possibly also from a horticultural standpoint, especially when we consider the great possibilities for the hybridizer. The many Cyrtanthus enthusiasts in America will welcome this excellent review. The great wealth of line drawings is especially noteworthy for quality.

Miss Winsome F. Barker has favored us with the valuable summary of amaryllids discovered in South Africa since 1888.

After reading Edith L. Stephens' article on Gethyllis, there will be hardly a member of the Society who will rest until he or she has tried this fascinating subject in the garden, or under pot culture.

Other excellent articles are furnished by J. B. Creasey, K. C. Stanford, I. C. Verdoorn, E. P. Phillips, John Martley, G. Milne-Redhead, and Mrs. Archbell.

In addition to the valuable contributions from South Africa, there is a wealth of material from members in other parts of the world and at home. We take a glance at amaryllid culture under glass in Denmark. Jan de Graaff has written several stimulating articles on narcissi—shows, varieties, mechanization of the industry, plant nutrition, and forcing. Col. Steichen gives us a much needed review of the R. H. S. Color Chart. Dr. Hume's article on the "Zephyranthes of the West Indies" is the first of an important series.

Dr. Hutchinson introduces us to the entirely neglected *Gilliesieae*, including three of his inimitable line drawings that we will cherish always. Although we are already greatly in debt to him for his arrangement of the amaryllids, we are now still more in the red to Sir Arthur W. Hill, Director of Kew, and Dr. Hutchinson, for this very great favor. We trust that some of the members in South America will find it possible

to send ample herbarium material of the *Gilliesieae* to Kew as a partial repayment.

The daylily is receiving more and more attention as the movement for their popularization gains momentum. Col. Steichen presents a report of the Daylily Committee that shows progress. Dr. Steward, in China, tells of the discovery of *Hemerocallis fulva rosea,* and *H. multiflora.* These were originally sent to the New York Botanical Garden, and are revolutionizing the breeding of this plant. Mr. Kelso again favors us with daylily ratings for garden value; Dr. Stout continues his list of newly named daylilies, and Dr. Leonian shares with us his adventures in breeding red daylilies. Mr. Leach writes on the culture of daylilies in California. In the next issue of Herbertia we plan to increase the space devoted to daylilies, and we ask your cooperation in sending in articles on all phases of daylily culture. One article has already been received—Mrs. Dewey presents a review of the breeding work with daylilies carried on by Mrs. Nesmith. Similar articles about the work of all the younger daylily breeders are urgently solicited.

The reader will be interested in the articles on cytology by Dr. Flory. It is this kind of research that will serve as a sound foundation for further advances. We take this opportunity of expressing the gratitude of the Society to Dr. Flory and the Texas Agricultural Experiment Station.

Since the last issue of Herbertia, Sealy has suggested the conservation of the *invalid* genus name, *Hippeastrum!* The members will want to read Dr. Uphof's critical review of Sealy's paper. In the previous issue of Herbertia, Dr. Uphof showed that *Amaryllis belladonna* is the *valid* name for an American amaryllid because Linnaeus indicated plainly in the first edition of Species Plantarum, 1753, the foundation of the nomenclature of vascular plants, what he considered as the type-illustration of this American amaryllid. Dr. Uphof shows in this issue that common usage upholds this method of typifying Linnean species; that there was no confusion about this matter as early as 1758, and that it was only after the 18th. Century that the subject was befuddled by one or two individuals. The reader can readily perceive the undesirability of validating plant names by means of "blank" specimens and the use of circumstantial evidence unlimited. Dr. Uphof points out that "no argument can ever be drawn from silence". There is a time and place for everything. Attempts of this kind may be appropriate in such disciplines as archeology where speculation is necessary in some cases to have any interpretation at all, but certainly is out of place in establishing plant names when Linnaeus himself indicated unmistakable type-illustrations.

Volume 7, Herbertia, 1940, will be dedicated to Latin America. The main feature will be the amaryllids of Mexico, Central America, the West Indies, and South America. Some of the material has already been received. Mr. Rice has sent in most excellent "portraits" of *Childanthus* and *Sprekelia.* Dr. Uphof contributes an article on Alstroemerias, and C. V. Morton favors us with "A Checklist of Amaryllidaceae, Tribe Allieae, in the United States".

Hamilton P. Traub

New York City,
Sept. 9, 1939

FOREWORD

When plans were originally being laid for the dedication of this volume to the Amaryllids of South Africa an ambitious "List of Contents" was proposed from the Editorial chair. Although all the "castles in the air" have not materialised, we in South Africa, hope that our contributions will be of some interest to the readers of *Herbertia*. When it is realized that the Union of South Africa covers an area of 472,550 square miles, in any square yard of which an amaryllid may be found, and that the total white population is only 2 million odd, of which about 1/6 is centered round the gold mining industry, it may not occasion great surprise that Amaryllid activity is meagre compared, for instance, with that in the United States of America. Added to this the natural modesty of most South Africans, my attempts to elicit information on such subjects as Hybridisation, Propagation, Harvesting, Storage and Forcing have not been very fruitful. The following is an extract from one reply to a circular letter: "All my work, well over 30 years, has been with the hybrids and all seedlings have been the result of recorded hand work, but I fear that I could write little that would be of interest to the public for whom Herbertia is printed". I wonder if this is so!

Some articles intended for this year's volume have passed through my hands and I should like to draw attention to the one by Miss G. Blackbeard on hybridisation with species of *Clivia*. As evidenced in 1935 Herbertia, workers in other countries are ahead of us in this work, for instance E. K. Cowlishaw in Australia and E. P. Zimmerman in California, both of whom have propagated remarkably fine hybrids. I have little doubt, however, that Miss Blackbeard's results will stimulate a desire for fuller information. *Clivia* hybrids have great possibilities and her pioneer work in South Africa with them will be appreciated by all and will encourage some to follow her example. Another interesting article is by Miss K. Stanford and anyone reading it will realize that she has an intimate knowledge and love for the indigenous amaryllids.

Interesting developments are taking place also in the garden of Mr. John Martley of Banhoek, Stellenbosch, who is already known to readers. He is building up a large collection of South African Monocotyledons in which Amaryllidaceae are a prominent feature. Hybridisation is a hobby at Banhoek which promises to yield profitable results as time goes on. One of the first fruits is a repetition of the cross between *Vallota speciosa (=V. purpurea)* and *Cyrtanthus sanguineus*. Mr. Martley mentions that there was an excessive endosperm in the seeds which burst out of the testa. If seed was stored it withered and died within two weeks or so, whereas that planted immediately after picking germinated without delay.

Messrs. Hurling and Neil, of Bonnie Vale in the Cape Province, pay more attention to South African succulents than to the amaryllids, nevertheless, these growers have oversea connections in amaryllid dealings. Several interesting species are indigenous in their area. The bulb of *Brunsvigia Josephinae* is said to attain an enormous size, reaching a circumference of about 26 inches and growing mostly above ground.

Messrs. de Mole and Kisch who have a floral farm in the neighbourhood of Pietermaritzburg, Natal, grow only those amaryllid species which "need no special attention".

In the introduction to my review of the genus *Cyrtanthus,* published in this volume, I made mention of the popularity in cultivation of *Cyrtanthus Mackenii* (Ifafa Lily). One of the successful growers is Mrs. J. Archbell of Willow Glen, Umkomaas, Natal. She has Ifafa Lilies ranging in colour "from pure white to deep red, exquisite peach pink, yellow and many other shades". The common name may here cover more than one of our so called species. Mrs. Archbell finds that species of *Cyrtanthus* generally, respond well in a mixture of sandy loam, leaf mould and a little wood ash and soot. This, however, does not apply to such species as *C. contractus,* one of the "fire lilies" previously incorrectly referred to under the name *C. angustifolius,* with which growers have had little success. The bulbs more often than not either rot or dwindle after being brought into cultivation.

Agapanthus, a comparatively recent acquisition to the Amaryllids, which is featured elsewhere in this Herbertia, enjoys a great measure of popularity in gardens. Without special attention it makes an attractive evergreen border plant and flowers freely. In the related genus *Tulbaghia* there is an attractive species, which has a very pleasant perfume instead of the strong garlic smell usually associated with species of this genus. In some gardens it has been cultivated under the name *T. fragrans** and in others as *T. pulchella,* but the former is the first valid name for the species. *T. fragrans* was discovered not many years ago in the mountains of the eastern Transvaal and within very recent times has spread extensively in South African gardens. It flowers freely in winter provided severe frosts are not experienced. It is destined to become a particular favourite in horticulture.

The genus *Ammocharis* is often referred to in accounts of Amaryllids from South Africa and the specific epithet most frequently used is *A. falcata.* Researches carried out at Kew by Mr. Milne-Redhead and Dr. H. G. Schweickerdt have made it necessary to make certain changes in the present accepted classification, including the creation of a new genus. The ms. of the paper embodying the results should go to press shortly and until it appears in print further comment would be inopportune.

In viewing this volume of Herbertia dedicated to the Amaryllidaceae of Southern Africa, contributions in earlier numbers should not be overlooked. In 1936 Professor Compton gave a complete list of "Amaryllidaceae in the Union of South Africa" and in the same year the present writer contributed an article "An Introduction to the South African Amaryllidaceae". There have been several short articles by various authors dealing with *Cyrtanthus, Nerine, Haemanthus, Clivia* and other popular genera. One should not neglect to refresh ones memory with

(Continued on bottom page 13)

***T. fragrans** Verdoorn, 1931 (=**T. pulchella** Barnes non Avé-Lallemant; **T. Davisii** Gray, 1938).

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FIGURES

ERRATA

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 "autocracy" 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 "*ambigum*" read "*ambiguum*."
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*."

ERRATUM

HERBERTIA, VOL. 3, 1936

Page 68; under "*Ammocharis*," the 3rd. species, for "*Traveliana*" read "*Taveliana*."

AGE OF THE LATE GEORGE YELD—A CORRECTION

The Gardeners' Chronicle, April 9, 1938, p. 259, contains an obituary notice in which it is stated that Mr. George Yeld died April 2, 1938 at the age of *ninety-five*. "In Memoriam—George Yeld," by A. B. Stout, HERBERTIA, Vol. 5, p. 61, 1938 repeats the statement noted above. *The Gardeners' Chronicle*, August 10, 1935, p. 99, gave Mr. Yeld's age, at that time, as *ninety-three*. The issue of the *Gardeners' Chronicle* of March 17, 1935, p. 130, stated this to be an error and said that Mr. Yeld celebrated his *ninetieth* birthday in March, 1935. Mr. Yeld's age, therefore, at his death on April 2, 1938, was *ninety-three* years and a few days —depending on the date of his birthday in March.

—*A. B. Stout.*

INSTRUCTIONS FOR CONTRIBUTORS

Year Book Correspondence. Correspondence regarding articles and illustrations for **Herbertia,** the Year Book of the American Amaryllis Society, is cordially invited. The annual news-letter or articles from Corresponding Members and Regional Chairmen of Trial Collections should be forwarded, if at all possible, by April of each year, or earlier, depending upon the distance, so as to reach the editor in ample time for publication.

Manuscripts should be **typewritten** if at all possible and **double spaced;** photographs should have the **name of the owner** to whom credit should be given, and the **name and size of the subject,** written on the back.

(FOREWORD—DYER; *continued from page* 7)

these accounts, for each one in its way is a contribution to the knowledge of South African Amaryllidaceae.

From a vast natural store South African amaryllids have provided many valuable additions to horticulture. More await discovery and *Herbertia* may be looked upon as an insurance against the cessation of these notable contributions.

R. A. Dyer

Division of Plant Industry,
Department of Agriculture and Forestry,
Pretoria, Union of South Africa,
July 26, 1939.

This volume of Herbertia
is dedicated to the Union of South Africa,
particularly to all the lovers of nature,
from the 17th. Century to the present time,
who interested, or interest, themselves in
the myriads of amaryllids of the veld.

Bolus Herbarium

See page 23

Dr. E. E. Galpin, F. L. S.

Plate 124

THE HISTORY OF BOTANICAL EXPLORATION FOR AMARYLLIDS IN SOUTH AFRICA

FRANCES M. LEIGHTON,

Bolus Herbarium, University of Cape Town

This account will be rather in the nature of a general review of botanical exploration with special reference to Amaryllids since there have never been any collectors who gave this group their undivided attention.

The Cape of Good Hope was discovered towards the end of the fifteenth century by the Portuguese in quest of a sea route to the East. During the sixteenth and early seventeenth centuries, Table Bay was a port of call for the boats of the Dutch East India Company plying between Europe and the East in the spice trade. These vessels put into the bay for supplies of fresh water and for meat which they obtained by barter with the Hottentots who then inhabited the region.

Without doubt these early visitors took back with them some of the curious plants which they found growing round the shores of Table Bay. The first record of South African plants in literature as far as the writer knows, is in Johannes Bodaeus a Stapel's edition of Theophrastus published in 1644. The plants referred to in this book were collected by Justus Huernius, a minister of religion travelling to the Dutch East Indies. There are two figures of *Haemanthus rotundifolius* Gawl. which grows quite commonly round Cape Town, whether in flower or in leaf, could not fail to attract the attention of a stranger. (See Fig. 35.) Its massive bulb could endure many months of journeying over the sea.

In 1652 the Dutch East India Company decided to establish a provisioning station on the shores of Table Bay where vegetables could be grown, and fresh meat supplied to their ships on the long voyage to the East Indies. From this time onwards South African plants were taken back to the gardens of Holland which were then among the foremost in Europe. It is in the records of the gardens at Leiden and at Amsterdam that most of the early references to South African plants are found—in such works as Van Royen's Catalogue of the Leyden Botanical Garden and Commelin's Hortus Amstelodamensis. It is recorded that *Callicore rosea* was grown by Van Royen who sent bulbs to England in 1754. Later it was re-introduced by Sir Joseph Banks who collected it at the Cape when he called there on his return from the East Indies.

Paul Hermann, a botanist and physician who visited the Cape on his way to Ceylon sent specimens back to Holland which were lost when the ship carrying them was captured by British cruisers off St. Helena. Later, Hermann became a Professor at Leyden and his Paradisus Batavus (1698) contained many references to Cape plants but he does not state that he collected them himself.

During the Governorship of Simon van der Stel and that of his son Willem Adrian, expeditions were made into the interior and many new plants were found. The account of Simon van der Stel's journey to the copper mines of Namaqualand does not contain any figures of amaryllids

although he must have seen many of the unusual *Haemanthus* and *Gethyllis* which occur in the territory through which he passed. In some of Caspar Commelin's works he mentions receiving seeds from Willem Adrian van der Stel in 1700.

Since the chief object of establishing a settlement at the Cape was to provide fresh food for the scurvy-ridden crews of the East Indiamen, it was essential that, amongst the earliest settlers from Holland, there should be competent gardeners. Such men were Hartog, Oldenland and Auge who sent back the botanical rarities often figured in the works of Burmann and Boerhaave. In Burmann's Prodromus there are figures of *Agapanthus africanus* (L.). Hoffmaq and *Ammocharis falcata* Herb. Auge went on a collecting trip to Namaqualand in 1761 and later accompanied Thunberg and Masson on several expeditions.

Ryk Tulbagh was Governor at the Cape from 1751-1771 and during this time he corresponded with Linnaeus and sent him many specimens. Among these was the plant which Linnaeus called *Tulbaghia* and he says in a letter ". . . . . a drawing of the *Tulbaghia* which plant will, I trust, remain a lasting monument to Your Honour, among botanists, as long as the vegetable tribe shall endure . . . . . I wish, my honoured friend, that you would favour me with a bulb or two of your *Tulbaghia*, that it may be propagated and dispersed throughout the gardens of Europe so as to render your name familiar to all lovers of rare and beautiful plants." Linnaeus concludes the letter with the following—"May you fully realise your own fortunate lot, not only in being permitted by the Supreme Disposer of events to inhabit, but also to enjoy the sovereign control of that paradise upon earth, the Cape of Good Hope, which the Beneficent Creator has enriched with his choicest wonders. Certainly, if I were at liberty to change my fortune for that of Alexander the Great or of Solomon, Croesus, or Tulbagh I should without hesitation prefer the latter."

The first of the great botanical collectors who visited South Africa was Thunberg. He was a pupil of Linnaeus at Upsala and came to the Cape, owing to his limited financial resources, as an Assistant-Surgeon on one of the East Indiamen. He arrived in 1772 and spent three years travelling about the country in search of botanical specimens. He says of himself: "there never travelled a poorer lover of flowers than I, yet never one more ardent".

Thunberg made three extensive journeys into the interior (shown in the accompanying map, Plate 126), and collected many specimens representing, *inter alia*, the following genera—*Haemanthus, Brunsvigia, Buphane, Crinum, Cyrtanthus, Strumaria, Agapanthus, Tulbaghia* and *Gethyllis*. To the last mentioned genus he makes the following reference in his Travels . . . "Kukumakranka *(Gethyllis)* is the name given to the legumen or pod of a plant that grew at this time among the sand hills near the town, without either leaves or flowers. This pod was of the length of one's finger, somewhat wider at the top than at the bottom, had a pleasant smell and was held in great esteem by the ladies. The smell of it resembled in some measure that of strawberries and filled the whole room". Thunberg enumerates four species of *Gethyllis* in his Prodromus.

Contemporary with Thunberg at the Cape was Francis Masson, a gardener from the Royal Gardens at Kew, sent out by William Aiton to collect seeds and plants. Sir Joseph Banks had been so impressed with the richness of the Cape Flora that he urged the King (George III) to send out a man to obtain specimens for the Royal Gardens. Masson came to the Cape in 1772 and accompanied Thunberg on two journeys. He collected a large number of bulbous plants as is shown in the Hortus Kewensis published in 1789. This work shows that, in 1774, he intro-

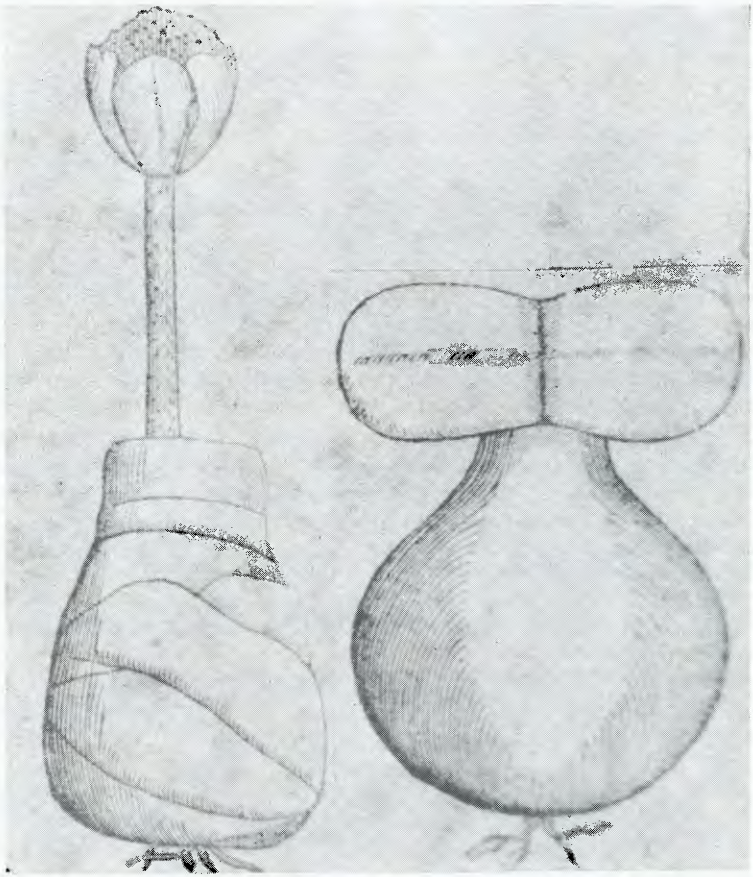


Fig. 35. Haemanthus rotundifolius Gawl. from Johannes Bodaeus a Stapel's Theophrastus, 1644.

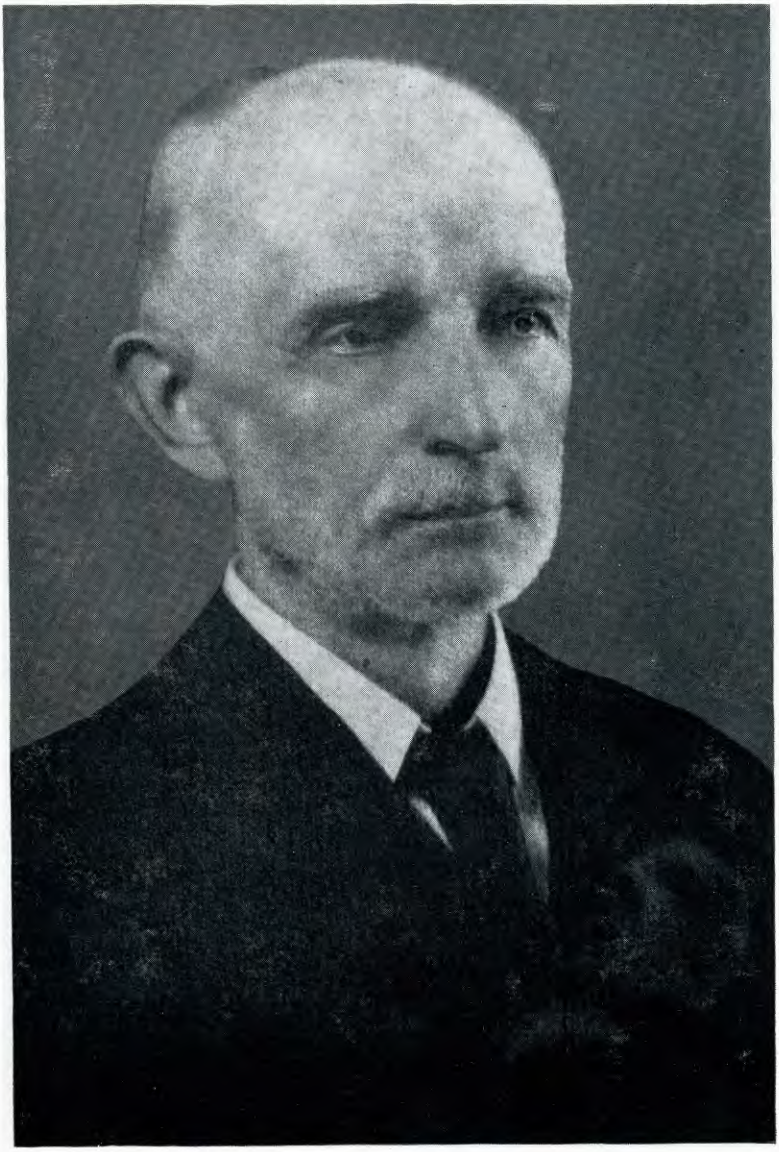
duced the following amaryllids into the Royal Gardens at Kew—*Haemanthus pubescens* L. f., *Buphane ciliaris* Herb. *(Haemanthus ciliaris* Linn.), *Buphane disticha* Herb. *(Haemanthus disticha* L. f.), *Carpolyza spiralis* Salisb. *(Haemanthus spiralis* L. f.), *Hessea filifolia* Benth. *(Leucojum strumosum* Thunb.) *Tulbaghia alliacea* L. f. *Cyrtanthus angustifolius* Ait. *Cyrtanthus obliquus* Ait. *Vallota purpurea* Herb. *(Amaryllis purpurea* Ait.) *Ammocharis falcata* Herb. *Gethyllis villosa* L. f., *Gethyllis ciliaris* L. f.

Masson's name is perpetuated in the Liliaceous genus *Massonia*. There is some doubt whether the drawings which were executed at the Cape, of Stapelias and other plants were the work of Masson or that of a soldier of the garrison. Among these were some drawings of *Gethyllis*, one of which, *G. latifolia* Mass. ex Baker, has never been collected in the field since. The drawings of this genus were published by Baker in the Journal of Botany (1885) Vol. XXIII when he revised the genus *Gethyllis*.

Francis Masson returned to England and was sent to the Azores to collect. After visiting Portugal and Tangiers he again came to the Cape of Good Hope in 1786. This time he was strictly enjoined by Sir Joseph Banks to collect in the vicinity of False Bay and not to make costly excursions into the interior. Masson left the Cape in 1795 with his precious collections—"lest he should, in an unexpected invasion, lose the collection of living plants made during ten years residence here". The Cape was taken over by the British in 1795 to protect it against the French invasion which Masson had feared. He was later sent to North America and died in Montreal in 1805 at the age of 64.

Between the years 1777 and 1779 Lieut. William Paterson made four journeys into the interior. He went east almost as far as the Keiskamma River (long. 27E) and in the North he crossed the Orange River. Paterson mentions numerous strange plants in the account of his travels, among them *Buphane disticha* Herb. *(Amaryllis disticha)* which he found growing in large numbers in the Roggeveld. He says "Horned cattle are exposed to danger from the *Amaryllis disticha* or Poison bulb, with which the country is covered; they are extremely fond of its leaves which generally prove fatal". Under the figure of the plant he states that the bulb is used for poisoning arrows, and in an appendix he writes that this is known as "Mad Poison" from the effects usually produced on the animals wounded by weapons impregnated with it. The natives prepared it by slicing the bulbs at the time when the leaves were being produced and keeping the fluid obtained in the sun until it was of the consistency of gum.

In 1810 William J. Burchell arrived at the Cape. Burchell's Travels, with their wealth of information and anecdote and their copious illustrations, are perhaps the most interesting and delightful of all the records made by early travellers in South Africa. The route which Burchell followed is shown approximately in the accompanying map (Plate 126). In the map which he himself drew to illustrate his travels we find evidence all the way of Burchell the naturalist. His stations, when there was no name already attached, bear names such as these—Sugarbird Station, Cuckoo Station, Toad Station, Giraffe Station, Royena Halt. He went east to the Fish River and north into Bechuanaland and in the course of his travels collected many amaryllids. Burchell writes thus of *Amaryllis lucida (Nerine lucida* Herb.) which he found in Griqualand West—"A handsome and entirely new species of *Amaryllis* profusely covered a space of ground of half a mile in extent"—again referring to the same species he says ". . . we drove over an extensive field of thousands of the beautiful *Amaryllis lucida* in full bloom



Raimund H. Marloth, Nelspruit See page 23

Dr. Rudolf Marloth

Plate 125

which gave the whole plain within view, the delightful appearance of a gay flower garden''. He writes of the same scene 10 days later—''I looked now in vain for that rosy flower garden which decorated these plains on our former visit to the Asbestos Mountains. It had totally disappeared; and so astonishingly, and almost incredibly rapid is the progress of vegetation in these regions, with respect to bulbous plants, that in the short space of ten days, the beautiful lilies, then observed just coming into bloom, had completed their flowering, ripened their seed, the flower stems were dried up, and had parted from their roots and were nearly all blown away''.

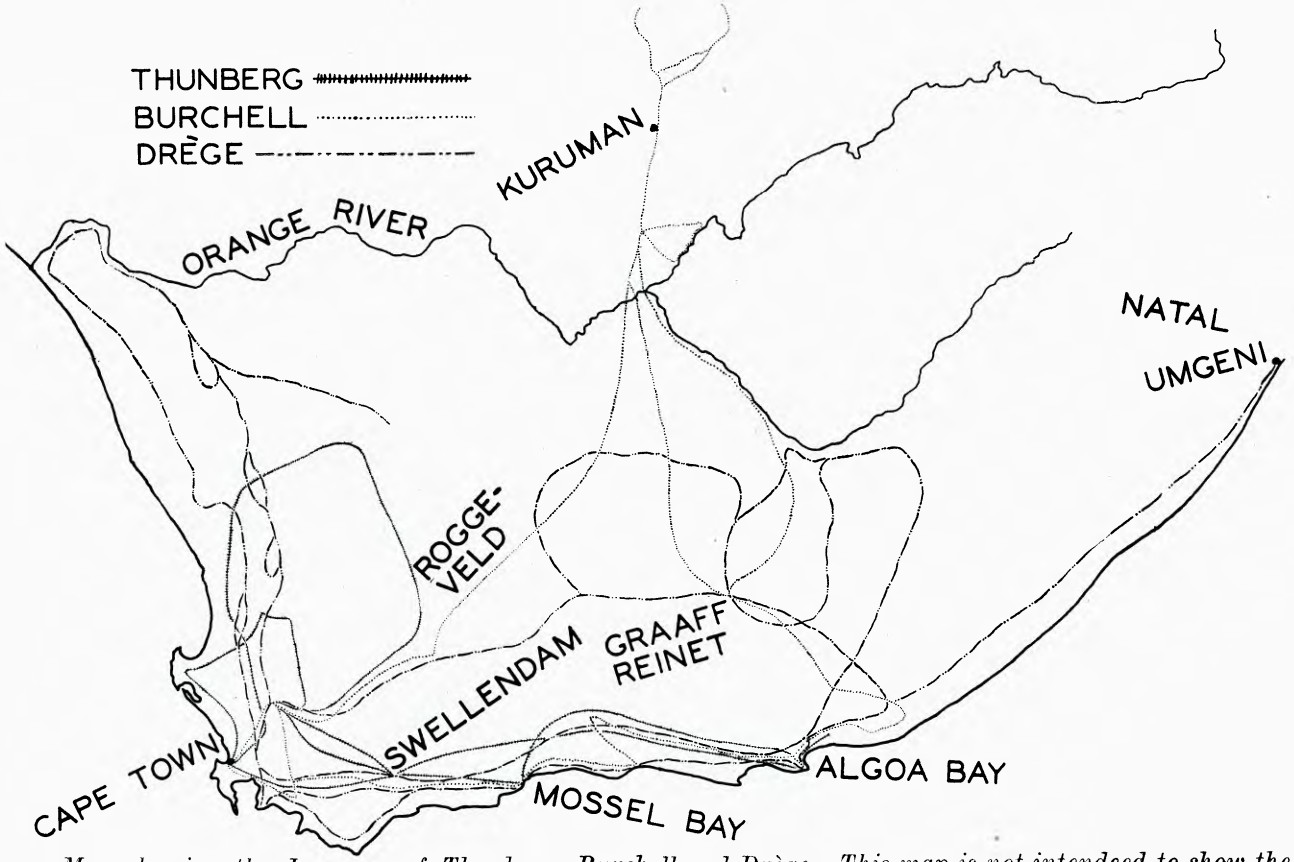
This quick growth after rain explains in some measure why some of the South African amaryllids are still imperfectly known. In writing of the Green Point Common Burchell gives another instance of this ephemeral character of the vegetation. He says, ''The effect of the late rains was surprising, not six weeks before, the herbage seemed entirely parched up; vegetation had disappeared and the plain looked like a barren waste; but the sterile plain was now changed to a verdant field and myriads of gay flowers had started up out of the earth. Those who had seen this spot only in summer, would never suppose that a soil so arid and bare contained such an astonishing quantity and such a great variety of bulbous roots. Blossoms of every colour and every hue were at this time expanded to the genial warmth of the sun, and in such profusion that, from a little distance, some particular parts of the plain appeared as if painted red, others white, and others yellow. It is chiefly to the beautiful tribe of *Oxalis* that these enlivening effects are at this season attributable but not less so to two other extremely small and delicate plants *(Ixia minuta and Carpolyza spiralis (Strumaria Spiralis)* which in countless multitudes whiten the soil.''

Even today although Green Point is in the midst of a populous suburban area it still exhibits these phenomena as far as the carpet vegetation is concerned. Most of the larger plants which could be plucked have dwindled and disappeared.

After Burchell came Ecklon and Zeyher and later Drège. These zealous and painstaking collectors were most aptly referred to by Professor MacOwan as ''the lynx-eyed trio''.

Charles Frederick Ecklon came to South Africa in 1822 as assistant to an apothecary. He was an ardent amateur botanist and after some years forsook his profession and attempted to make his living by selling collections of dried plants and other natural history specimens. He was joined in this venture by Karl Zeyher who had come to the Cape as a botanical collector in the same year as Ecklon. They made extensive journeys alone and together in search of rarities to send to Europe. Much could be written of their ups and downs—one of the collections which they sent to Europe was destroyed in a warehouse fire, another was lost in a shipwreck, and for many they received little or no recompense.

These men both died in extreme poverty in Cape Town but today many herbaria are greatly enriched by the specimens which they collected.



Map showing the Journeys of Thunberg, Burchell and Drège. This map is not intendeed to show the exact routes taken but to give an idea of the extent of their travels.

In 1826 Johan Francis Drège arrived at the Cape. He ranks with Burchell as perhaps the most systematic and scientific collector of the early days of South African Botany. He collected in the South-Western parts of the Colony then later went inland and east as far as Graaff Reinet whence he returned by a more southerly route, via Albany, Uitenhage, the Langkloof and Swellendam to the Cape. He then undertook a journey into Namaqualand where he collected a vast amount of material including several *Gethyllis* and a *Crinum* on the banks of the Orange River—this was probably *Crinum longifolium*.

In 1831 Drège set out with Dr. Andrew Smith the Zoologist on an expedition to Delagoa Bay. Drège, however, went no further than Umgeni in Natal. From there he returned to Uitenhage and Albany, and later, travelled north through the districts of Queenstown and Aliwal North to the Orange River. Among the records of plants collected on this trip we find *Agapanthus, Tulbaghia, Brunsvigia, Strumaria, Cyrtanthus, Crinum* and *Haemanthus*.

Although not a collector or discoverer of amaryllids the name of William Henry Harvey cannot be omitted because of the stimulus given by his "Genera" to other botanists in the latter half of the nineteenth century. From 1835-1840 he held a position in the Treasury at the Cape and during this time he published the "Genera of South African Plants" and built up a large herbarium. In 1840 for health reasons he returned to his native Ireland and was made keeper of Trinity College Herbarium; later he became Professor of Botany at Trinity College and during this period, in collaboration with Dr. Wilhelm Sonder of Hamburg, he produced the first three volumes of the Flora Capensis.

After the publication of Harvey's "Genera" there came a group of men who were no longer merely collectors but who studied the botany of the country while they built up herbaria. These men were Bolus, MacOwan and Guthrie.

Harry Bolus came to South Africa in 1850 and the early period of his botanical activity was spent in and around Graaff Reinet and it was here that his friendship developed with Professor MacOwan who was then teaching at Somerset East. In 1874 Bolus came to Cape Town and joined his brother in business. The rich flora of the Cape at once claimed his interest and he began his special study of the orchids. He was actively engaged through all these years in building up his herbarium—the herbarium which today bears his name and is in the possession of the University of Cape Town.

His botanical excursions included journeys to Namaqualand, the Transvaal, Swaziland and as far afield as Delagoa Bay. He visited the eastern parts of the Colony, the Orange Free State and the Drakensberg Mountains. He collected many amaryllids—one of these, *Apodolirion Bolusii* was one of his early finds near Graaff Reinet. Practically all the South African genera of amaryllids are represented in the collections he made on these journeys, and in his systematic collection of the plants of the Cape Peninsula and its environs.

Contemporary with Bolus was Peter Macowan who came to South Africa as a school master in 1861. After teaching for a number of years, first at Grahamstown and then at Somerset East where he accumulated

an extensive herbarium, he was in 1881, appointed Director of the Cape Town Botanic Gardens and Curator of the Government Herbarium. MacOwan did not travel very much but he was the first to collect *Crinum MacOwani* in the Transkei and Griqualand East. This species is perhaps one of the most beautiful of our crinums and one which is frequently grown in gardens.

Among the professional collectors of this period was Rudolf Schlechter who came to the Cape about 1891. He travelled widely and collected many new plants as well as many which had not been seen since the days of the early travellers. He collected, *inter alia*, new species of *Cyrtanthus, Tulbaghia* and *Hessea*.

One of the first trained botanists to work on the South African flora was Dr. Rudolf Marloth (Plate 125)[1]. By profession he was an analytical chemist but his magnificent work on "The Flora of South Africa" indicates the wealth of botanical knowledge which he possessed. He published a number of papers on the physiology and morphology of South African plants as well as much work of a taxonomic character. In a paper on *Gethyllis* which appeared just before his death in 1931 he described three new species and gave an account of the morphology of the peculiar epidermal structures which many members of this genus possess. Marloth was an ardent mountaineer and a keen photographer of plants in their native habitats.

Among the present day botanists in South Africa Dr. E. E. Galpin F. L. S. (Plate 124)[2] has perhaps made the most substantial contributions from the collector's point of view. He has also published several lists of the flora of regions in which he has collected. Dr. Galpin has enriched the South African herbaria, and more especially the National Herbarium at Pretoria, with thousands of specimens of the African Flora including many amaryllids. One of his recent discoveries was *Crinum crispum* Phillips (Flowering Plants of South Africa pl. 532, 1934). His name has been given to species of *Cyrtanthus* and *Tulbaghia* which he was the first to collect. Dr. Galpin is now 81 years of age, and is still collecting for herbaria.

There have been numerous other botanists and collectors in South Africa who have played important roles in bringing to light many rare and beautiful plants but it is impossible to detail them here. Many of them have their names perpetuated in the plants which they discovered and a glance at the list published elsewhere in this journal will reveal their names.

There is still a great deal of work to be done on the amaryllids of South Africa both in field and herbarium. There is not a genus without undescribed species—many of the specimens are incomplete since the flowers and leaves appear at different seasons and, in such a large and sparsely populated country, it is not always possible for the collector to return to a locality to complete his material.

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[1]The photograph reproduced in Plate 125 is the property of Raimund H. Marloth, the son of the late Dr. Rudolph Marloth.

[2]The photograph reproduced in this Plate is the property of the Bolus Herbarium, and was kindly lent by Mrs. Bolus, the Curator.

South Africa has provided many beautiful garden subjects and not least among these rank the amaryllids—*Nerine, Callicore, Vallota, Crinum* and *Agapanthus*. Some of these genera still hold surprises for the horticulturist—the less well known species of *Nerine* for example are not sufficiently appreciated in gardens. The day of the botanical explorer is almost over in South Africa although new species are still to be discovered off the beaten track; much, however, needs to be done on the taxonomy of the family and there is a rich field for the horticulturist to explore.

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WHAT SOUTH AFRICA IS DOING TO POPULARIZE ITS NATIVE SPECIES OF AMARYLLIDACEAE

E. P. PHILLIPS, *Chief Botanist,*
Division of Plant Industry.
Dept. of Agri. & Forestry, Union of So. Africa, Pretoria.

The American Amaryllis Society has opened a new vista and brought within the view of flower lovers the possibilities of species of *Amaryllidaceae* in horticulture. As far as South Africa is concerned, the Society has re-stimulated the interest in the family which was shown in the gardens of England and the Continent when species from the Cape first found their way to Europe at the end of the seventeenth and beginning of the eighteenth century and many of which were figured in the older botanical publications of the day. In South Africa a large area extending from the Cape, through the coastal districts to Natal and parts of the Transvaal lends itself to gardening and as a whole South Africans are keen gardeners. While that is so, only a very small percentage pay any attention to native species and in most private gardens one will only find the common orthodox garden plants from Europe in cultivation.

The Division of Plant Industry, Pretoria, through the publication "The Flowering Plants of South Africa" has attempted to make the native species of plants better known.

The tribe *Amarylleae* of the family *Amaryllidaceae* is represented in South Africa by sixteen genera and over one hundred and thirty species. Twelve genera and over fifty species have been described and figured in colour in the "Flowering Plants." It is the hope of the Division that through this channel the horticultural possibilities of the native species of Amaryllids may become more widely known in South Africa.

See page 26

Prof. R. H. Compton, upper left; Frances M. Leighton, upper right; Winsome F. Barker, lower left; L. B. Creasey, lower right.

Plate 127

BIOGRAPHICAL SKETCHES

This section, devoted to biographical sketches and portraits of contemporary South Africans interested in amaryllids, is not as complete as it ought to be. For various reasons part of the material did not arrive on time. In one case, L. B. Creasey (See Plate 127), only the photograph was received. We hope to include in 1940 Herbertia the missing biographical material.—Ed.

Prof. R. H. Compton—a biographical sketch

Robert Harold Compton was born at Tewkesbury, England, on 6th August 1886, and was educated at Mill Hill School and Cambridge University. He was a College and University prizeman, took first classes in both parts of the Natural Sciences Tripos, with distinction in Botany, and became a research fellow of Gonville and Caius College and a University demonstrator in Botany. His interests were mainly in morphology, and anatomy on which he published several papers. In 1913 he went on a plant collecting expedition to New Caledonia, and thereafter turned his attention chiefly to plant systematics. In 1919 he went to South Africa as one of the Professors of Botany in the University of Cape Town, an appointment carrying with it the Directorship of the National Botanic Gardens. He has held this post ever since, and has devoted himself, apart from teaching and taxonomic work on the South African flora, mainly to the administration and development of the Gardens at Kirstenbosch and Whitehill.

Frances M. Leighton—a biographical sketch

Born in 1909 in King Williams Town, South Africa; obtained in 1929 the B. Sc. degree at Rhodes University College, Grahamstown; joined the staff of the Bolus Herbarium, University of Cape Town in 1931, and holds the position of third assistant; married Dr. William Edwyn Isaac, Plant Physiologist, Government Low Temperature Laboratory, Cape Town, in 1936; chief botanical interest lies in the taxonomy of the monocotyledons, especially the Genus *Ornithogalum (Liliaceae)* and *Agapanthus (Amaryllidaceae)*.

Winsome F. Barker—a biographical sketch

Born in South Africa; educated at Rhodes University College, Grahamstown; obtained the B. Sc. degree; joined staff of National Botanic Gardens, Kirstenbosch, as holder of the Edward Muspratt Solly Scholarship for 1929 and 1930; from 1931-July 1933, while stationed at Kirstenbosch, was employed by the Royal Botanic Gardens, Kew, making collections of herbarium specimens and living plants; was appointed Botanical Assistant at Kirstenbosch in 1933; chief botanical interest lies in the taxonomy of the petaloid monocotyledons, especially in *Nerine* and *Hessea*.

HERBERT MEDALISTS—1939

With the award of the Herbert Medal to five outstanding workers in the field of the *Amaryllidaceae* in 1939, the stage has been reached when over-due honors have been more or less taken care of, and in the future *not more than one* Herbert Medal will be awarded each year.

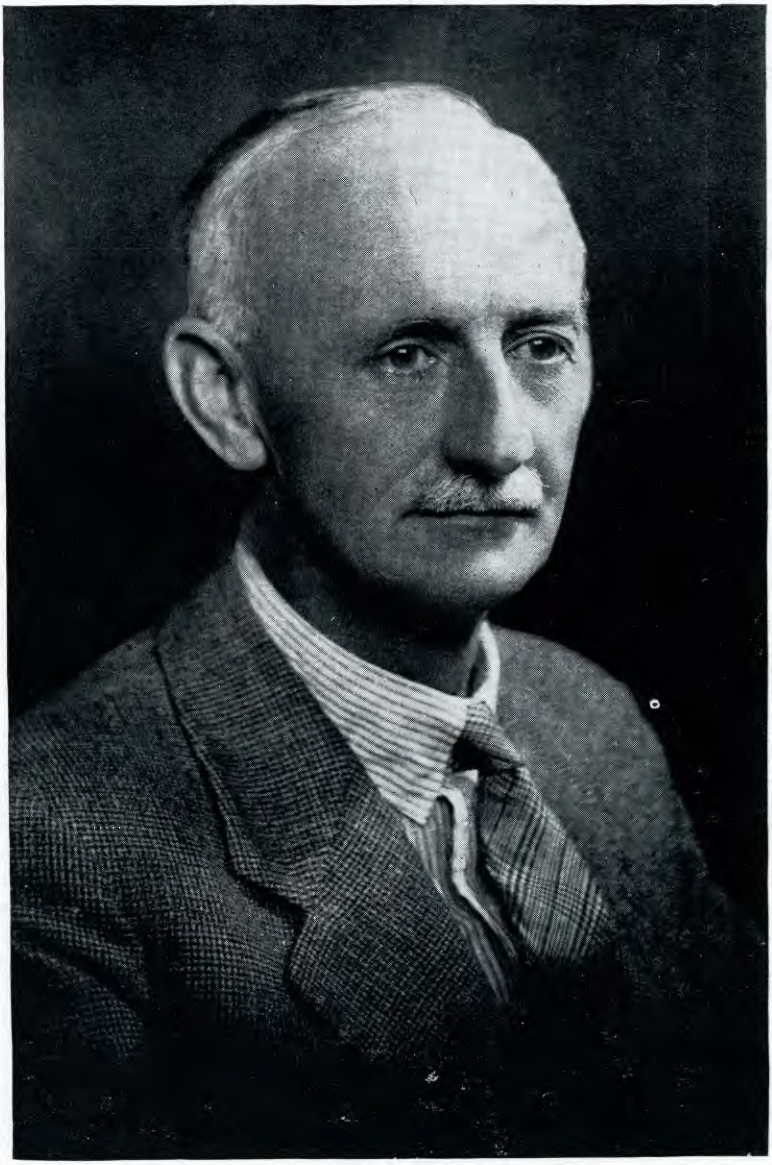
The class of 1939 is as illustrious as the preceding classes including the names Hutchinson (phylogeny of amaryllids), Stout (daylily breeding), Lancaster (origination of *Cooperanthes*), Purdy (introduction of *Brodiaea,* and *Allium* species), and Howard (origination of *Crinodonna Howardii* and hybrid amaryllis).

DR. J. HUTCHINSON—A BIOGRAPHICAL SKETCH

He was born on January 20th, 1884, and lived for the first twenty years of his life in his native county of Northumberland. There he attended schools and developed his early interest in Botany, winning distinction in the subject at school. For six years after leaving school he received his training in practical horticulture in gardens in Northumberland and came to Kew as a Student Gardener in 1904. His interest in the scientific side of horticulture was quickly recognized and he was selected to fill the post of Temporary Technical Assistant in the Herbarium the following year, a post he held until 1907 when he was promoted to be Assistant for India. This post he filled for two years and in 1909 he was appointed to the newly-created post of Assistant for Tropical Africa, a post he held with distinction from 1909 to 1915. He then reverted to Indian Botany and held the post of Assistant for India a second time from 1915 to 1919, relinquishing it on his appointment as a Botanist in the Herbarium on the permanent staff of the Royal Botanic Gardens, Kew. This appointment he held from July 1919 until April 1936, and during this time he devoted his studies to the African flora and also wrote his well-known books. It was during this period that he paid two collecting visits to South Africa.

His work on the South African flora and his contributions to Systematic Botany were very fittingly recognized by the University of St. Andrews, Scotland, when the Honorary Degree of Doctor of Laws was conferred upon him on the same day (Oct. 17, 1934) that General the Right Hon. J. C. Smuts, F. R. S., was installed Rector of the University. On this occasion the Dean of the Faculty of Arts gave the following oration:—

> "Mr. Hutchinson, whose career is itself a tribute to the system of promotion that prevails at Kew, is a Botanist whose detailed work on the Families of Flowering Plants marks the end of an old, and the opening of a new chapter in British systematic botany. Four years after he entered the Kew Herbarium he became Assistant for Tropical Africa, and his devotion to African botany was pledged. Twice at the invitation of the Government he visited and explored the country and on these journeys had with him as fellow traveller and collector a South African systematic botanist of no mean order —the Rector of St. Andrews, i. e., General Smuts! On the moun-



Vandyk, London See page 29

Dr. John Hutchinson—Herbert Medalist, 1939

Plate 128

tains at the southern end of Tanganyika they were fortunate to find a new species—*(Pteronia Smutsii* Hutch.)—of a genus known formerly only farther south; and one of them gave to it the other's name. We congratulate them both to-day on adding simultaneously to their vasculums a northern specimen, which, if not exactly rare, for it is something of a hardy annual now, is still coveted by many, and not easy yet to come by—the *Doctoratus Andreensis utriusque legis.*"

Hutchinson is now Keeper of the Museums at Kew, having been promoted to that important office on 1st April, 1936.

Arthur W. Hill
Director

Royal Botanic Gardens,
Kew, Surrey,
2nd. March, 1939.

EDITORIAL NOTE

While in Europe last summer and fall, the writer had the great pleasure of meeting Dr. Hutchinson personally, and he was impressed by his charming personality (Plate 128) and keen intellect. We are all exceedingly grateful to him for his forward-looking scientific approach to the science of plant phylogeny. His system of plant classification has a number of important features, but one is of particular immediate value to us. The former, more or less, complicated grouping (poly-phyletic in many cases) on the basis of more or less artificial characters, has been broken up into smaller but more natural and homogeneous families. The value of such an approach to both the scientist and amateur is at once evident for these simpler units can be more easily understood, and the system therefore becomes a tool for inspiration and progress.

Hutchinson's system has been criticized by some on the basis that it would mean too much work to reclassify the herbarium specimens under their care. The scientist attempts to come ever closer to the truth, and Dr. Hutchinson certainly never intended that it should be used as a guide for filing herbarium specimens at this stage for it is a scientific treatise meant for research workers in plant taxonomy who are interested in working with phylogenetic entities. He knows that there is a distinct difference between the science of phylogeny that is *never* static and *ever* dynamic, and the system of filing specimens where *stability* is desirable. The physicist and chemist, for instance, do not ignore progress in their respective fields because it would necessitate the rewriting of their texts. Why should it be otherwise in the field of Taxonomy? One might suggest, to the taxonomist who is so concerned about his dried specimens, that he keep his present system of classification indefinitely for purposes of filing, or he might file his specimens alphabetically and so have a system that will never be out of date, for progress in the science of phylogeny, when new facts are uncovered, may mean changes in any natural system of plant classification. With no further axe to grind,

he will no longer be an incubus to progress by resenting changes as science develops.

Dr. Hutchinson's work has been particularly inspiring to the members of the Society in spite of the fact that he has pruned whole branches from the family tree. Although the field covered has been narrowed, we have the satisfaction of knowing that we are working with a more homogeneous Amaryllis Family. The award of the Herbert Medal to Dr. Hutchinson is especially appropriate since his grouping of the amaryllids is really the first great advance in the understanding of the Family since the publication of Herbert's Amaryllidaceae in 1837.

Hamilton P. Traub

Mira Flores,
Orlando, Fla.,
July 4, 1939

ARLOW BURDETTE STOUT

An Autobiography

The writer of an autobiography may ignore the period of childhood and youth but he must know that it is a most important segment of a life, and who can remember and evaluate its experiences better than he?

I cherish many memories of home, school and social life in the humble and wholesome setting of the rural community at Albion, Wisconsin. At an early age there were chores for me; then came light labor in the care of a vegetable garden, and my mother was one of the best of gardeners; and later there were long days of hard work on the farm. But in that community honest labor was dignified; it brought not only the necessities but the pleasures of life; it was the privilege of everyone except unfortunates.

At that time at least three-fourths of the region about our home was uncultivated. There was a mosaic of virgin areas of prairie, lowland meadows, swamps and woodlands of several types. There were meandering creeks, larger streams to the size of Rock River and ponds and lakes, the largest of which was Lake Koshkonong. Plants and animals were diverse and abundant. To me it was a fairyland and almost every spare hour and day in all seasons throughout the years from the age of 10, I spent afield. I hunted, fished and trapped; I spent much time in learning by direct observation as much as possible about the plants, animals (especially birds), rocks, fossils and Indian mounds of the area.

Early Education

School was somewhat serious and interesting, but scarcely strenuous. There was a one-room country school house and there were about forty pupils of ages from six to eighteen. For the older pupils from the farms, attendance was decidedly intermittent and mostly confined to the winter months. A dictionary was the sole volume for reference and supplementary reading. Few of the younger children wore shoes

or boots except during cold weather. There was a tin pail for drinking water and one dipper for all. No one was graduated. Some "finished" school when the fifth reader and the advanced arithmetic was "learned" from cover to cover.

The early settlers in Albion brought from the East a keen interest in education and they soon established Albion Academy which flourished for several years. But this school had closed and its three large buildings on a spacious campus stood empty and forlorn at the time when my generation was leaving country school. Two different attempts were made to reestablish the school and during these periods I was able to have three terms of study. In the first of these, when I was 16, I had for a teacher in physical geography, the naturalist and ornithologist, Ludwig Kumlein. To me he was a most inspiring teacher, and the first to present a natural science to my ken. His descriptions of the character of the earth's surface and particularly of the polar regions which he had helped to explore, his discussion of Ferrell's Law in relation to ocean currents and to air currents, and his explanation of the agents of surface erosion presented to me a never-to-be-forgotten mental picture of the dynamic earth on which we live. Also he answered outside of the classroom many of my inquiries about plants and birds. Two years later he was a Professor of Natural Sciences at Milton College and I went there for the winter term, chiefly to enroll in classes which he taught. I was not admitted to the course in zoology which was considered an advance course, but I was allowed to join the class in physics and thus had my first introduction to the experimental method of study and demonstration.

In 1895-1896 I was a student in Albion Academy which had been reorganized under the leadership of Professor Peter Hendrickson. Now for the first time I studied botany as a class room subject. The text book was "HOW PLANTS GROW" by Asa Gray. The chapters on the gross structure of flowering plants were followed closely and the class was taught how to use the key to "Popular Flora". The instruction did much to organize my knowledge of plants in the field. Somehow I was most impressed with the description of the processes of seed reproduction. The text on this point reads as follows:

> "The use of the pollen is to lodge on the stigma of the pistil, where it grows in a peculiar way, its inner coat projecting a slender thread which sinks into the pistil, somewhat as a root grows down into the ground, and reaches an ovule in the ovary, causing it in some unknown way to develop an embryo, and thereby become a seed". . . . "After the flower comes the fruit. The ovary of the flower becomes the seed-vessel (or pericarp) in the fruit. The ovules are now seeds".

But during the following summer I was both surprised and perplexed to observe that the two plants of our flower garden that had the most conspicuous flowers did *not* produce capsules and seeds. At one end of the porch there was a cluster of plants of the old familiar fulvous daylily *(Hemerocallis fulva* clone EUROPA) and at the other end

there was a colony of the tiger lily *(Lilium tigrinum)*. The numerous flowers were perfect but *after the flowers the fruit did not come*. My curiosity regarding this condition has remained through the years that have followed. When I came to The New York Botanical Garden plants of these two clones were obtained for experimental study and soon thereafter my interests became centered in the processes of reproduction in flowering plants with special reference to the conditions of sterility.

Teaching in Rural Schools

During the autumn of 1895 I met with what seemed at the time a dire misfortune. While playing football the tendons of one knee were so badly torn that for weeks at a time I could get about only with the aid of a crutch or cane. When the spring of 1896 came I was unable to work on the farm. I could earn nothing and it was a period of hard times. I was twenty years old. For the first time I was forced to consider the value of physical well-being and its uncertainties. I faced despair. Something had to be done and so for about six weeks I gave the injured knee complete rest with the home treatments advised by the family physician. And during that time I memorized the contents of text books on those subjects which were included in the examinations for a teacher's certificate. I actually learned the Constitution of the United States from beginning to end. Luckily for me I obtained a "third grade certificate" and also an appointment as teacher of a country school at the wage of $25.00 per month.

For two happy busy years (for me at least) I was teacher in a modest little country school house with an attendance of about 35 pupils. The knee improved and crutches were discarded. I saved $300.00 which were on deposit in a bank and I planned to enter the State Normal School at Whitewater, Wisconsin in the autumn of 1898. But before that time arrived the bank failed due to the defalcation of the cashier who fled to Canada and there lived in immunity. Ultimately I obtained about $30.00 of my bank savings. I went to the Normal School with less than $50.00 at my command and I completed the elementary course of two years of study without receiving a cent from anyone except as I earned it.

During the school year of 1900-1901 I taught in the one-room district school of my home village of Albion. The wages were $50.00 a month. There were about sixty pupils of all ages from six to sixteen. During the year the inadequacies of this one-room school were discussed with pupils and parents and at the following school meeting a graded school of two rooms was provided for.

Studies at The Whitewater State Normal School

Then two more years were spent at the State Normal School at Whitewater where I was graduated from the advanced course in June 1903. It is indeed proper that I pay special tribute to the sterling character of the faculty of this School and to the able leadership of President Albert Salisbury. The more elementary subjects were covered in 10-

week or 20-week courses. Attention was given to methods of education and to actual practice teaching. The last two years of the curriculum covered a well-balanced schedule comprising sciences, mathematics, literature, languages, history and education. Especially did I appreciate the courses in human physiology, zoology and botany taught by Professor W. S. Watson who possessed both a rare skill as a teacher and a comprehensive knowledge of these subjects.

I had managed to take the advanced course in botany during 1900. The chief texts used were "LABORATORY MANUAL OF BOTANY" by Clark and "ELEMENTARY BOTANY" by Atkinson, both of which were editions of 1898. There were various other volumes for reference. In this course I obtained an entirely new conception of living plants and of the processes of their reproduction in the treatments (1) of protoplasm, (2) of physiological processes, (3) of comparative morphology, especially in respect to life histories in relation to reproduction, (4) of chromosomes in cell-duplication, fertilization, and reduction divisions, and (5) of ecology, especially in respect to pollination. The use of a microscope and its revelations interested me to the point that approached fascination.

My copies of the two texts mentioned above have remained among the few choice volumes of frequent reference in my "working book shelf." It still seems to me that no text of the size of this "ELEMENTARY BOTANY" equals it in comprehensive scope and clearness of presentation. I confess that there were times when I wondered what advanced botany could be like if this volume is merely "elementary."

During my last year of study at the Whitewater State Normal School I attempted to identify all the species of plants which grew on the grounds of the school. Part of this area was an arboretum but there was a virgin area of nearly five acres of a drumlin on which grew a diversity of native wild flora. The list of these plants was edited and revised by Professor W. S. Watson and published as "A Hand-book of the Arboretum of the Whitewater Normal School and the Flora Inhabiting its Grounds" (Bulletin of the State Normal School 5: No. 3. 1908). For use in this study I had the 6th edition of the "MANUAL OF BOTANY" and "FIELD, FOREST AND GARDEN BOTANY" by Asa Gray, and the three volumes of the then recently published "ILLUSTRATED FLORA" by Britton and Brown.

Teaching Science in the High School at Baraboo, Wisconsin

From September 1903 until June 1907 I was a teacher of science in the High School at Baraboo, Wisconsin and during the last year I was principal. About 60 pupils were enrolled each year in botany. There were laboratory exercises with the use of microscopes for demonstration. There was some study of bacteria. A few representative species of algae, fungi, liverworts and ferns were collected in the immediate locality and studied; but about half of the time was devoted to flowering plants. The text book which was used was "FOUNDATIONS OF BOTANY" by Bergen. The definition of botany which was printed in the introduction

to this volume and credited to Professor George L. Goodale is as follows:—"Botany is the science which endeavors to answer every reasonable question about plants." In our effort to meet the more popular questions about plants a special table was set aside in the laboratory for the display of plants and plant materials and the attempt was made to name for this display any plant of which material was brought by any person, student or otherwise. It was necessary for me to send some of the specimens, especially of the fungi, to the University of Wisconsin or to the Public Museum in Milwaukee for identification. My first association with Professor R. A. Harper was in this relation.

My First Paper on Botany

The first of my published papers on botany appeared in 1905 (More About Canvas-Back Food, Northwestern Sportsman). This reported observations on the formation of tubers or fleshy buds by plants of *Potamogeton pectinatus* which grows in abundance in the shallow waters of Lake Koshkonong. The naturalist, H. L. Skavlem, had previously discovered and reported that the tubers of this species provide an important food for ducks, especially the Canvas Back, which then frequented this Lake in great numbers during the spring and autumn migrations. For some two weeks in August 1904 I was a guest of Mr. and Mrs. Skavlem at their summer home at Carcajou Point, Lake Koshkonong, and this period was spent in studies on the plants which provide food for wild ducks. Without consulting me, Mr. Skavlem published under my name the notes which were recorded of our observations. For a number of years thereafter I made studies and collections of all species of *Potamogeton* which I could find in the areas that I frequented.

Interests in Ornithology

For 15 years I assiduously studied bird life in the wild and during a considerable part of this time I held a permit issued by the proper authorities of the State of Wisconsin which made it legal for me to collect at any season both birds and their eggs for "scientific purposes." I accumulated a collection of bird-skins for record and study. My main guidance in these studies was a volume of the fourth edition of the "KEY TO NORTH AMERICAN BIRDS" by Elliott Coues. This book cost $7.50 and I recall that the sum expended for it came from the sale of raw furs of mink, muskrat and skunk which I had trapped. I also made some progress in the art of taxidermy (for birds and small mammals). I still possess my well-worn volume on "TAXIDERMY" by William T. Horniday, which I purchased soon after the edition was published in 1893. Frequently handy cash came to my pocket in payment for mounting ducks, owls, hawks and other birds for hunters and also pet canaries that had died of old age.

But my last serious endeavor in ornithology was during the early summer of 1904 when I invited Alexander Wetmore, who had been a stu-

Dr. A. B. Stout—Herbert Medalist, 1939

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dent during the previous year in the Baraboo High School, to spend two weeks with me at Lake Koshkonong. At that time his interests in ornithology were already keen and his knowledge of bird life in the area about Baraboo and North Freedom was very complete. I believe that this was his first collecting trip at some distance from his home and his first opportunity to study the bird life of a large lake. Dr. Alexander Wetmore is now internationally known for his noteworthy contributions to the science of ornithology.

Interests in Archeology

Week-ends and portions of my vacations throughout the four years of teaching at Baraboo were spent out-of-doors in the area about Baraboo, in which there was, and still is, much of interest in ornithology, botany, geology and Indian archeology. A descriptive survey of the archeology of eastern Sauk County was undertaken and this was published in 1906 (The Wisconsin Archeologist 5: No. 2). In this area there is a remarkable earthen effigy of the human figure, 214 feet in length, and the only one of its kind in existence. It seemed to me obvious that this effigy mound should be preserved from destruction. The cooperation of those who made this possible is a matter of record.

During my vacation in the summer of 1906 several weeks were spent at Lake Koshkonong in making, with the collaboration of H. L. Skavlem, a survey of the archeological features about this lake. This was published in 1908. Mr. Skavlem was then a naturalist and ornithologist of extensive knowledge and unusual ability. Later he became skilled in manufacturing arrow-heads and other stone artifacts such as had been made by the Indians.

My surveys of Indian mounds in Sauk County, at Lake Koshkonong and later about Madison were purely avocational. But in each of the summers of 1908 and 1909 I spent about six weeks in the employ of the North Dakota Historical Society under the general direction of Professor O. G. Libby in making surveys of the old village sites of the Mandan, Arikara, and Hidatsa Indians.

At the University of Wisconsin

In the autumn of 1907 I was matriculated in the University of Wisconsin, where I had already been enrolled as a student during two summer sessions. Botany was elected my major subject and Professor R. A. Harper was my adviser. There were courses on the morphology of the fungi, the algae, the mosses and liverworts, the ferns and the flowering plants, on physiology, on cytology, on hybridization, on heredity, and on the special subjects of the seminars. Courses of study were taken in chemistry, soils, bacteriology and plant pathology. During the year 1908-'09 I was assistant in botany. In June 1909, I received the degree of B. A. and I was one of those chosen for Phi Beta Kappa and a year later I was elected to Sigma Xi.

Decision Regarding a Vocation

In June of this year (1909) Zelda Judd Howe and I were married and we began our home-keeping at Madison. We had been friends since our youth. Soon it was necessary to decide on one of four opportunities which arose for a vocation. One was as teacher of biology in a State Normal School; one was in agricultural work at the State Agricultural Experiment Station; one was a position as state archeologist in a nearby state; and one was the opportunity to remain at the University as instructor in botany with some time for studies and research under the guidance of Professor R. A. Harper. The decision to undertake the work last named, which carried the least salary, was urged by Mrs. Stout. Because of this and of her continued sympathetic accord to my interests and work it can be said that since the autumn of 1909 some aspect of botanical endeavor has been our vocation. The earlier activities in ornithology and in archeology provide many pleasant memories and add much to the more incidental and avocational interests and interludes.

At The New York Botanical Garden

In the autumn of 1911, Professor R. A. Harper became Torrey Professor of Botany and Head of the Department of Botany in Columbia University and at the same time I was appointed Director of Laboratories in The New York Botanical Garden, which is affiliated with Columbia University. In February 1913, the degree of Ph. D. was granted to me by Columbia University. I have remained at The New York Botanical Garden and in January 1938, I was asked to take charge, for a time, of various of the educational activities and public relations and in accord with this my official title was changed to "Curator of Education and Laboratories."

During the past twenty-eight years of my tenure at The New York Botanical Garden most of my time has been devoted to research. Especially during the earlier years I had the advice of Professor R. A. Harper and of Professor N. L. Britton, who was Director-in-Chief of The New York Botanical Garden, and to them I owe much. My interests and research have centered in the processes of seed reproduction in flowering plants and especially in the limitations or "sterilities" in such reproduction. Various plants have been involved in these studies. There have been (1) direct observations, as of the flower behavior of avocados, (2) experimental studies, especially in regard to the behavior, the scope, and the heredity of incompatibilities, (3) cytological studies, especially in *Lilium* and *Hemerocallis,* (4) hybridization and selective breeding for the development of new types of value in horticulture, and (5) the application of the results of various of the studies to genetics and to practical problems in plant breeding and in the production of fruit. Some of the special lines of study may be mentioned.

For the academic year 1921-'22, I was a visiting member of the faculty of Pomona College in Southern California. During this time studies were made on the viability of date pollen in cooperation with Dr. Walter T. Swingle of the United States Bureau of Plant Industry.

Also a special interest developed in regard to the irregular fruiting and non-fruiting of avocados and the studies which were made of the flower behavior revealed the synchronous and reciprocating nature of dichogamy in these plants. Later (1925 and 1932) two periods of further research on this condition and on its relation to fruit production were spent in Florida.

Research on seedless grapes has been a major project since 1919, and this has been conducted in cooperation with the Department of Pomology of the New York State Experiment Station at Geneva, New York. This research involves (1) a study of the nature of the types of seedlessness (parthenocarpy and stenospermocarpy) in grapes. (2) breeding for the development of hardy seedless grapes, and (3) a study of the heredity of seedlessness. At the present time more than 200 different seedlings which bear seedless or near-seedless berries have been obtained. The most promising of these are being tested for possible vineyard culture.

During the seven years from April 1924 to July 1931, I planned, directed and participated in an extensive program of hybridization in the genus *Populus*. This was done for the Oxford Paper Company in connection with plans for reforestation in the production of pulp wood. Dr. E. J. Schreiner, then a student in the College of Forestry of Syracuse University, was employed by the Company for this research and I am pleased to speak of his ability, keen interests in the problems involved and splendid spirit of cooperation. We are pleased to note and recognize the support given to this project by Professor Ralph McKee who was for a time director of research for the Oxford Paper Company and whose interest in this project was largely responsible for its inception. The studies of the large number of hybrid poplars obtained in this breeding effort have been combined with other projects of tree breeding under the auspices of the U. S. Forest Service and with Dr. Schreiner in immediate charge. I have the pleasure of collaborating in this research.

Studies of the sterilities of cultivated potatoes were made over a period of several years, and during the years 1921-1924 inclusive several weeks were spent each summer at Presque Isle, Maine, in cooperation with Dr. C. F. Clark of the U. S. Bureau of Plant Industry in a special and rather extensive survey of pollen viability in numerous clonal varieties, seedlings, and wild species (See Department Bulletin 1195, U. S. D. A.)

To various readers of HERBERTIA my researches on daylilies *(Hemerocallis)* will be of special interest. The complete failure year after year of the old fulvous daylily (clone EUROPA) and of the tiger lily *(Lilium tigrinum,* clone INTERMEDIATE) to produce capsules and seed attracted my attention during my youth and has continued to be of interest to me ever since. Observations on the results of self- and close-pollination of plants of the EUROPA DAYLILY began during my first year at The New York Botanical Garden. Plants of this clone were obtained from various localities in United States and from other countries. Other species of *Hemerocallis* were soon included in the studies. By 1919 (Jour. N. Y. Bot. Garden 20: 104-105) seeds had been obtained from

several hybridizations and several thousand controlled pollinations had been made for flowers of daylilies. It was soon decided that the sterility of various daylilies and of lilies which are propagated vegetatively as clones is due to "incompatibilities" and not to "correlative sterility."

Hybrid daylilies in considerable number were blooming in 1923 and various persons who saw them advised that they be distributed for garden culture. In 1924 Dr. N. L. Britton, Director of The New York Botanical Garden, considered this matter quite fully and decided that the Garden can not propagate daylilies either for general distribution or for sale and that cooperation with some one reputable nursery firm should be obtained for the introduction of the new selections. Various nurserymen in the vicinity of New York City, some of whom had favored the Garden with contributions of plants, were approached but not one of them was willing to cooperate in testing and propagating the most promising seedlings of these daylilies.

Letters were then written to more remote nurserymen but the only response came from Bertrand H. Farr, who soon came to inspect the new seedlings. He offered to cooperate in introducing them to the trade. After his death in the following autumn the nursery company which he had established continued in the cooperation, the fundamental aims of which are (1) to evaluate selections critically, (2) to propagate the selected seedlings during the period of trial and evaluation, and (3) to make the best of the selections available to a considerable number of persons at the same time and at a relatively low price.

The scope of my investigations with *Hemerocallis* include several main objectives:—(1) There is the taxonomic treatment of the genus which involves a critical study of numerous wild plants from various parts of the Orient. The text and twenty-four colored plates are now in the final stages of preparation for a folio monograph of the genus. (2) The extent to which inter-specific hybridizations are possible is being determined and studies are made of the character of the hybrid offspring in regard to the heredity of specific characters and to sterility and fertility. (3) Selective breeding after hybridization is being tested and its possibilties determined in respect to the extent and the degree to which characters may be modified for the development of distinctly new types of horticultural daylilies. (4) Studies of the comparative cytology of all species and of various hybrids are in progress with reference to specificity, to structural sterilities, to heredity and to polyploidy. (5) Much study is directed to the phenomena of self- and cross-incompatibilities within the different species. (6) The selection of seedlings of distinct character for garden culture is a feature to which critical attention is given but this is rather incidental and secondary to the scientific and botanical studies.

Affiliations

I have been favored with an Honorary Life Membership by The Horticultural Society of New York and by The Pennsylvania Horticultural Society. In February, 1935, I was elected an Honorary Life

Fellow in The Royal Horticultural Society. Other affiliations with scientific organizations are as follows: American Amaryllis Society; Fellow, American Association for the Advancement of Science; American Society of Naturalists; Botanical Society of America; Honorary Life Member, Ohio State Historical and Archeological Society; Torrey Botanical Club; Honorary Life Member, Wisconsin Archeological Society; Wisconsin Academy of Arts and Sciences. In 1937 I received the Thomas Roland Medal of The Massachusetts Horticultural Society. An exhibit of seedling daylilies was awarded a gold medal in June 1938 by The Horticultural Society of New York.

This autobiographical sketch would never have been written had something of its nature not been required in connection with the award of the William Herbert Medal by the American Amaryllis Society.

An appraisal?

During a recent visit with relatives in the village of my boyhood days, a young cousin of a later generation asked me to explain what my work is. My attempt to answer in non-technical terms brought the comment "Well that seems more like the pursuit of a hobby than real work." I confess that my efforts in botany throughout a half century of first hobby and then vocation have never seemed to me to be work that is toil or labor. And I am certain that this may also be said for the botanists and horticulturists whom I have known most intimately.

SYDNEY PERCY LANCASTER

An Autobiography

My father, a banker by profession, was also a keen gardener and when he was manager of a local Bank in Lucknow was well known as a grower of lilies. His experiments in cross breeding were entered in a note book and show that his first hybrids of Amaryllis were raised in 1890, and of Canna in 1896, at the time of his death the Society had a collection of 390 Amaryllis, more than half being seedlings he had himself raised.

In 1892 my father was appointed Secretary to the Agricultural & Horticultural Society of India, Calcutta, which had its Garden at Alipur. Being an only son I spent my holidays pottering about the Society's Garden and to keep me out of mischief, father gave me a small plot of land to call all my own. I had seen him pollinating Canna so tried my prentice hands and at the age of twelve obtained, among my seedlings, a deep yellow variety which my father took over. I was rather resentful that my "ewe lamb" had been absorbed into the Society's collection and it was not till later that I appreciated the compliment. This was in 1898. As I was fond of gardening father decided to put me through the rudiments of the trade before sending me to England and the Continent to finish my training, and in November 1902, I was entered as the Society's first apprentice. The following November father took ill and died in

Sydney Percy Lancaster—Herbert Medalist, 1939

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February 1904, leaving me to support a mother and three sisters. With the appointment of a new Secretary I was promoted to Assistant Secretary and succeeded to the Secretaryship in October 1914.

The Agricultural and Horticultural Society of India was founded in 1820 by the Baptist Missionary, Revd. William Carey, chiefly to improve the Cereals, fruits and vegetables of the country, by the introduction of imported seeds and plants, with horticulture as a secondary theme. Literature dealing with Indian Agriculture will show that the Society did its work with credit but in 1920 the Viceroy of India, Lord Curzon, placed all agricultural work in the hands of a Government Department and this relieved us of the burden. I might add that the Society is not supported by contributions or donations but depends on members who, in exchange for an annual subscription, receive a very generous return in plants and seeds, etc. The Garden in Alipur is only 23 acres in extent, part is utilised as a Public Park and the rest as a nursery so that very little space can be utilised for testing grounds. The term Secretary embraces Superintendent of the Garden as well and in my dual capacity I have little time for experimental work; with a membership of a little more than a thousand I spend hours at my desk offering them help and advice. This accounts for the small return I can show for the years of work given to gardening.

Cannas have always been my first love and since 1904, I have added many new and improved varieties to the Society's collection and the selection stands second to none in India and perhaps in the world. Cooperanthes came into being in 1909 and were the result of an attempt to obtain coloured Cooperias. These lilies are not appreciated in this couuntry as the period of beauty is short lived and we have a voracious caterpillar, black spotted with scarlet and white, that eats down not only the leaves but delves into the heart of the bulb. (See Herbertia Vol. 3, page 108) A selection of Cooperanthes is being grown by the American Amaryllis Society and these bigeneric hybrids can be judged on the spot. Amaryllis (Hippeastrum) do not succeed in Calcutta for the damp humid climate brings about rot in two to three years and only the hardiest types survive. Of those raised by my father none remain, the white and pale shades dying out first. *Amaryllis belladonna (H. equestre)* and *A. stylosa* flourish and I am now using these two as the parents of a hardy race. In 1932 an out of season *Amaryllis stylosa* flowered and I was able to obtain a cross between this and *A. reticulata*, var. *striatifolia* and most of the seedlings have now flowered and three are worth retaining. (See Herbertia Vol. 3, page 97)

After my fathers death a seedling *Crinum* flowered in 1905 which I named *Lancasteri*. I could find no mention of the parentage and it was quite distinct from any I had seen, the foliage being shiny and the colour of the flowers several shades paler than *Ellen Bosanquet*. Unfortunately the bulbs do not increase rapidly and I have only two small offsets. I made a number of crosses in subsequent years between the many varieties in our collection but few set to seed and as the flowers of *Crinum* are mostly night opening they are not popular with amateurs in this country. Since 1932 I have been using *C. americanum* as seed

parent and there are quite a number of distinct seedlings now being tested. *Hedychium,* the Butterfly Lily, has given me many new types, large and small flowered. I commenced crossing this Canna-like plant in 1913 and in four years built up an excellent collection which died out one year when we had drought and were compelled to use brackish water for our plants. A further series of hybrids is now in existence and specimens have been sent to Kew and distributed to keen amateurs in more suitable climates. These plants flower during the wet months of the year. *Hemerocallis* hybrids are a new venture and the slight variation in shade and shape I have obtained is not worth mentioning.

Here are a few other lines of plants that I have succeeded with. Shrubs—My first successes with *Hibiscus* and *Ixora* are recorded in 1907, *Lagerstroemia* in 1908, *Dombeya* in 1909, *Plumeria* in 1908, *Barleria* in 1912, *Dracaena* in 1909, *Crotons* 1912, and *Bauhinia* 1912. In climbers I first obtained a hybrid of *Antigonon* in 1904, and *Bougainvillea* in 1931. Many herbs and succulents such as *Ruellia, Anthurium, Begonia Rex,* etc, have been kind and given results for my attempts. In 1929, I raised my first hybrid *Cosmos, Alipur Beauty,* and have since worked on a new range of colours and forms. Bodgers have very kindly undertaken to breed true some of the forms and introduced them. *Tithonia speciosa* crossed with the perennial yellow *T. tagetaeflora* gave me distinct shades in 1930. A range of *Hibiscus cannabinus* hybrids were raised in 1934. I have also a number of colour variations of the perennial *Verbena erinioides.* These are the result of crosses with the annual varieties, but the majority being sterile, can only be propagated vegetatively.

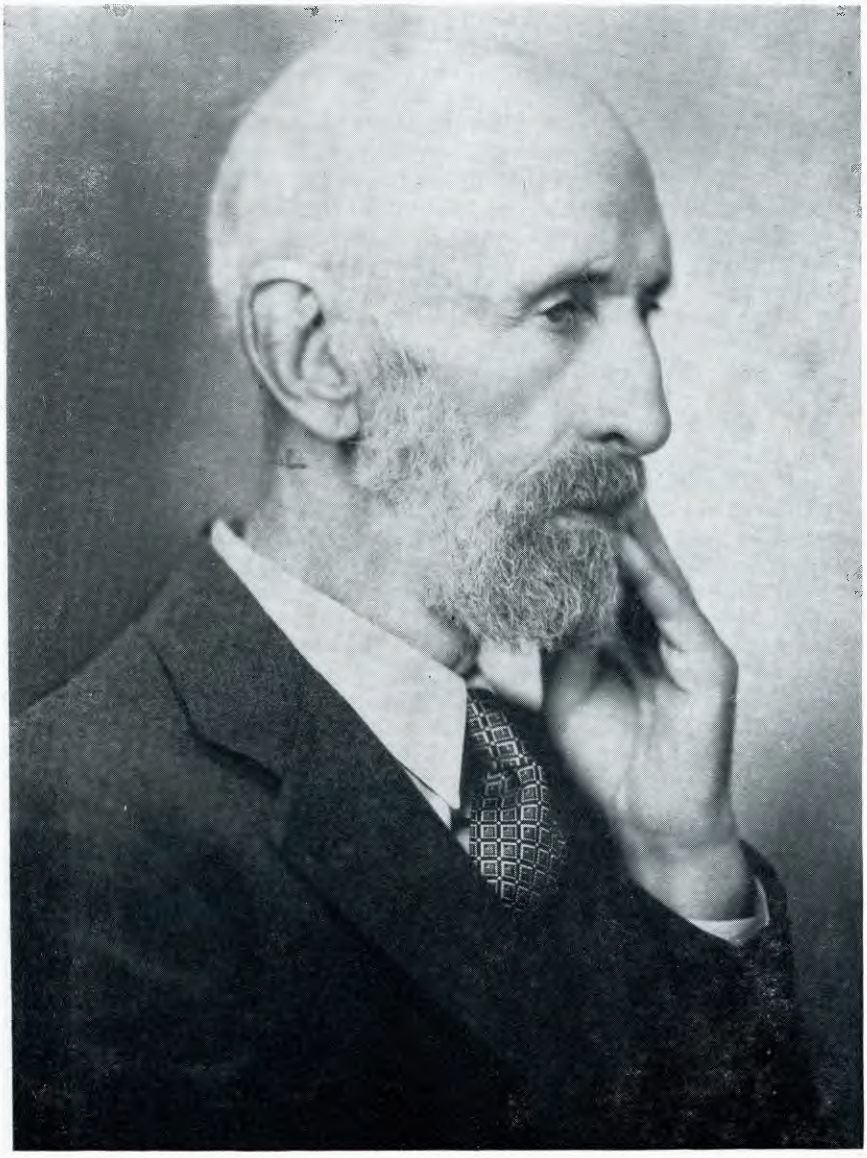
Attempts that have failed are legion and promising seedlings destroyed by accident or carelessness too many to enumerate. The actual operation of cross breeding is simple enough (except in the case of the *Compositeae),* it is the long years of waiting before the seedling flowers and the various elements that conspire and combine to cause loss that is so disappointing.

CARL PURDY—AN AUTOBIOGRAPHICAL SKETCH

Carl Purdy was born in Dansville, Michigan on March 16, 1861. When he was still a child he crossed the Great Plains with his parents in an emigrant (covered) wagon in 1865. After living in Virginia City, Nevada for a few years, the Purdy family took up residence in Reno. At the age of nine years, in 1870, he moved to Ukiah, California, and has maintained a residence there ever since although he absented himself for varying periods before 1888.

At the age of seventeen he began commercial bulb collecting, and this later became his life's work. He became intensely interested in botany, particularly systematic botany, and devoted a large part of his time to it.

He taught school from 1879 to 1886, and during the next two years he was employed by the Wells Fargo Express Company, and was also a fire insurance agent.



Carl Purdy—Herbert Medalist, 1939

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In 1888, his bulb business had become large enough to warrant making it his life's work. During his career, he laid out and maintained several gardens, the last one at his home, "The Terraces," is now 37 years old. It is located in a lovely natural setting high in the mountains east of Ukiah.

Mr. Purdy's botanical work has at all times had close connections with his garden, and in this way he specialized in one plant genus after another. He has published monographs on *Calochortus, Lilium* (of W. N. Amer.), *Erythronium, Brodiaea, Fritillaria,* and the minor *Liliaceae* of Western North America. He has lectured widely and has written much on plants during the past sixty years as the spirit moved him with little thought of the matter after it was written other than his major works. For a long time he had no library facilities and even now these are not ideal.

In 1903 Mr. Purdy began work as a landscape gardener and this has been quite a large part of his life ever after. Since that date he has laid out many estates in Northern California as well as wild flower gardens for which he is especially qualified on account of his wide experience in growing wild flowers.

Among the plants, named by Mr. Purdy, are *Lilium Kellogii, L. occidentale, Calochortus vesta, C. amabile, C. concolor, C. shastensis, Lewisia Whiteii,* and *L. Finchii.* Plant species discovered by him and named for him by others include *Lewisia Purdyii* Jepson, *Allium Purdyi* Eastwood, *Calochortus Purdyii* Eastwood, *Fritillaria Purdyii* Eastwood, *Lilium Purdyii Waugh* (proved to be synonymous with *L. columbium), Sedum Purdyii* Jepson, *Brodiaea Purdyii Eastwood,* and *Erythonium Purdyii* Jepson.

His work with *Hemerocallis* has been commercial only. He interested himself in them rather ahead of most others, and he has nearly fifty varieties including most of the latest introductions, excepting Betscher's multitudinous sorts of which he has about twelve.

Mr. Purdy, now in his 78th. year, with all but four spent on the West Coast, is now writing a book, "My Life and Times." In this a more detailed biography will be included.

FRED H. HOWARD

An Autobiography

The writer is of the opinion that one of the most difficult of tasks is to tell the story of one's life—one's accomplishments in any sphere of endeavor, scientific or otherwise, and to tell it in such a manner that when it reaches the reader it will not be construed as egotistical. I will endeavor to review mine and with deepest apologies to the reader, here are a few facts.

I was born on September 1, 1873 in Los Angeles, California. My father was born near Exeter, Devonshire, England and my mother in Louisville, Kentucky.

At a very early age I developed that which might be referred to as an innate love of nature as expressed in flowers, plants and trees. After

leaving school at the age of eighteen, I decided to devote my life to horticulture and more particularly to that angle relating to plant breeding.

My first extensive experiments were with carnations *(Dianthus caryophyllus)* wherein I made hundreds of reciprocal crosses between those of the English border type and those of the earlier American perpetual class. This latter emanated from the establishment of Alegatiere in France, and the particular strain had at that time been much improved by early American growers. The results were interesting to say the least: an improvement in size of the flower, non-splitting calyx, perpetual blooming characteristics and a magnificent range of new colors not hitherto found in the Alegatiere race, became a patent fact.

Following the early experimental work I decided to enter the field of horticulture in a commercial way and in 1895 founded the firm of Howard & Smith. With this done, the work of plant breeding and the growing of plants for commercial use was prosecuted vigorously. We incorporated the firm in 1906. The members at that time consisted of Fred H. Howard, George W. Smith and Paul J. Howard. In 1914 I purchased the interest of Mr. George W. Smith and from then to the present time, my energies have been devoted not only to the ordinary commercial expansion of the business, but also to cross breeding of plants with the object of producing hybrids of our own raising, but we handle also the worthwhile novelties of other growers. While strides were made in the improvement of perennials and many annual plants, two of the major subjects to which attention was given were *Amaryllis (Hippeastrum)* and Roses. The writer covered on Page 189 of the 1937 edition of Herbertia the results of the work done in this class of bulbous plants. There is little need of repetition now.

Prior to 1914 several roses, improvements over existing sorts, were originated at our establishment and some of these are still in commerce today.

It was, however, in the year 1916 that wider recognition was gained by the winning of the International Gold Medal awarded by the French Government at the seedling trials of new roses at the Bagatelle Gardens, Bois de Boulogne, Paris, France, with the variety *Los Angeles.* Again in 1921 the Gold Medal was awarded for a new introduction of that year; i.e. the copper colored rose *Lolita Armour.* At that time the Bagatelle Medal had only been won once by an American grower, Mr. E. G. Hill, the Dean of all American rose growers, of Richmond, Indiana.

During the period from 1914 to the present, medals of lesser distinction, gold and silver cups in large number, First Class Certificates and other trophies have been forthcoming, attesting the fact that my efforts were not in vain.

Amongst the various trophies are two, however, which I value most highly. The first: the award of the Cory Cup for our *Amarcrinum Howardii* (or the synonym *Crino-Donna Corsii)* this award having been made by the Royal Horticultural Society of England in 1926 for the best new plant of that year. It is the only time to my knowledge that this

Mauray, Los Angeles

Fred H. Howard—Herbert Medalist, 1939

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most highly prized cup has been brought home to the U. S. A., and I am further glad to say—to California the land of my nativity.

The second award above referred to is the Gold Medal of which we were the recipients for our new rose *The Doctor*. This award was made by the British National Rose Society at Regents Park, London, England in 1938.

Lack of space forbids any full enumeration of the many other hybrids emanating from the firm. In passing I might note the various strains of California Giant curled and interlaced asters, California Giant peony flowered types, the beautiful and informal Giant Sunshine and other Giant varieties such as the non-lateral branching shell pink *Los Angeles;* the unsurpassed *Swansdown* in a white, *Maidens Blush* and others, all regarded as standard and sold by seedsmen all over the world. The same fact applies to our strain of Giant Flowered cinerarias which through constant effort over a period of thirty years have reached a stage of perfection the writer believes without peer.

Other subjects which have received intensive attention during the past few years are primarily roses, amaryllis, new double gerberas and zinnias. Of the second mentioned item after years of applied effort, there has been produced a strain which we are of the opinion will stand the test of time and we leave it to others to judge its merits. On the matter of rose breeding, many promising varieties are in the test plots. The fields of our new hybrid double gerberas at this writing are a sight worth a trip of miles to see—over sixty thousand clumps in full bloom in a color range of wide diversity and enormous flowers that reflect twenty years of intensive effort.

The new race of zinnias (to be sent out later) were obtained by reciprocal crosses between the small flowered scabious type and the Giant dahlia flowered class, and if I may use the recent words of a prominent visiting Eastern seedsman, constitute "the most sensational addition to the list of new annuals in a decade." In this new class, the blooms have a crested center with broad guard petals after the character of a double *Pyrethrum roseum*. They bid fair, on account of their rich color and informal build, to supplant those of the double flat-petaled class as a cut flower. Aside from their distinctive nature it is my opinion that when introduced to commerce they will prove a worthy addition to gardens in every state in the Union, or for that matter, the world as well.

In conclusion, I might say that when through action and applied purpose of thought, wherein a flower or plant of new form or new color raiment, heretofore non-existent except in the abstract, becomes a patent fact, then indeed the sponsor whoever he may be, will derive a sense of satisfaction in having contributed something tangible to the fund of spiritual uplift and human happiness.

IN MEMORIAM—RICHARD DIENER

BERTHA L. LIGHTON,
Formerly Secretary to Richard Diener

Tucked away in Oxnard, California, a quiet little town where the racing tide of the world's traffic misses it, is the nursery and plant breeding establishment of the late Richard Diener. It is quite unpretentious in outward appearances and quite small as compared to many other nurseries in California, but no one who has ever visited this nursery can truthfully say that it is not one of the most interesting ones.

Many of those who visited this nursery in the past have had the pleasure of meeting and talking with this genius of plant life, and those who visit it in the future will see the "Work Shop" and breeding grounds where the patient spirit and persistent effort of this very modest man, once a German immigrant, produced and gave to the world some of the highest perfected specimens of the plant breeder's art.

Mr. Diener spent a great deal of time and patience in the development of hybrid amaryllis. His aim was to produce larger flowers, faster and healthier growing plants. After a number of years of crossing and careful selection, this was accomplished very successfully. Then some years ago, among these highly bred amaryllis seedlings, some very outstanding specimens were found,—some flowered not only during the usual flowering season, from February to May, but also again in the summer or fall. These were used for further breeding and now, flowers may be had at almost any time of the year from the Diener strain of hybrid of amaryllis. The colors range from pure white through all shades of pink, coral, salmon and copper to the deepest red and many flowers measure twelve, fourteen and even sixteen inches across.

These hybrid amaryllis are comparatively easy to grow. They may be planted in the open in climates where the ground does not freeze, or may be planted in the open in the summer and brought indoors in the winter. Or they may be dried up in the fall and re-potted in good rich soil about the last of November. In a living room of average warmth, many will flower within six weeks after planting.

Amaryllis make excellent cut flowers. After being cut they will keep for days in perfect condition. In April 1936, Diener's amaryllis blooms were exhibited in the National Amaryllis Show at Orlando, Florida, and carried away their share of prizes. The flowers were boxed and sent on their 3000-mile journey by Air Express and arrived in such excellent condition that four exhibits won first class certificates and one flower won the first class certificate as the largest flower in the entire show.

Aside from the magnificent amaryllis, many other highly perfected flowers will be found at the Diener Nursery, such as delphiniums, petunias, pelargoniums, Shasta Daisies and gerberas.

It was Mr. Diener's wish that his work be carried on after his death, and like something foreseen, special preparations were made years in advance. He spent a great deal of time with a certain young man, a Mr. William Rohbock, the son of a very good friend, to whom he left his

business and property, so that the results of his work and knowledge gained through his years of experiences might be passed on, and that his methods and plans of his work in hybridizing might be continued. And this young man is ambitious, persistent and determined to take up the work where Mr. Diener left off, so that he will undoubtedly offer to the flower loving public, from time to time, new, improved and interesting developments in the field of floriculture.

Richard Diener was born in Halle, Germany, March 30, 1872, and immigrated to America about 1908. He first settled in Sonoma Valley, California, and was for a time associated with Luther Burbank. He became a naturalized American citizen June 24, 1912 at San Jose, Santa Clara County. He took up residence at Oxnard, California about November 1926 where he resided until his death, August 26, 1938.

SOILS AND MEN[1]

R. V. Allison,
Department of Chemistry & Soils,
University of Florida

The Yearbook of Agriculture for 1938, developed under the impressive title, "Soils And Men," is the most complete treatment of soil science for the lay reader that has ever been published. As might be surmised from the title, it deals not only with the technical nature of soils and the methods that have been developed for their orderly classification and mapping as a basis for all types of work with them but also emphasizes the highly basic relationships they hold with plants, animals and men.

While there is much in the volume that is essential for any lover of plants, whether his preference be for a beautiful amaryllis or a stately forest tree, the paramount theme that pervades the entire volume is conservation. This trend is tersely sounded in two brief sentences that appear in the foreword by the Secretary of Agriculture,—"Nature treats the earth kindly. Man treats her harshly." The appeal throughout is to the civic pride and conscience of all.

In this volume, as never before, effort is made to analyze the problems and causes of soil misuse, to state the horrible implications for the future of continuing the neglect and abuses of the past and to set forth clear, logically developed preventives and remedies. This phase of the treatise is taken up in Part I, The Nation and the Soil.

In Part II, The Farmer and the Soil, a wide variety of subjects are discussed that have to do primarily with the handling of the land—tillage operations, organic matter, methods of mixing and applying fertilizer materials, rotations, irrigation, erosion control, management of forest soils, and numerous other special chapters. Among these of most direct interest to readers of Herbertia would be those sections dealing with the determination of fertilizer requirements of soils (p. 469), a detailed discussion of the composition of fertilizer materials (p. 487) and a treatment of soil acidity and liming (p. 583).

[1]Year Book of Agriculture, 1938. Government Printing Office, Washington, D. C.

In the section on Soil and Plant Relationships, Part III, the soil requirements of economic plants are stressed both in terms of the so-called major or macro elements and the trace or micro elements. A chapter also is included in this section on the use of plants as indicators. A consideration of the role of trace elements in the culture of plants under greenhouse or other intensive conditions frequently is found of great practical importance.

In Part IV, Fundamentals of Soil Science, the physical, chemical and biological nature of the soil and the relationships of water and of organic matter and humus to it are strongly emphasized as preliminary to a brief discussion of formation and classification. The subject matter of this Section as well as that of Section III should be most helpful in giving a comprehensive understanding of those characteristics of the soil that have so much to do with the normal growth of plants.

Part V, The Soils of the United States, is a comprehensive brief discussion of our soils from a national standpoint based upon "areas" made up of generally similar series. This treatment involves a consideration of geographic setting, climate, native vegetation, parent materials, and the use to which they are locally adaptable.

To those who would like first to obtain a comprehensive notion of the scope of the volume, the excellent summary at the front of the book by Mr. Gove Hambidge is highly recommended.

GREY'S "HARDY BULBS"[2]

HAMILTON P. TRAUB, *Florida*

We owe Lt.-Col. Grey a lasting debt of gratitude for giving us these three valuable volumes on hardy and half-hardy bulbs, tuberous and fibrous-rooted plants, including selected species, as distinct from garden hybrids, of seven plant families. The work was written by one who has grown many of the plants he discusses, and who has been a professional gardener for seven years and a lover of plants for more years than he cares to remember. Such a work, although it was written primarily for English gardeners, must contain much inspiration for gardeners in other lands.

With reference to the botanical classification used, he states,—"Dr. Hutchinson's grouping appears to me very logical. I do not suppose that it is likely to find general acceptance in the immediate future, but very much regret that it was published[3] after the greater part of this work, based on the Genera Plantarum of Bentham and Hooker, had been written and set up in type, as it would have given me much pleasure to have based my work on his classification."

The three volumes contain 43 color plates and 132 black-and-white drawings by Cecily Grey who is to be complimented for an important job well done. The illustrations are of the impressionistic type, and as

[2]Grey, C. H. Hardy Bulbs. Vols. I, II, and III. E. P. Dutton & Co. New York. 1938.

[3]Dr. Hutchinson's second volume on Monocotyledons was published in 1934.

art objects they rank very high indeed. They give us really a truer picture of what we might see than the detailed, more or less "photographic," plates one usually finds in garden books. These numerous stimulating illustrations alone are worth much more than the price of the three volumes. The reviewer knows of no other popular gardening work that offers so many artistic illustrations of rare plant species.

After a brief introduction, in which the subjects "Propagation and Cultivation," "The Rock Garden," "Woodland and Streamside," "The Wild Garden," "The Border," "West-County Garden," "Desert Plants" and "Alpine House" are discussed, there follows the main work which is arranged by plant families. The species are arranged in alphabetical order under the genera. Lt.-Col. Grey has found it necessary to use technical terms in the description of plant species, but he has compensated for this by including in the glossary such terms used.

The first volume covers 50 genera of the Iris Family. As an illustration of the method of treatment, the Genus *Crocus* might be cited. The species described are referred to one of ten classes by means of a Roman numeral following the species name, and at the end of the descriptions, one finds a list of recommended species for autumn, winter and spring. The other genera receive equally appropriate treatment.

The second volume includes the *Amaryllidaceae, Commelinaceae, Haemodoraceae, Orchidaceae,* and the *Scitamineae.* Among the *Amaryllidaceae* one finds the following genera represented,—*Amaryllis (=Callicore), Ammocharis, Apodolirion, Brunsvigia, Calostemma, Chlidanthus, Clivia, Cooperia, Crinum, Cyrtanthus, Galanthus, Gethyllis, Haemanthus, Haylockia, Hessea, Hippeastrum (=Amaryllis), Hymenocallis, Ixiolirion, Leucojum, Lycoris, Narcissus, Nerine. Pancratium, Sprekelia, Stenomesson, Sternbergia, Strumaria, Ungernia, Urceolina, Vallota* and *Zephyranthes.* It is indeed the most up-to-date treatment of the amaryllids from the gardeners point of view, and as such will be eagerly received by the amaryllid enthusiasts.

The third volume is devoted to the *Liliaceae.* A total of 110 genera are treated, including the following genera that Dr. Hutchinson has placed with the *Amaryllidaceae—Agapanthus, Allium, Bessera, Bloomeria, Brevoortia, Brodiaea, Leucocoryne, Milla* and *Tulbaghia.* The colored plates of *Allium Caput-Medusae,* with petiolate leaves and pendulous reddish-purple flowers, and *Allium cyaneum,* with flowers of brilliant-dark-blue, are especially interesting.

There are minor errors here and there such as the recognition of the invalid species *Zephyranthes Tsouii Hu,* and the plate of *Zephyranthes rosea* showing flowers of very light pink. Errors of this type can be corrected in a future edition, and it would be an indication of ingratitude to dwell on these at any length. Finally it should be emphasized that Lt.-Col. Grey has achieved to a remarkable degree the object that he had in view, and that is after all the important fact.

IN MEMORIAM—ALBERT G. ULRICH, SR.

It is with the deepest regret that we record the death of Mr. Albert G. Ulrich, Sr., who died, August 28, 1939, at his home, 3966 Arsenal Street, St. Louis, Missouri, after an illness of two weeks. He was a native of St. Louis, 72 years old and had been a piano tuner for the past forty years. His favorite avocation was horticulture. He maintained a flower garden at his home that contained a great many species and varieties of roses, amaryllids, peonies and other ornamental plants, and his home grounds became a beauty spot of south St. Louis. He frequently wrote and lectured on the appreciation and care of flowers and birds. He was a charter member of the American Amaryllis Society, and a member of its Membership Committee for the North Midland.

Mr. Ulrich was also a musician and played the violin at many St. Louis concerts and church functions. He is survived by his widow, the former Miss Martha V. Wolf; his mother, Mrs. Mary Ulrich, and a son, Albert G. Ulrich, Jr.

SIR JOHN HILL, 1716-1775

Elsewhere in this issue of Herbertia the work of Sir John Hill is mentioned, and we take this opportunity of directing the reader to a brief biography of this versatile gentleman.

This is not the place for an estimate of Dr. Hill's rank in the history of science but it should be pointed out that he was one of the most versatile men who ever lived. He was endowed with remarkable talents but with a temperament that drew him into many controversies that dissipated his energies. However, his botanical works are as a rule not involved. For a preliminary estimate of Dr. Hill see "The Versatile Sir John Hill" by L. L. Woodruff. (Amer. Nat. 417-442. 1926). He was one of the best informed scientific men of his day. He has been credited with the making of improvements on the compound microscope; the first use of a dye in microscopic work—the use of carmine in studying the ascent of sap, in 1770, an initial attempt to classify protozoa, coining such names as Paramecium, that are still in use; the mentioning of the relationship of insects to pollination a decade before Koelreuter; the introduction to English botanists of the Linnean system of plant classification; and initial attempts in presenting the subject of botany to classes by the laboratory method. Disraeli says of him—"Sir John Hill, ... after all the fertile absurdities of his literary life, performed more for the improvement of the Philosophical transactions, and was the cause of diffusing a more general taste for the science of botany, than any other contemporary."—Ed.

1. REGIONAL ACTIVITIES AND EXHIBITIONS

AUTUMN NATIONAL AMARYLLIS SHOW, POMONA, CALIFORNIA, SEPT. 22-23, 1938

CECIL HOUDYSHEL, *California*

The Annual Fall Amaryllis Show, sponsored by the American Amaryllis Society, was held on September 22 and 23, 1938, in connection with the Floral Section of the Los Angeles County Fair, at Pomona, California.

In the extent of space used and in the number of species and varieties exhibited there was considerable improvement over the preceding year. There were also a few new exhibitors.

The difficulty we experience in having a greater number of flowers to show on a particular date we presume would be encountered anywhere but perhaps in a lesser degree than in Southern California. Here we have almost all kinds of climates from desert, hot interior valleys to mountains, canyons and cool coasts. Some regions are cool and foggy, some have continuous dazzling sunshine. So the species have a different blooming date in nearly each section. Many species are very erratic too in this date. Nerines especially (at least in our experience) are very erratic. We have had flowers in September and even as late as January.

For these reasons two very important Santa Barbara Nurseries, the Orpet and the Las Positas Nurseries, having had an earlier-than-usual season were unable to exhibit.

The Los Angeles County Fair offered liberal cash prizes up to $25.00 and probably every exhibitor received enough in prizes to pay at least their expenses. All exhibitors were commercial growers and the attention and interest their exhibits received were of considerable advertising value. The promotion value for amaryllids was no doubt much greater. Considerable promotion was given by the press and one Press Service is still furnishing amaryllis pictures for garden pages.

The Richard Diener Nursery, of Oxnard, showed more than fifty umbels of the Diener strain of hybrid amaryllis. As is well-known, this strain is noted for its profuse blooming habits. They bloom normally in the spring as do other hybrids. Again in the fall a very good crop of flowers are produced, with enough in between these times to rank them as the nearest ever-blooming strain. The flowers are immense, probably the largest known. The colors shown were from pure white to various tones of red and pink. The exhibit attracted much attention and won a First Prize Ribbon.

Mrs. Leonard Swets, Riverside, showed the Blue Ribbon vase of *Lycoris radiata*. There were several other vases of this favorite amaryllid shown. It is a favorite garden bulb in California and is still often called "*Nerine sarniensis.*" Mrs. Swets also showed a fine bloom of *Valotta purpurea* which won a first. Mrs. Swets is to be complimented for her ability to grow such fine specimens of this rather difficult species. The

writer is not able to do it. There are several commercial growers of valottas in Southern California but no others seemed to have flowers to show.

Mrs. Swets also received Second for *Amaryllis (Hippeastrum)* species and *Amaryllis miniatus:* Third for *Callicore rosea minor.* In the Sweepstakes she ranked Second with a cash prize of $20. She had two first, two second and two third prize ribbons.

Mrs. Swets grows some very fine *Amaryllis (Hippeastrum)* hybrids for the commercial production of seeds.

E. P. Zimmerman, of Carlsbad, showed his beautiful Callicore hybrids, receiving a Blue Ribbon on them. The colors ranged from nearly pure white, light pink to very deep pink with many variations in the markings. He also received First on *Crinum Powelli album, Hemerocallis* species, and on a new, unnamed *Amaryllis (Hippeastrum)* species. In Sweepstakes Mr. Zimmerman placed third with a cash prize of $15.

Mr. Zimmerman is the most important breeder and grower of clivias in the U. S. and ranks high if not highest for the world. He estimated the number of his plants a year ago at 30,000,—and he is increasing the size of his houses rapidly. Clivias bloom only rarely out of season here, but the show date was only a couple of weeks too late to receive several nice plants.

The writer, Cecil Houdyshel showed the largest number of species, receiving 12 Firsts; 3 Seconds and 1 Third and therefore the Sweepstakes prize. Too much credit cannot, however, be gleaned from this fact as we can scarcely be called specialists on any one type of amaryllid (unless it be *Crinums)* and the nature of our retail mail order business requires the growing of as many species as possible. The other exhibitors grow quantities of only a few species in which they specialize.

IMPRESSIONS OF THE NATIONAL AMARYLLIS SHOW, JACKSONVILLE, FLA., APRIL 11, 1939

EVA NOBLE, *Chairman*
Publications Committee, Federated Circles of Garden Clubs, Jacksonville, Florida

The Garden Club of Jacksonville (composed of 69 circles) was very proud to sponsor the annual show of the American Amaryllis Society for 1939. The date was set for April 11, and the usual amount of anxiety was felt before the day came, lest there be no flowers to show. The outcome was also as usual—there were many flowers, and the display was a revelation to many people who had not had the opportunity to study amaryllis as thoroughly as now when so many colors and kinds were assembled in one place.

The auditorium of the Woman's Club, where the show was held, was given over to the display of representatives of the very large family of amaryllis. Long tables were ready with wide aisles between to give the feeling of spaciousness necessary for such large flowers. The background was neutral—a soft buff-colored paper covered the tables, and

Federated Garden Club, Jacksonville, Fla.

Russell S. Wolfe Exhibit at National Amaryllis Show, Jacksonville, Fla., Spring 1939

Plate 133

the wall pockets were painted the same shade as the wall. This also was a concession to the emphatic color personalties of amaryllis. Glass bricks were used to prop the containers with their top-heavy blossoms. The wall pockets held arrangements of amaryllis with other flowers or foliage—these arrangements having been assigned to former ribbon winners in flower shows. The whole effect was well-balanced and very colorful indeed.

Several other features had also been planned for the show. The stage was set as a Garden Center—that dream of every ambitious garden club. Just below the stage were two Spanish carts—one on the right and one on the left. One of these housed a demonstration of orchid growing by Mr. and Mrs. Bruno Alberts, of the Orchid Farm, Mandarin. It showed the seed through the years of nursing until the time when the exquisite blossoms should appear,—an average of seven or eight years. The ungainly strap-leaved plants with their precious weight of perfect blossoms was a worthy complement to the main show. The other cart contained an educational exhibit, in charge of Mrs. W. D. Diddell and Mrs. Philip Trout, and was an ensemble of rare and unusual plants of any kind whatsoever. Both these carts were centers of interest.

The sun room of the Club was given over to arrangements of Spring flowers, in attendance on "The Court of Amaryllis." The lounge of the Club held an intriguing display of the collection of rare books and prints of flowers and birds and Mr. and Mrs. Alonzo P. Boardman of Augusta, Georgia, the owners, were present to explain the books and the merits of the artists.

The show was one of varied interests, but not for a moment did the amaryllis fail to hold the spotlight. It was the queen for the day and night, and all else was subordinate. Even the orchids remained respectfully in their corner and bowed their heads to the reigning monarch.

Visitors came first to see the amaryllis and also came last, so as to carry away the memory of satin petals, delicately marked, and unbelievable colors ranging from vivid scarlet to purest white. The size of the flowers was a matter of amazement. Indeed, mere human beings were apt to be awed in the presence of such enormous flowers, so that it was comforting to hear growers say that color and texture were constant aims for improvement, rather than an increase in size.

The list of out-of-town exhibitors included the following: Robert H. Jewel, New Rochelle, N. Y.; Russell Wolfe, Orangeburg, S. C.; Dr. Albert Fleming, Folkston, Ga.; William J. Leseman, Green Cove Springs; R. N. Wheeler, Orlando; and M. C. Varnier, Fort Pierce. The Howard Seed Company, Jacksonville had a fine display of bulbous plants.

The judges were Mrs. G. Walter Potter, Mrs. Vivian Collins, St. Augustine; Mrs. Endor Curlett, Sanford; Mrs. Addison Pound, Mrs. M. M. Parrish, Gainesville; Dr. H. H. Hume, Gainesville; E. L. Lord and R. W. Wheeler, Orlando, and C. J. Hudson, Jacksonville.

It seemed to the amateur flower lovers that these learned men and women could develop the fine points of the amaryllis like working out a theorem in geometry, and as for the hybrids and their ancestral history,

it was far beyond the comprehension of ordinary people but anyhow, respect and admiration for amaryllis in their complicated geneaology was greatly increased by the show.

Mrs. Frederick McConnel, President of the Garden Club, Mrs. Frederick Waas and Mrs. Millar Wilson, Show Chairmen, Mrs. W. E. MacArthur, who wrote countless letters to possible out-of-town exhibitors, and other members of special committees, worked hard to make the show the success which it was. Mr. Wyndward Hayward and other officers of the American Amaryllis Society, deserve the gratitude of flower lovers for their valuable assistance.

Newspapers and magazines were most generous in giving publicity to the event. We who were whole-heartedly interested in the show and feel that it served the purpose of any true flower show—it gave pleasure to all comers, and it spread a desire to grow more amaryllis, for even "Solomon in all his glory was not arrayed like one of these."

TWO DAFFODIL SHOWS IN MID-WINTER

Jan de Graaff, *Oregon*

The Christmas Show in Sassenheim, Holland, December 23, 1938 which was held the week before Christmas provided an opportunity for the leading Holland growers to show what modern hybrid daffodils, cured and prepared along the latest scientific lines, could do to increase the variety of flowers available during the holidays.

As one of the trade papers reported: "A few years ago it would have been beyond one's dreams to expect a large collection of new daffodils so early. Now at Sassenheim there was not one collection but two, each one worthy of the large silver cup that was offered. After long deliberation the special jury decided that, since both collections were equally worthy and since there was only one cup offered, they would themselves pay for an exact duplicate of the cup and in this way reward both exhibitors."

The prize winning collections were shown by Messrs. Warnaar & Co., and by de Graaff Brothers Company, and contained among others the following varieties: Fortune, Magnificence, Mrs. Barclay, St. Agnes, Livia, Decency, Mary Florence, Scarlet Leader, Francisca Drake, Marion, Achievement and Golden Attraction. Scarlet Leader is especially mentioned in the reports that I received as one of the finest daffodils at this Christmas show.

Other exhibitors brought good flowers of Helios, Godolphin, Giant Perfection, Alasnam, Orange Cup and M. van Waveren & Sons brought a pan of Magnificence with six bulbs and twenty-six flowers of good quality.

It must be mentioned that at that time Holland was "enjoying" a Siberian winter and that it was, therefore, all the more noteworthy that such a large special show could be held.

It would be impossible to mention or report on all the special flower shows held each Monday in the General Bulb Growers Society's rooms at Haarlem, Holland, but the show of January 2, 1939, deserves special

Mohr Bros., Copenhagen See page 60

Mohr Bros. amaryllis exhibit, Copenhagen, Denmark, Flower Show, 1938, upper; Mohr Bros. amaryllis greenhouse, lower. Note that Mrs. Mohr appears at the left.

Plate 134

mention as it was a remarkable exhibition of growers' skill. Many daffodils were shown and, as required by the Society's rules, the treatment that the bulbs had undergone before forcing was reported to the public. We find that several varieties of daffodils exhibited were not treated in any special way. Of these, February Gold, the attractive cylamineus seedling, and a new yellow trumpet called Innovation were outstanding. Another group of daffodils was grown in a normal way, but the bulbs had been cold-storaged before forcing. Of these special mention must be made of Orange Glow, Poeticus Dulcimer and Incomparabilis Clamor.

The last group consisted of bulbs grown in a cold greenhouse, in which they normally ripen a couple of weeks before bulbs grown outside. After a short period of curing, they were cold-storaged and subsequently forced. Among the varieties treated in this manner were Leedsii,—Mrs. Nette O'Melveny; White Trumpet,—Ada Finch; and several others.

These methods of treatment have opened entirely new vistas to the daffodil growers. No longer is earliness under normal field conditions an indication of the value of a new flower to the greenhouse men. We now find that many so-called late varieties react very favorably to cold storage treatment and that, therefore, they have at least equal value for forcing as the early types.

MOHR AMARYLLIS EXHIBIT, COPENHAGEN, DENMARK, 1938

Wyndham Hayward, *Florida*

What is undoubtedly the largest indoor culture of hybrid amaryllis in northern climates is being developed near Glostrup, Denmark, by Mr. O. Mohr, a member of the American Amaryllis Society for several years and a sincere lover of amaryllis and related plants. Mr. Mohr is a member of the firm of Mohr Bros., which has been a leading rose grower and producer of forced flowers in Denmark for a number of years.

Mr. Mohr sent the Society the pictures which are reproduced in this number of Herbertia, showing the large greenhouse of the bulbs with Mrs. Mohr in the foreground and a display of hybrid amaryllis blooms from Mr. Mohr's commercial collection at the Fall 1938 Copenhagen flower show (Plate 134). Mr. Mohr writes that because of the "crisis" at that time, attendance was low.

The collection was built up recently by purchase of seeds and bulbs from the leading commercial Amaryllis growers, breeders, hybridizers in America and Europe. Mr. Mohr expects to have more than 100,000 blooming size bulbs in another year. His collection includes numbers of pure whites, deep self reds and many other desirable shades. He was planning to send some bloom spikes to the 1939 Chelsea Flower Show of the Royal Horticultural Society in England as an experiment, last May.

The bulbs will be used to produce cut spikes of bloom for sale in the European flower markets, and also for the production of fancy pot plants as well as breeding stock.

THE 1939 AMARYLLIS SHOW OF THE BUREAU OF PLANT INDUSTRY U. S. DEPARTMENT OF AGRICULTURE

The twenty-sixth annual Amaryllis Show of the U. S. Department of Agriculture was held at the Department Greenhouse, Fourteenth Street and Constitution Avenue, N. W., Washington, D. C., from March 25 to April 2, 1939, inclusive. It was open each day from 9:00 a. m. to 9:00 p. m. and was viewed by 28,338 people.

The exhibition comprised 1,260 amaryllis bulbs, each bearing two or three flower stems with two to seven flowers on each stem. Thus there were displayed several thousand flowers ranging in color from dark velvety red through various shades of red, pink, orange, yellow-orange and striped types to pure white. The plants were arranged in the exhibition house on two side benches and on a center elongated pyramidal staging. Small pots of Vinca major with rounded grey-green leaves edged with white were placed between the pots of amaryllis to form a pleasing combination with the pointed dark green leaves, thick silvery green flower stems and clear bright blossoms of the amaryllis. Baskets of Streptosolen jamesonii and Lantana Weeping Lilac-rose were hung alternately from the roof of the greenhouse. Several large pots, each containing a group of bulbs in flower, were placed along the ridge of the center staging to provide accent notes.

The bulbs in the Department's collection of amaryllis are hybrids resulting from many years of breeding work carried on by Department of Agriculture experimenters since 1909 when twelve varieties were imported from England. The Amaryllis Shows are exhibitions of the work to produce improved plant forms. Department workers with amaryllis have successfully endeavored to obtain longer stems, new shades and larger flowers. The white amaryllis was produced through successive selection and cross-pollination of striped flowers showing the most white. A group of seedlings, flowering for the first time this spring, revealed larger flowers, longer and heavier stems.

SEVENTH NATIONAL AMARYLLIS SHOW MONTEBELLO, CALIFORNIA, 1940

The Seventh annual National Amaryllis Show will be held next spring in Montebello, Calif., at the Howard & Smith establishment, according to plans announced in September by a committee of the California members headed by Messrs. Fred H. Howard, W. E. Rice and Cecil Houdyshel.

The tentative dates are April 12-14, 1940, Friday, Saturday and Sunday, two weeks after Easter.

Mr. Howard will grant the Society the use of his Nursery and greenhouse display rooms for the exhibition, free of charge and will provide assistance by his staff of employes. It is contemplated to set an admission charge of 25 cents for the show, the proceeds derived from the sale of admissions to go toward the expenses of publishing the Society's yearbook, Herbertia.

Further information can be obtained by writing to Mr. Fred H. Howard, Montebello, Calif., or Mr. Cecil Houdyshel, LaVerne, Calif. Plans for the 1940 show were first drawn up at a meeting of members of the Society at Mr. Houdyshel's home in LaVerne, Calif., during the Los Angeles County Fair in September, 1939, when the annual Fall Amaryllis Show sponsored by the Society was in progress.

2. COLOR DESCRIPTION

THE ROYAL HORTICULTURAL SOCIETY COLOR CHART

EDWARD STEICHEN, *Connecticut*

The first volume of the Royal Horticultural Society Color Chart is sufficiently complete in itself to establish its value as a standard for color nomenclature in horticulture. It is practical in its application and, most important of all, considering the great expense of such an undertaking, it is sold at a very reasonable price.

I have used it extensively during the course of this past summer in checking the colors of numerous kinds of flowers. All flowers that come within the scope of the present volume can easily be "color analyzed" with reasonable accuracy. There are, however, some flowers that will have to await the publication of future volumes and additional color charts before they can be described. There are also certain elements which go into the making of a color impression, such as the gradation of merging tones, which no description based entirely on a chart can completely solve. There is also the matter of under and overlay of warm and cold colors and of texture differences changing the general impression of similar or like colors.

It is a mistake to imagine that all you have to do is open up the book and juxtapose the color samples of the chart with flower petals. Anyone who plans to use the book must give the matter considerable time and study. It will be necessary to become familiar with and adopt the exact meaning of the terms, color, hue or shade that are used in the book. The technical meanings of these terms as described in the book are often quite different from the general conception of their meanings. The chart does not actually solve the problem of defining colors for you but materially assists you in defining them accurately. The chart acts as a measuring meter. It requires careful and considered use; it cannot reliably be used in the field because of changing light conditions there. All the comparisons should be made by a window with north light, and preferably towards the middle of the day so that a reasonably constant comparison factor is obtained. The readings made by an inexperienced gardener are apt to be only fairly accurate because of variations in the human judgment equation.

In comparing the judgments of an artist, a color photographic technician, and an interior decorator, their readings were found to be about 95% alike. In testing it on four gardeners, who were without previous experience in color matching and without any knowledge of the theories of color contrast, etc., the results were less than within 75% in accord. I am sure that these same gardeners with more experience with the chart would come closer to an accord. It is easy to foresee that whereas an experienced and color-sensitive person might describe the color of a flower as he saw it in the terms of the color chart, a purchaser of the plant, without any experience and with a casual comparison with the chart may violently disagree with the description and be a dissatisfied customer. This brings up the question of the practical value of such a

chart. It can be of no value to the general plant-buying public unless they can be induced to buy the chart and to learn how to use it. I doubt whether it is reasonable to expect this to happen. To the breeder talking to the grower or to the distributor it can be an entirely satisfactory means of color description, and it can be of like value to the botanist in speaking to another botanist about the color of plant material.

I hope the Amaryllis Society officially adopts the book and thereby gives the theory of standardized color nomenclature a real and general working test. Until such a working test is made by a considerable number of gardeners and horticulturalists who have a similar interest we cannot know how valuable or how useful such a chart may become. It is well for all of us to bear in mind that even if this chart were as accurate a color-measuring device as the spectroscopic photograph can be, it does not mean that we have solved all of the problems of describing the color of a flower. There are certain subtle complex psychological factors involved in our emotional reaction to flower colors that this form of measurement cannot describe. I believe that these reactions are more responsible for the preferences people have for certain flowers than a factual description of the colors can reveal. In this connection we must also bear in mind the prejudices that breeders or growers are sure to have in favor of new breaks in color which, after they are no longer new, may be meaningless. For instance, I am inclined to doubt the eventual popularity of the fulvous and chocolate and mahogany colored daylilies, unless they are varieties producing 8 to 10 inch flowers. I would be willing to bet heavily on the future of a pure white or clear rose pink colored daylily.

Among Oriental poppies there has recently been introduced a flower of a new and unusual color break. It is a brilliant and vivid watermelon pink color, called "Wunderkind." This color apparently has been welcomed and regarded as a sensation by many specialist poppy growers and some gardeners. In my garden I have found that without exception people with a cultivated color taste, and without knowing of the unusualness or newness of this particular color in poppies, thoroughly dislike it. I have heard it variously called "horrible," "vulgar," and "rasping." It takes more than an accurate color description of a flower to make people love it.

3. DESCRIPTION, CLASSIFICATION AND PHYLOGENY

A REVIEW OF THE GENUS CYRTANTHUS

R. A. Dyer,

Division of Plant Industry, Pretoria

This review of the genus *Cyrtanthus* arose mainly out of a suggestion by your Editor. He thought it would serve a useful purpose if the information recorded since the Flora Capensis of 1896, were correlated with earlier literature. In the preface to 1938 Herbertia he wrote "Other plant subjects that are coming into their own are *Cyrtanthus* * * * * * *Cyrtanthus* appear to be excellent for forcing and some of the species at least are of the easiest culture. As pot plants they are unexcelled".

The following review has been prepared in a relatively short time and is consequently a preliminary treatment not intended to take the place of a careful monograph, which is none the less desirable. A monograph in the present state of our knowledge would, however, be premature. There are too many species about which only incomplete information exists. It has, moreover, been a serious handicap to the writer to undertake this review without the opportunity of making a critical examination of the material at the Royal Botanic Gardens, Kew, which formed the basis of Baker's monograph in the Flora Capensis, 1896. To have made a request for the loan of the Kew material in such troublous times as exist at the moment was out of the question. It is most desirable that collectors and growers alike should co-operate with scientific institutions to accumulate helpful data with a view to making possible a monograph at some future date. Further information is required on such points as the plants as they grow in the veld and under cultivation, the nature of the bulbs, whether the leaves are contemporary with the flowers, how long they persist, their shape, the shape of the perianth-tube and of the lobes, the colour of the flowers, and particularly any details likely to be lost during the preservation of a specimen for incorporation in a herbarium. Complete specimens, accompanied by careful notes and sketches or photographs, are invaluable to the scientific worker, who is entrusted with the task of revision. Locality records are often of considerable assistance in the task of identification, absence of them is a frequent source of confusion.

Based on present records, *Cyrtanthus* is the largest genus in the family *Amaryllidaceae* in Africa, consisting of 44 species.

Brief History of the Genus

The name *Cyrtanthus* meaning "curved flower" was established by W. Aiton in 1789 in his "*Hortus Kewensis*". He used it for the two species *C. angustifolius* and *C. obliquus,* both of which had previously been described by the younger Linnaeus in 1781, under the generic name *Crinum.* From time to time further species were described by different authors, but not always under the generic name *Cyrtanthus.*

When, in 1837, William Herbert, after whom *"Herbertia"* is named, reviewed the genus in his *"Amaryllidaceae"*, he laid the foundation of our present conception of the genus, enumerating 10 species under *Cyrtanthus* and one under *Gastronema (G. clavatum)*. Previous to this, however, he had considered *C. obliquus* (one of Aiton's foundation species) to differ so much from the rest of the then known species, that he adopted the generic name *Monella* for the latter group. This classification he soon found it desirable to modify, especially when *C. carneus* became known to him, since this was a connecting link between the *C. obliquus* and *C. angustifolius* types of flower.

The next piece of work of importance was the monograph of J. G. Baker who, in 1888, published his *"Handbook of the Amaryllideae"*. Having 20 species under his examination, he went a step further than Herbert and combined the genus *Gastronema* with *Cyrtanthus*, which latter he proceeded to subdivide into three *subgenera: Cyrtanthus proper, Monella* and *Gastronema*, using for his subgeneric names, it will be noted, the two generic names which he placed in the synonymy of *Cyrtanthus*.

By 1896, when Baker monographed the genus for *"Flora Capensis"* he enumerated 24 species but increased this number to 26 in the addendum to the volume.

It may be mentioned in passing that Baker placed *C. vittatus*, for which no locality record is available, in the subgenus *Monella*, where it does not happily belong; in fact I have some doubt as to whether it belongs to *Cyrtanthus* or if it represents an indigenous South African plant. It is only known from the coloured illustration in Redoute's *"Les Liliacées"*, an adaptation of which is reproduced here to enable anyone possessing definite knowledge of its true identity or habitat to make it known. Several other modifications to Baker's classification in *"Flora Capensis"* have been necessary. These will be referred to under the respective species.

Baker records two species in *"Flora of Tropical Africa"; C. Welwitschii* and *C. sanguineus* (also in South Africa).

Since Baker's time a further 16 specific descriptions have been published by various authors. When describing for the first time, *Cyrtanthus Fergusoniae* in *"South African Gardening and Country Life"*, 1931, Dr. L. Bolus took the opportunity to make a few general remarks on the genus. Embodied in this article is the original description by Barker, of the smallest known species in the genus, namely *C. flavus*.

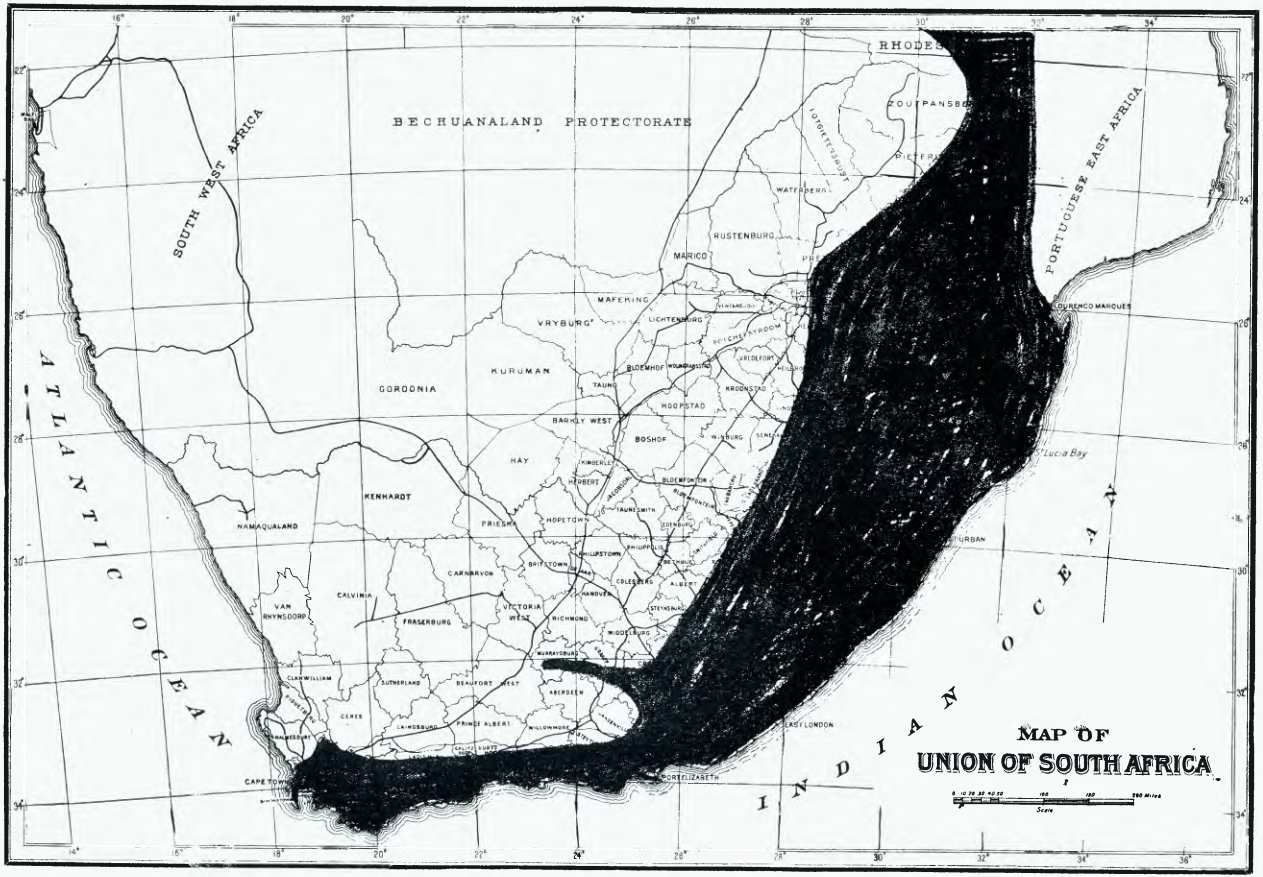
My examination of the herbarium material housed in the main South African herbaria has revealed three groups of plants which appear to be undescribed and to merit specific rank. For these I have used the names *C. falcatus, C. attenuatus* and *C. bicolor*. Two varieties have been established under *C. stenanthus* and *C. Mackenii*. There are other specimens, the identity of which remains uncertain. Fuller information must be sought in the veld to fill in the unavoidable gaps in our present knowledge. Thus with additions and subtractions to previous conceptions, the number of species dealt with here is 44.

From time to time, by the discovery of additional species, the artificial barriers between the subgenera established by Baker have been

R. A. Dyer, Pretoria See page 70

Cyrtanthus Mackenii Hook f. in a Pretoria, South Africa, Garden, June 1939

Plate 135



See page 69

Distribution map of Cyrtanthus in South Africa; the shaded area indicates the range.

Plate 136

progressively destroyed. Even the gap between the the two genera *Cyrtanthus* and *Vallota* has been closed further by the discovery of *C. Guthrieae*. In the words of the author of the species, Dr. L. Bolus "The spread of the perianth and the relatively long tube are more characteristic of *Vallota* than *Cyrtanthus,* but there is no doubt the two genera are very closely related, and *C. Guthrieae* may almost be considered a connecting link". In view of my present uncertainty on the most useful method of subdivision, I have decided to dispense with subgenera.

Distribution

The genus *Cyrtanthus* is restricted to the continent of Africa. Here it has its northern limit in Angola and British East Africa represented by *C. Welwitschii* and *C. sanguineus* (fide Baker), respectively. More extensive collecting in the tropical area may well reveal further species in this area but on present records the only other species recorded outside the Union of South Africa is *C. rhodesianus.* Within the Union the number of species steadily increases from the north on its way through the Transvaal and Natal to the eastern Cape. The eastern Cape may be looked upon as the headquarters of the genus, for as the western Cape area is approached the number of species again decreases. The distribution from the north lies mainly along the mountain ranges in moist places, in open grassveld and on cool rock ledges. Unlike many other genera with bulbous rootstocks, *Cyrtanthus* is not represented in the arid Great Karoo nor in the equally dry area of Namaqualand. *C. Macowani,* however, is found as far as Murraysberg overlooking the Karoo but even here the conditions on the mountain ranges are not excessively severe. And, further, a very few species, for example *C. Smithiae* and *C. helictus* penetrate semi-arid areas in the eastern Cape Province, such as the Great Fish River Valley, where, under exceptional conditions, the rainfall may be as low as 12 cm. (5 ins.) over a period of a year. (See Plate 136.)

Some species are apparently extremely rare, whereas others are excessively common. In the midlands of Natal after grass fires in the early spring, one may gather literally baskets full of *C. contractus,* the red "fire lily" as it is popularly known. It may be found commonly in unburned grassveld also but the grass fire does appear to have a stimulating effect. The common name "fire lily" is not restricted to *C. contractus.* Several other plants, including *Anoiganthus breviflorus* Baker, also pass by that name in certain areas.

C. Mackenii and the newly recognised variety *Cooperi* are frequent in the southern parts of Natal and eastern Cape extending from the coast to the high mountain ranges inland. These plants commonly known as "Ifafa lilies" are possibly the most widely cultivated forms locally.

Cultivation

To those eager for cultural hints I come more or less empty handed. But it will no doubt interest them to hear what Herbert had to say in this respect in 1837, remembering of course that only about a dozen

species were known at the time. Referring to *C. obliquus* and *C. carneus,* he observes that he found them "altogether plants of difficult culture, the bulbs being more disposed to dwindle and rot than to increase in bulk" the greenhouse usually being too damp for them in winter and the air of a hot stove too confined. Speaking generally, Herbert remarks that " a light soil which is not retentive of water will be found to suit the whole genus". On the other hand he found that there is some peculiarity in the soil congenial to them which is very difficult to analyse. In support of this he says, "When I lived at Mitcham in Surrey, *C. angustifolius* was a weed with me, ripening seed freely and the seedlings quickly came to a flowering age and were vigorous, being potted in soil of Mitcham common".—"Since I have lived in Yorkshire I have been able to find no soil that suited it—nor have I found any species of *Cyrtanthus* succeed well in the soils to which I have access here". His experience led him to believe that "a soil that is more disposed to set firm and not fall to pieces when turned out of the pot", should be used but "the difficulty is to find a light soil which has a little tenacity".

How much further has our knowledge advanced on this interesting question of successful cultivation in the 100 years elapsed since Herbert made his observations? If all the information possessed by growers throughout the world were available for incorporation here, it would probably be found to be considerable. Unfortunately I have little advice to give. The notes on distribution and habitat and the general information accompanying many of the specific descriptions in the enumeration which follows later, should afford useful hints as to the treatment most likely to produce satisfactory results. In another article in this issue Miss K. C. Stanford makes several interesting remarks bearing on the subject.

Many gardens of the Natal coast have luxuriant borders of *C. Mackenii* in sandy loam. My neighbour in Pretoria, a photograph of whose plants (Plate 135) appears in this volume, does well with this species in a light sandy loam enriched with well-rotted farm manure.

Those species which normally flower with the leaves stand more liberal watering than those accustomed to a longer resting period without leaves.

ACKNOWLEDGMENTS

To have undertaken the review of such a genus as *Cyrtanthus* within a relatively short time certainly has the air of foolhardiness. Had it not been for the generous loan of herbarium specimens from all the more important herbaria in South Africa it would have met with certain failure. I owe special thanks to the Curator of the Bolus Herbarium, The Directors of the South African Museum and of the Albany Museum, and to the Mycologist in Charge, Natal Herbarium, for the loan of specimens. Miss M. E. Connell, artist at the National Herbarium, Pretoria, has adapted illustrations from various botanical works to suit the requirements of the article and has prepared three original drawings; and several other colleagues have aided me in sundry respects, for all of which assistance I am very grateful.

General

The "key" to the species which follows later is by no means an infallible avenue for the identification of the species. It is a rough guide, in parts constructed from descriptions and figures, and this point must not be lost sight of. To aid further towards identification, figures of the inflorescences and leaves are given of a number of species. These have been adapted as far as possible from type figures or figures of authentically named specimens. Always read the descriptions and locality records before finally deciding on any identification. The presence or absence of leaves at the time of flowering must not necessarily be considered of specific importance, since some species are known only from cultivated plants and others only from wild plants. In the wild state some bulbs of species such as *C. contractus* may produce flowers before the leaves, whereas others, within a radius of a yard or so, may have a leaf well developed by the time of maturity of the flowers. In this and other similar species bulbs may not flower every year, and those which do not bear an inflorescence, usually produce leaves earlier than their neighbours with inflorescences.

Characters of the Genus Cyrtanthus

Rootstock a tunicated bulb. *Leaves* contemporary with or produced later than the inflorescence. *Peduncle* or scape hollow or rarely solid. *Flowers* umbellate, subtended by 2-4 bracts, suberect, nodding or pendulous; *perianth* tubular for more than half its length; *lobes* subequal nearly as long or considerably shorter than the tube, 3 outer lobes furnished within the apex with an incurved point or tuft of hairs. *Stamens* usually inserted in the perianth tube, anthers oblong, dorsifixed, versatile. *Ovary* three-celled; ovules numerous, crowded, superposed; *style* long, filiform indistinctly or distinctly three-lobed at the stigmatic apex. *Capsule* mostly oblong, loculicidally three-valved; seeds flattened, somewhat winged, testa black.

Key to the Species

A. Flowers several to many in an umbel, rarely three or less, perianth not bell-shaped:
  B. Bulbs large, 6-10 cm. diam., partly above ground, copiously covered with dry leaf-bases; leaves somewhat leathery, strap- or sickle-shaped, 3-6, rarely only 2 cm. broad:
    C. Leaves strap-shaped, twisted once or twice at maturity, rounded at the apex:
      D. Perianth-throat about 2 cm. wide; tips of lobes slightly converging ..... 1. *obliquus.*

      DD. Perianth-throat about 1 cm. wide; lobes slightly spreading ..... 2. *carneus.*

    CC. Leaves sickle-shaped, not twisted, contracted gradually to the apex; perianth throat about 1 cm. wide ..... 3. *falcatus.*

BB. Bulbs rarely up to 4 cm. in diam., leaves from filiform up to 2.5 cm. broad (up to 4 cm. in *C. Huttoni):*
E. Flowers yellow, cream or white, suberect or spreading:
F. Perianth not constricted at the throat:
G. Flowers white ..... 6. *Mackenii.*
GG. Flowers yellow or cream:
H. Bulb and neck inclusive 5 cm. or less long:
I. Perianth 2 cm. long, broadest about the middle; flowers 2-3, yellow ..... 4. *flavus.*
II. Perianth 2.5-3 cm. long, tube narrowly funnel-shaped, lobes slightly connivent to slightly diverging ..... 18. *bicolor.*
III. Perianth 3.5-5 cm. long, lobes spreading or reflexed:
J. Leaves 5-10 mm. broad present at the time of flowering; bulbs increasing by budding ..... 6. *Mackenii* var. *Cooperi.*
JJ. Leaves filiform or up to 2 mm. broad, absent at or produced during flowering period ..... 5. *ochroleucus*
HH. Bulb and neck inclusive 9-14 cm. long; perianth 6-7 cm. long, yellow:
K. Perianth-lobes about 6-8 mm. long, leaves 0.5-1 cm. broad ..... 7. *attenuatus.*
KK. Perianth-lobes about 1.5 cm. long; leaves 1-2 cm. broad, obtuse ..... 8. *Flanagani.*
FF. Perianth-tube very slender, slightly constricted at the throat, lobes becoming recurved, flower yellow ..... 9. *stenanthus* var. *major.*
EE. Flowers with red as predominating colour:
L. Perianth-tube very slender, constricted at the throat; lobes spreading or recurved ..... 9. *stenanthus.*
LL. Perianth-tube dilated fairly evenly from the base; lobes usually somewhat connivent:
M. Perianth 2.5-3 cm. long; lobes 5-6 mm. long ..10. *parviflorus.*
MM. Perianth 2.5-3 cm. long; lobes 1-1.2 cm. long ..... 18. *bicolor.*
MMM. Perianth 3.75-5 cm. long; lobes 6-9 mm. long ..... 23. *Tuckii.*
LLL. Perianth-tube dilated evenly from the base to the throat; lobes spreading or reflexed:
N. Inner perianth-lobes subglobose, rotund or shortly oblong, less than 8 mm. long (see also *C. rectiflorus):*
O. Peduncle or scape solid, perianth-lobes widely spreading or revolute:
P. Leaves 5-7 mm. broad ..... 11. *suaveolens.*
PP. Leaves about 1.7 cm. broad ..... 12. *rotundilobus.*
OO. Peduncle hollow (fistulose):
Q. Perianth-tube rarely more than 5 mm. wide at the throat; leaves less than 1 cm. broad; plants growing in open veld:
R. Perianth-lobes spreading ..... 13. *O'Brieni.*

RR. Perianth-lobes ultimately spreading-reflexed ..... 14. *Macowani.*

QQ. Perianth-tube about 8 mm. wide at the throat, lobes spreading reflexed, leaves 1-2 cm. broad, plants growing on trees or rocks with roots embedded in moss ..... 15. *epiphyticus.*

NN. Inner perianth-lobes oblong or oblong-lanceolate, 1-3 cm. long:

S. Leaves 2.5-4 cm. broad, 50-60 cm. long; perianth 3.5-4.5 cm. long, lobes 1-1.5 cm. long, spreading ..... 17. *Huttoni.*

SS. Leaves rarely up to 2 cm. broad and usually less than 40 cm. long or not present at time of flowering:

T. South African species (but see also Trop. Afr. spp.):

U. Perianth usually less than 4 cm. long.

V. Perianth 2.5-3 cm. long, tube as long or somewhat longer than the lobes; leaves absent or one produced during flowering period ..... 18. *bicolor.*

VV. Perianth up to 2.5 cm. long; tube somewhat longer than the oblong-lanceolate lobes ..... 19. *brachyscyphus.*

VVV. Perianth 2.5-3 cm. long; tube twice as long as the oblong lobes ..... 20. *rectiflorus.*

VVVV. Perianth 3.5-4 cm. long, tube 4-5 times as long as the oblong lobes ..... 21. *Junodii.*

UU. Perianth 4.5-6.5 cm. long; lobes about 1 cm. long.

W. Perianth lobes broadly oblong-elliptic, rose scarlet ..... 16. *rhododactylus.*

WW. Perianth-lobes ovate, red ..... 25. *angustifolius.*

WWW. Perianth-lobes ovate, tube red with yellow stripes ..... 26. *striatus.*

UUU. Perianth 4.5-8 cm. long, rarely less; lobes 1.5-3 cm. long:

X. Perianth about 4.5 cm. long, pale red; lobes about 1.75 cm. long, 6-7 mm. broad ..... 27. *pallidus.*

XX. Perianth 5-6 cm. long, bright red, lobes about 1.5 cm. long, narrowly oblong ..... 28. *odorus.*

XXX. Perianth 6.25-7.5 cm. long, "lobed about half way down," somewhat asymmetrical, "coral red" ..... 29. *inaequalis.*

XXXX. Perianth 6-8 cm. long, "brilliant red," lobes 2-3 cm. long ..... 30. *Fergusoniae.*

TT. Tropical African species (possibly extending into Zululand):

Y. Perianth 3.5-4.5 cm. long, lobes narrowly oval, about 1 cm. long; leaves undescribed ..... 22. *rhodesianus.*

YY. Perianth 3-3.75 cm. long, lobes oblong-lanceolate, rather shorter than the tube, leaves contemporary with the flowers ..... 23. *Welwitschii.*

LLLL. Perianth-tube narrow for a short distance at the base, inflated above (not evenly dilated from base to throat) contracted or not at the throat:

Z. Leaves flat or slightly grooved above and keeled below:

A'. Perianth-tube smooth, red; perianth 6.5-7.5 cm. long ..... 31. *contractus.*

A'A'. Perianth-tube smooth, the typical form with six whitish lines extending along the perianth; perianth about 5 cm. long ..... 32. *collinus.*

A'A'A'. Perianth tube fluted:

B'. Perianth 5-5.5 cm. long, lobes 1.5-1.75 cm. long; style hardly lobed at the apex .... 33. *ventricosus.*

B'B'. Perianth 4.5-5 cm. long, lobes about 1 cm. long; style trifid ..... 34. *staadensis.*

ZZ. Leaves spirally twisted, perianth 4-7 cm. long, lobes about 1-5 cm. long ..... 35. *spiralis.*

AA. Flowers 1-2, rarely 3:

C'. Perianth-tube slender, trumpet shaped:

D'. Perianth lobes about 2 cm. long, 0.9-1.2 cm. broad, flowers cream ..... 36. *leucanthus.*

D'D'. Perianth lobes 4.3 cm. long, 1.9 cm. broad, flowers crimson ..... 37. *Guthrieae.*

C'C'. Perianth tube slender at the base, amply dilated above to the throat, upper portion more or less bell-shaped:

E'. Flowers white or shell pink with dark stripes down the back of the lobes:

F'. Leaves not twisted, 1-3 mm. broad; perianth 4-6 cm. long ..... 38. *clavatus.*

F'F'. Leaves spirally twisted:

G'. Perianth 4.5-6.5 cm. long; leaves 3.5 mm. broad ..... 39. *helictus.*

G'G'. Perianth 8-10 cm. long; leaves 5-8 mm. broad ..... 40. *Smithiae.*

E'E'. Flowers red or dark pink:

H'. Leaves 3-5 mm. broad, perianth about 3 cm. long, narrow basal portion of tube 5 mm. long ..... 41. *Thorncroftii.*

H'H'. Leaves 3-5 mm. broad, perianth 5-8 cm. long, narrow basal portion of tube 1.2-2 cm. long ..... 42. *Galpini.*

H'H'H'. Leaves 1-2 cm. broad, perianth 7.5-10.5 cm. long ..... 43. *sanguineus.*

AAA. Flowers several in an umbel; pedicels short, basal portion of tube long and slender, abruptly dilated above, flowers pink with dark stripes extending down the backs of the lobes ..... 44? *vittatus.*

Description of the Species

1. C. obliquus *(Linn. f.) Ait.* Hort. Kew, 1, 414 (1789).

Description.—Bulb subglobose, up to about 10 cm. in diameter, contracted into a neck above ground, covered with chestnut tunics, occasionally budding from the base into clumps of 3 or 4. *Leaves* 4-12 from a bulb, contemporary with the flowers, distichous, strap-shaped, 20-60 cm. long, 3-6 cm. broad, obtuse, twisted towards the apex. *Peduncle* 20-60 cm. tall, 1.3 cm. in diameter at the base, hollow. *Spathe-valves* ovate-oblong, acuminate, 3 cm. long, 1 cm. broad. *Pedicels* up to 2 cm. long, recurved. *Flowers* 6-12 in an umbel, pendulous; *perianth* about 7 cm. long, yellow and red or yellowish green tinged with red, or red on the tube passing into green on the lobes; *tube* straight or slightly curved at the base, dilated to a throat about 2 cm. wide, about 4.5 cm. long; *lobes* about 2.5 cm. long, and 1.5 cm. broad. *Stamens* in one row towards the base of the perianth-tube; filaments 3 cm. long. *Style* nearly equalling the perianth in length, slightly trifid at the apex. (Pl. 137,I.)

Distribution.—Cape Province, Knysna district and eastwards through the native territory of the Transkei into Natal.

Notes.—This species has been figured in several of the famous early botanical works and is certainly one of the most striking members of the genus. When writing the text accompanying plate 391 in *"Natal Plants,"* Medley Wood noted the following differences from Baker's description in *"Flora Capensis:"* leaves straight, not falcate, contemporary with, not produced after the flowers, perianth straight or nearly so, stamens equal, not biseriate, the stigma three-lobed, not capitate, etc. Harry Bolus confirmed Medley Wood's identification of *C. obliquus.* Baker may have had reasons for his statements about the leaves but in nature they are certainly contemporary with the flowers. Herbert recorded them as persistent. But Baker's statements concerning the stamens and stigma are misleading as they are also in his description of *C. carneus* Lindl.

The distribution of *C. obliquus* from Knysna district into Natal is intermittent. It may be found fairly abundantly in rocky grassveld areas, often with the bulbs wedged between rocks. It was first brought into cultivation about 1874 by Masson, a Kew gardener, who made a joint botanical excursion with the Swedish botanist Thunberg into the eastern Cape Province in 1873.

2. C. carneus *Lindl.* in Bot. Reg. t. 1462 (1831).

Description.—Bulb subglobose, 6-10 cm. in diameter, contracted into a neck above ground, covered with chestnut tunics. *Leaves* 8-10, apparently either persistent or deciduous and produced after the flowers, distichous, strap-shaped, about 45 cm. long 3-3.75 cm. wide, obtuse, twisted at maturity. *Peduncle* 30 cm. or more tall, glaucous, sometimes twisted. Spathe-valves 3-4, lanceolate, 3.5-5 cm. long. Pedicels 1.5-2.5 cm. long. *Flowers* 5-10 in an umbel, pendulous; *perianth* 6-7.5 cm. long, pink, paler towards the base; *tube* curved at the base dilated to the throat about 1 cm. wide, 4-5 cm. long; *lobes* elliptic-oblong, about 1.5 cm. long, 7.5-9 mm. broad. *Stamens* inserted in the middle of the perianth-tube; filaments about 2.5 cm. long. *Style* about equal to the perianth in length; stigma shortly three-lobed. (Pl. 137,II.)

Distribution.—Cape Province, Bredasdorp and Caledon districts.

Notes.—This species was introduced into cultivation later than *C. obliquus.* It was figured and described for the first time under t. 1462 of the *Botanical Register.* No definite native locality record was then known but specimens agreeing very closely with the type figure are recorded from sand-dunes near Elim.

Baker follows Lindley's description in most respects but departs from it in important details, for example he states that the stamens are inserted low down in the perianth tube *(C. obliquus* character) as against stamens inserted "into the middle of the tube," and stigma capitate instead of shortly three-lobed. As stated earlier I have not examined the specimens cited by Baker but I doubt very much whether the specimen cited from Alexandria Division *(C. obliquus* distribution) be-

longs to *C. carneus*. In this may be the explanation of the discrepancies in his description from that of Lindley. Both Lindley and Baker state that the leaves appear after the flowers, whereas Herbert, six years later than Lindley, included it in the section with persistent leaves: It is quite possible that bulbs under different conditions will react differently in the matter of leaf production.

3. CYRTANTHUS FALCATUS *sp. nov.*[1]

Description.—Bulb ovoid, 5-8 cm. in diam. contracted into a neck 8-12 cm. long, densely covered with membranous tunics. *Leaves* usually 4, contemporary with flowers or produced during flowering period, falcate, evenly narrowed to the apex, about 25 cm. long 2-3 cm. broad, leathery. *Peduncle* 25-30 cm. tall, recurved and somewhat flattened just below the umbel, making the whole umbel pendulous. *Spathe-valves* about 4, oblong-or linear-lanceolate, the largest up to 5 cm. long and 1.25 cm. broad. *Pedicels* about 1 cm. long. *Flowers* 6-10 in an umbel, pendulous; *perianth* about 6 cm. long, red, evenly dilated from the base to a throat about 1 cm. wide; *tube* 4 cm. long; *lobes* more or less obovate-oblong, about 2 cm. long and 1.25 cm. broad, the outer three with an inflexed apiculus with a few hairs. *Stamens* uniseriate or very indistinctly biseriate, inserted at the throat of the perianth-tube; *filaments* exserted, about 1.25 cm. long. *Ovary* oblong, becoming oblong-elliptic. *Style* slightly shorter than the perianth, trifid. (Pl. 138,I.)

Distribution.—Natal; Impendhle district, on the Inzinga River among rocks; also at Howick but no exact information available.

Notes.—The first herbarium record I have of this species is an infloresence in the Natal Herbarium. This was preserved in November 1905 from a plant in the Durman Botanical Gardens originally collected by J. Wylie. The original locality is, unfortunately, not recorded on the specimen sheet. In September 1932 Mrs. K. W. Anderson collected it at Inzinga in the Impendhle district and Mrs. A. C. Carter obtained it in the same locality in 1936. A collection by Mr. R. E. Symons at Howick is without date or exact locality records.

When Mrs. Carter forwarded her plant to the Natal Herbarium in 1932, Miss H. M. L. Forbes, then stationed there, suspected that it represented an undescribed species, and she has kindly handed over the duties of description to me.

C. falcatus is obviously most nearly related to *C. obliquus* and *C. carneus*. The recurved peduncle illustrated in the accompanying figure is, however, unique in the genus, and the broad falcate leaves are also very distinctive, hence the name of the species.

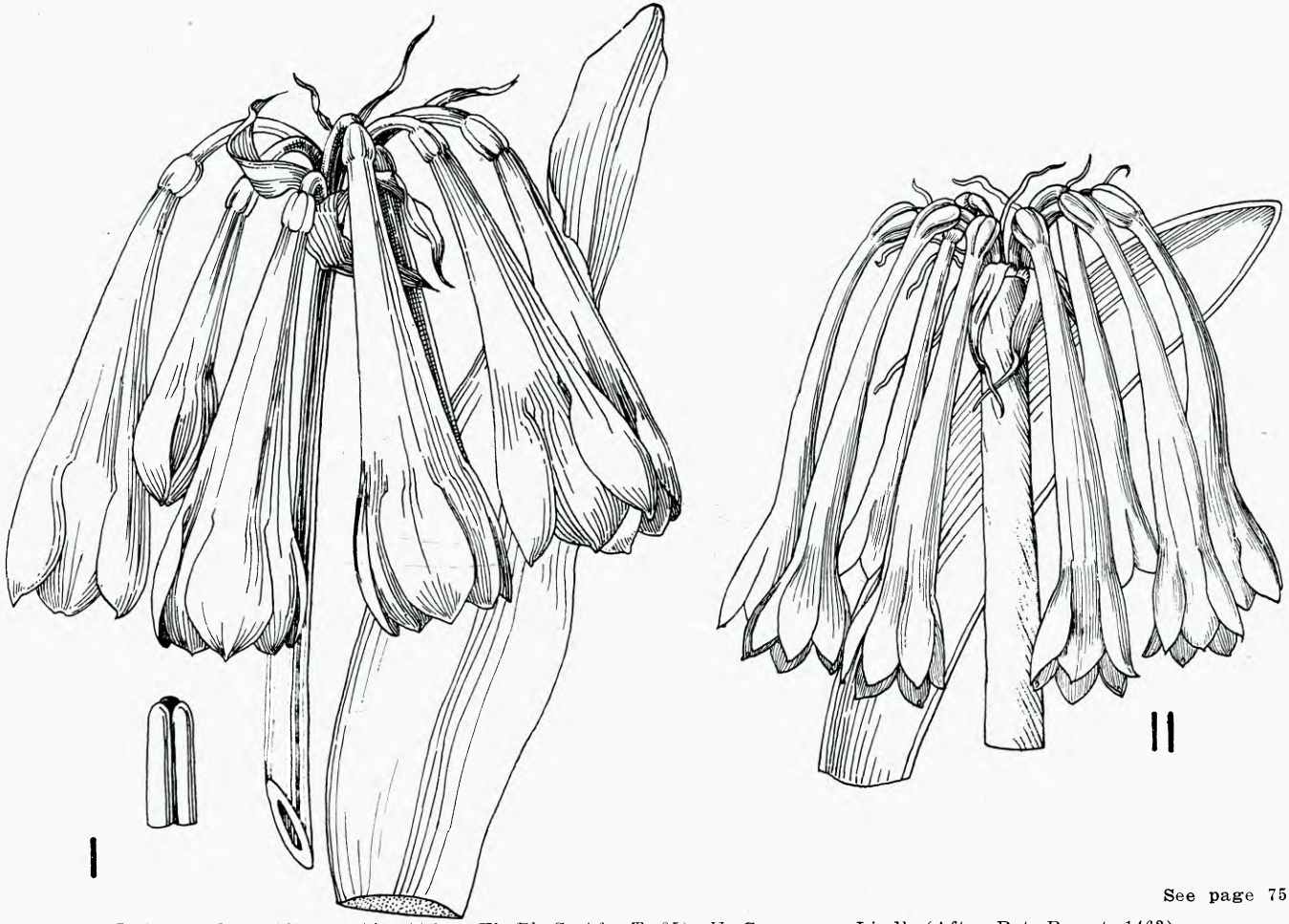
4. C. FLAVUS *Barnes* in S. Afr. Gardening & Country Life, *21*, p. 77 (1934); Fl. Pl. S. Afr. *14*, t. 559 (1934).

Description.—Bulb subglobose, 0.5-1.3 cm. in diam., produced into a neck about 1 cm. long. *Leaves* 1-2, contemporary with the flowers, linear, 7-15 cm. long, 1-1.5 mm. broad. *Peduncles* 1-2 from each bulb, slender, 20-25 cm. high, 2-3 mm. in diam. *Spathe-valves* linear-lanceolate or linear acuminate, about 2 cm long. *Pedicels* 1-2.5 cm. long. *Flowers* usually 2-3, rarely up to 5 in an umbel, suberect, canary yellow; *perianth* 2 cm. long; *tube* broadest at the middle; *lobes* slightly converging, ½ the length of the tube. *Stamens* biseriate, very short, well included. *Style* nearly as long as the perianth, trifid. *Capsule* globose or oval, 1-1.5 cm. long. (Pl. 138,III.)

[1] 3. Cyrtanthus falcatus **sp. nov.**, affinis **C. obliquo** Ait. et **C. carneo** Lindl. pedunculo apicem versus cernuo foliis falcatis facile distinguitur.

Bulbus ovoideus, 5-8 cm. diametro, in collo 8-12 cm. longo productus, brunneus. **Folia** 4, synantha, falcata, circiter 25 cm. longa, 2-3 cm. lata. **Pedunculus** 25-30 cm. longus, apicem versus compressus et cernuus. **Bracteae** circiter 4, oblongo—vel lineari—lanceolatae usque ad 5 cm. longae et 1.25 cm. latae. **Pedicelli** circiter 1 cm. longi. **Umbella** 6-10-flora; flores penduli; perianthium circiter 6 cm. longum, rubrum; tubus 4 cm. longus, superne gradatim ampliatus; lobi plus minusve obovato-oblongi, circiter 2 cm. longi, 1.25 cm. lati. **Stamina** uniseriata, ad faucem perianthii inserta, filamentis exsertis. **Ovarium** oblongum; stylus tubo perianthii exsertus, trifidus.

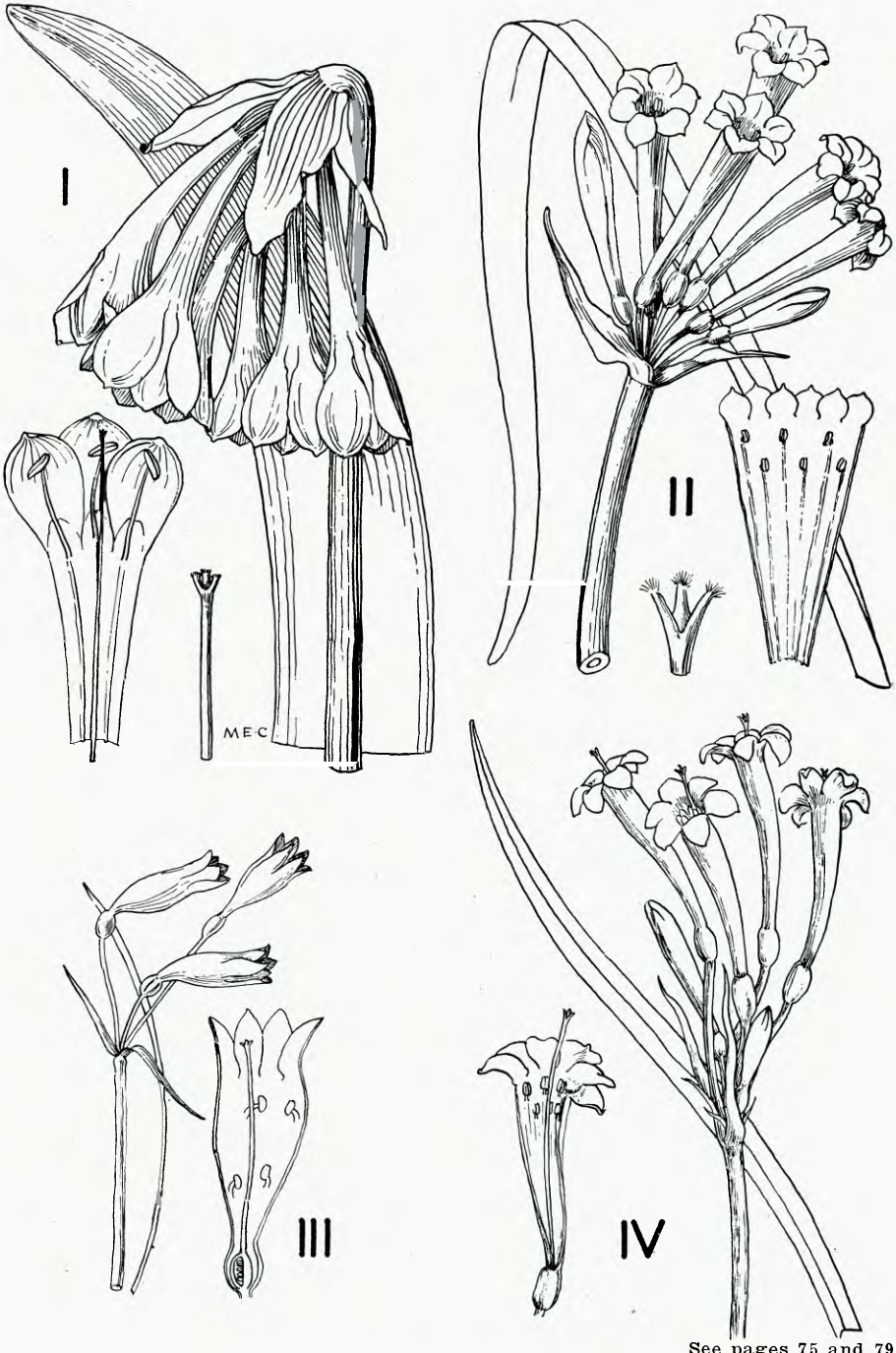
Distribution.—Natal; Impendhle district, Inzinga, Sept., **Carter** in Natal Herb. 30339 (type); among rocks at waterfall on Inzinga River, Sept., **Anderson** in Natal Herb. 22186; Howick, **Symons** in Nat. Herb. Pretoria, 24804.



See page 75

I, **Cyrtanthus obliquus** Ait. (After Fl. Pl. S. Afr. T 35); II, **C. carneus** Lindl. (After Bot. Reg. t. 1462)

Plate 137



See pages 75 and 79

I, **Cyrtanthus falcatus** sp. nov., R. A. Dyer; II, **C. Mackenii** Hook. f. (After Fl. Pl. S. Afr. t. 33); III, **C. flavus** Barnes (After Fl. Pl. S. Afr. t. 559); IV, **C. Mackenii** var. **Cooperi** R. A. Dyer (After Bot. Mag. t. 5374).
Plate 138

Distribution.—Cape Province; Bathurst district, Trappes Valley, abundant in small area.

Notes.—Our knowledge of *C. flavus* is limited to the type collection by Mrs. D. Hoole in 1930. It is remarkable for its small, suberect, bright yellow flowers, widest about the middle. Although it was found in moderate abundance in a small marshy area of sandy soil in Trappes Valley, it has not been recorded elsewhere. It is closely allied to the red-flowered *C. parviflorus* Baker.

5. C. OCHROLEUCUS *(Herb.) Burch.* ex *Steud.* Nom. ed. 2, 1. 475 (1840). *Monella ochroleuca* Herb. App. 29 (1821). *Cyrtanthus lutescens* Herb. Amaryllid. 129, t. 33, fig. 14 (1837); Baker in Fl. Cap. 6, 225 (1896).

Description.—*Bulb* globose, 2-2.5 cm. in diam. with a short neck. *Leaves* apparently produced after the flowers, linear or filiform, 1-2 mm. broad. *Peduncle* 15-30 cm. tall, slender, hollow. *Spathe-valves* 2, linear-lanceolate, 2-2.5 cm. long. *Pedicels* usually much shorter than the spathe-valves. *Flowers* 2-4 in an umbel, suberect; *perianth* 4-5.25 cm. long, very slightly curved, light yellow or yellowish white; *tube* dilated gradually from the base to a throat 5-7 mm. wide; *lobes* oblong, up to 1 cm. long, spreading. *Stamens* biseriate, included. Style exserted from the tube, very shortly trifid.

Distribution.—Cape Province; Riversdale and probably neighboring districts on the mountains at about 1500 ft. alt. and possibly extending to the eastern Cape.

Notes.—In classifying the plants included by Baker in *"Flora Capensis"* under *C. lutescens* and his variety *Cooperi,* the conclusion was arrived at that more than one species was included. The Galpin specimen, no. 654, cited by Baker, has been placed under *C. stenanthus* as var *major.* I was unable to distinguish specifically the typical form of *C. lutescens* var *Cooperi* from *C. Mackenii.* Therefore, left with the choice of regarding *C. Mackenii* also as a variety of *C. lutescens* or transferring *C. lutescens* var *Cooperi* Baker from *C. lutescens* to a variety of *C. Mackenii,* I have adopted the second alternative. It will be noted, however, that the name *C. lutescens* has to give place to the earlier name, *C. ochroleucus* Burch.

6. C. MACKENII *Hook. f.* in Gard. Chron. 1869, p. 641.

Description.—*Bulb* ovoid 2.5-4 cm. in diam. contracted into a neck and budding from the base. *Leaves* 2-6, contemporary with the flowers, linear, 20-30 cm. long, 0.5-1 cm. broad. *Peduncle* usually somewhat longer than the leaves, somewhat glaucous, hollow. *Spathe-valves* 2, lanceolate, 2.5-3.75 cm. long, green, spotted with red-brown when young. *Pedicels* in flower much shorter than the spathe-valves. *Flowers* 4-10 in an umbel, suberect; *perianth* about 5 cm. long, pure white or white with yellowish throat; *tube* slightly curved, 3.5-4.3 cm. long, dilated gradually from the base to a throat about 5 mm. wide; *lobes* ovate-oblong, 6-7 mm. long, 5-6 mm. broad. *Stamens* biserate, included; filaments very short. *Style* exserted, trifid, minutely bristly on the tips. (Pl. 138,II.)

Var COOPERI. *new comb.; C. lutescens* Hook. in Bot. Mag. t. 5374 (1863) non Herb.; *C. lutescens* Herb. var. Cooperi Baker Handb. Amaryllid. 58 (1888). Flowers yellow or cream. (Pl. 138,IV.)

Distribution.—Natal, moist places from Port Shepstone to Isipingo, never very far from the coast; var. *Cooperi;* Natal, Port Shepstone growing with the typical form and extending inland along valleys of southern Natal and of the eastern Cape to the mountain ranges.

Notes.—It will be observed from the synonymy above, that the variety *Cooperi* was formerly associated with *C. ochroleucus* Burch. *(C. lutescens* Herb.). Whether or not I am justified in dissociating the two forms is open to question. I am convinced, however, that the *C. lutescens* of Hooker in Bot. Mag. t. 5374 is not specifically distinct from *C. Mackenii.* Hook. f.

C. Mackenii commonly known as "Ifafa-lily" from the native name of the type locality, has been figured in several botanical works, probably the latest being Fl. Pl. S. Afr. t. 33 (1921).

It is generous under suitable conditions of cultivation. If grown in a moist situation it increases readily and flowers for a considerable period each year. In addition to the yellow or cream variety one sees occasionally in cultivation, plants whose flowers are suffused with pink. How they originated is not recorded.

7. CRYTANTHUS ATTENUATUS *sp. nov.*[2]

Description.—Bulb ovoid, 2.5-6 cm in diam. contracted into a neck 5-7 cm. long, covered with membranous tunics. *Leaves* 3-4, *contemporary* with the flowers, more or less linear, about 40 cm. long 0.5-1 cm broad, narrowed gradually to both ends. *Peduncle* 40-50 cm. tall apparently hollow. *Spathe-valves* 2, lanceolate, 4-5 cm. long. *Pedicels* 0.5-2 cm long. *Flowers* 6-9 in an umbel, suberect; *perianth* 6-7 cm. long, comparatively slender yellow; *tube* 5.5-6.5 cm. long very slender, gradually dilated to the throat 6-7 mm wide; *lobes* suborbicular, 6-7 mm. long, about 5mm broad, the outer 3 with an inflexed apiculus. *Stamens* biseriate with short filaments, extending to the throat of the perianth-tube. *Ovary* oblong. Style trifid. (Pl. 139,I.)

Distribution.—Basutoland; Leribe, damp slope near rocks.

Notes.—The specimens collected by Madame Dieterlen in 1910 have hitherto been considered forms of *C. Mackenii* var *lutescens* (C. lutescens var Cooperi Baker.) but they differ in the larger bulbs, generally taller habit and in the longer and comparatively narrow perianth tube. It also bears a strong likeness to *C. Flanagani,* which, however, is more robust in all respects and more showy. There is little doubt that *C. attenuatus* has a wider distribution than the neighborhood of Leribe in Basutoland but such haunts on the mountain ranges in which one would expect to find it are unfrequented by botanical collectors.

8. C. FLANAGANI *Baker* in Fl. Cap. *6,* 532 (1897).

Description.—Bulb 3 cm. in diameter extended into a neck up to 11 cm. long, budding from the base. *Leaves* up to 4, contemporary with the flowers, up to 20 cm. long or probably more at maturity, 1-2 cm. broad, narrowly strap-shaped, somewhat falcate, obtuse. *Peduncle* about 20 cm. long, somewhat compressed. *Spathe-valves* 2, lanceolate, up to 5 cm. long and 1.1 cm. broad, white with red veins. *Pedicels* up to 2.5 cm. long, green. *Flowers* 4-7 in an umbel, suberect; *perianth* 6-7 cm. long, yellow; *tube* narrowly trumpet-shaped, dilated from 1 mm. at the base to 6 mm. at the throat, 4-5.5 cm. long; *lobes* oblong, spreading, 1.5 cm. long, 8-9 mm. broad, the outer three slightly broader than the inner ones. *Stamens* biseriate, inserted near the mouth of the perianth-tube, included. *Style* slightly exserted, three-lobed. (Pl. 139,II.)

Distribution—On the mountains of the eastern Cape Province in the Transkei area, extending along the Drakensberg to Mont Aux Sources on the Natal border.

Notes.—It was not until this species was investigated by Miss I. C. Verdoorn for *"Flowering Plants of South Africa"* t. 693 (1938), that this species became properly understood. Baker recorded the colour of the flower as white. Although Flanagan,

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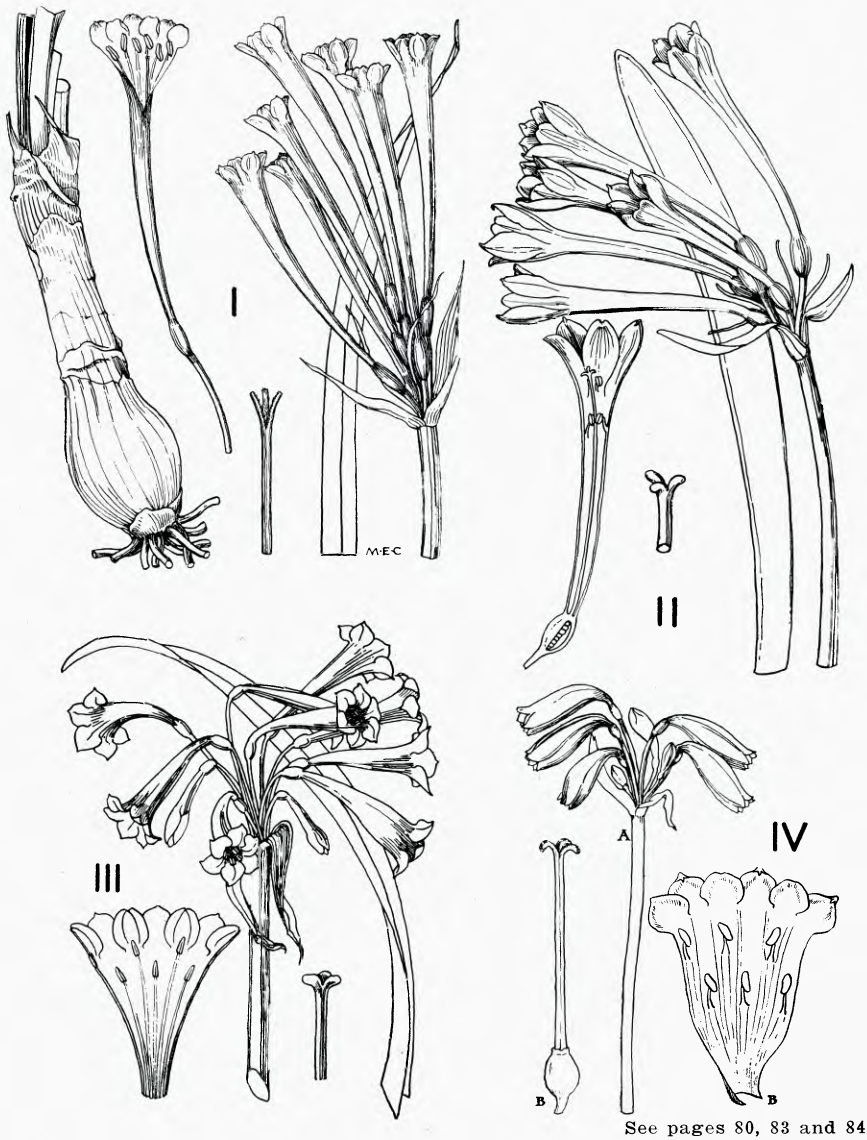
[2]Cyrtanthus attenuatus **sp. nov.,** affinis **C. Mackenii** var. **Cooperi** R. A. Dyer bulbo majore pedunculo et follis longioribus perianthio longiore differt.

Bulbus ovoideus, 2.5-3cm. diametro in collo 5-7cm. longo productus. **Folia** 3-4 synantha, plus minusve linearia, circiter 40 cm. longa 0.5-1 cm lata. **Pedunculus** 40-50 cm. longus. **Bracteae** 2, lanceolatae, 4-5cm. longae. **Pedicelli** 0.5-2cm longi. **Umbella** 6-9-flora; flores subercti; **perianthium** 6-7cm. longum, luteum; **tubus** 5.5-6.5cm. longus, attenuatus, superne gradatim ampliatus, fauce 6-7mm. lato; **lobi** suborbiculati, 6-7mm. longi et circiter 5mm. lati. **Stamina** biseriata filamentis brevibus. **Ovarium** oblongum 0.5-1cm. longum; stylus tubo perianthii breviter exsertus, trifidus.

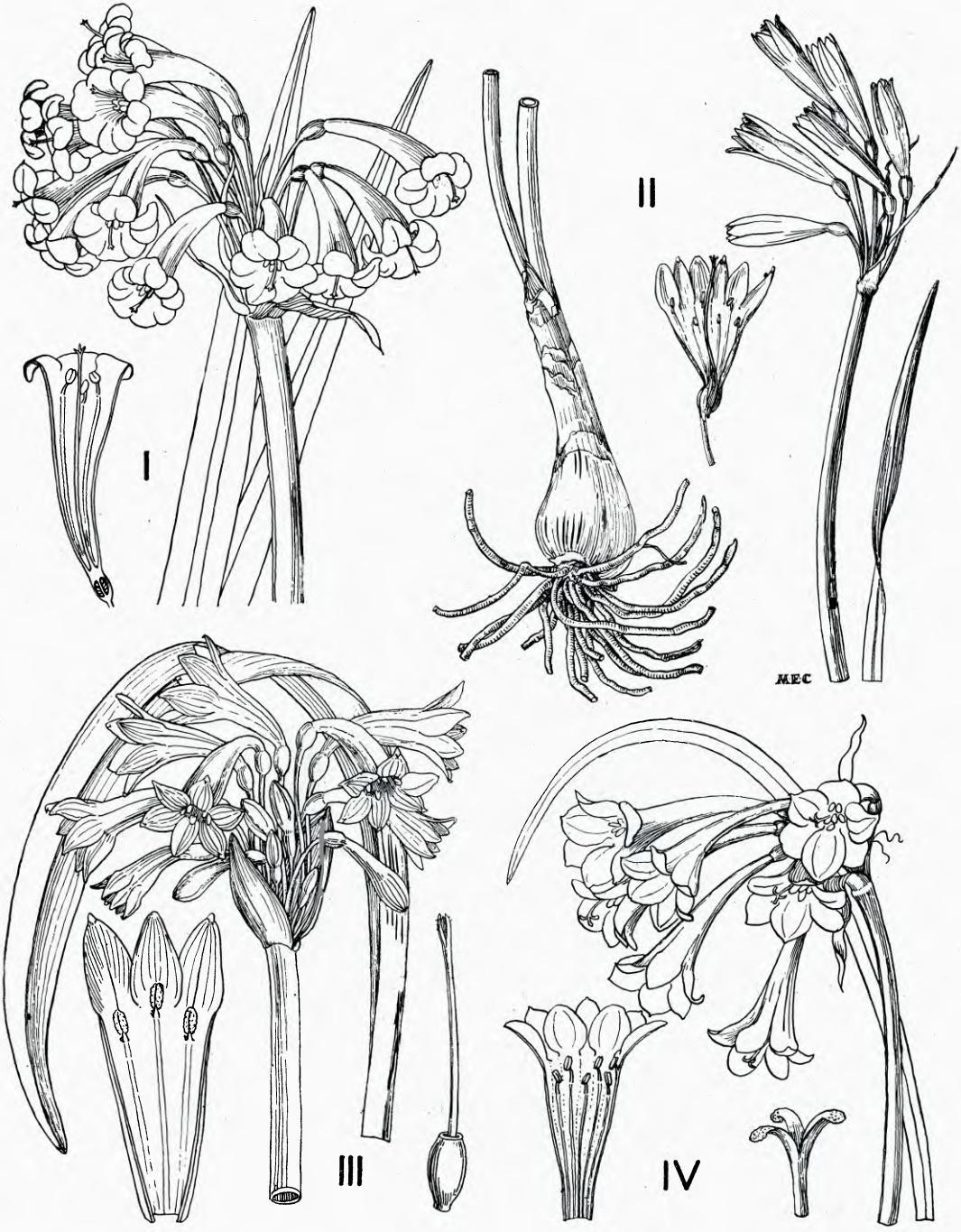
Distribution: Basutoland; Leribe, slope near a damp rock, Nov., **Dieterlen** 830 in South African Museum (type), National Herbarium, Pretoria, and Natal Herbarium.



See pages 80, 83 and 84

I, **Cyrtanthus attenuatus** sp. nov., R. A. Dyer; II, **C. Flanagani** Baker (After Fl. Pl. S. Afr. t. 693); III, **C. rotundilobus** (After Fl. Pl. S. Afr. t. 37); IV, **C. parviflorus** Baker (A, After Marloth Flora S. Afr. t. 34; B, After Bot. Mag. t. 7653).

Plate 139



See pages 85, 86 and 87

I, **Cyrtanthus epiphyticus** (After Bot. Mag. t. 9252); II, **C. bicolor** sp. nov., R. A. Dyer; III, **C. Huttoni** Baker (After Bot. Mag. t. 7488); **IV. C. rhododactylus** Stapf (After Bot. Mag. t. 9175).
Plate 140

the collector of the type specimen, made no specific mention of the colour on the collector's label, he nevertheless gave the plant the tentative name of *C. lutescens*, indicating thereby that the flowers were yellow when collected. Taking this to be the case it has been possible to match the type in Bolus Herbarium with several specimens in other herbaria, and thus extend the distribution records.

This charming species, the largest of those with yellow flowers, has flourished in at least one garden in Pretoria, and if further stock is obtained from its native fastnesses, it would be surprising if it failed to attract widespread attention.

9. C. STENANTHUS *Baker* in Fl. Cap. 6, 532 (1897).

Description.—Bulb ovoid, about 2 cm. in diam. contracted into a short neck, covered with membranous tunics. *Leaves* 2-4, linear, 20-30 cm. long, 2-5 mm. broad. *Peduncle* rather longer than the leaves. *Spathe-valves* linear, 2.5-3.75 cm. long. *Pedicels* much shorter than the spathe-valves. *Flowers* 3-7 in an umbel, suberect; *perianth* about 3 cm. long, red or reddish-brown; *tube* very slender, dilated gradually from the base nearly to the throat, there slightly contracted, 2-3 mm. wide; *lobes* ovate, about 3 mm. long. *Stamens* biseriate, inserted in the perianth-tube; anthers sessile. *Style* trifid.

VAR. MAJOR *R. A. Dyer n. var*[3]; perianth 4-4.5 cm. long; yellow.

Distribution.—Basutoland; slopes of Mont Aux Sources between 6000-8000 ft. alt. and in neighboring territory of the Cape Province, Natal and extending into the Transvaal; var. *major;* Transvaal, eastern grassveld in damp places.

Notes.—C. stenanthus is remarkable for its exceptionally narrow perianth-tube which has a collar-like constriction at the throat. Flowers have been recorded as "red," "reddish-brown," or "purple with green."

The variety *major* was at one time confused with *C. ochroleucus (C. lutescens)* by Baker, from which it is distinguished by the narrower perianth-tube and its collar-like contraction at the throat. It is found occasionally in damp places in the eastern Transvaal.

10. C. PARVIFLORUS BAKER in Gard. Chron. 1891, p. 104.

Description.—Bulb ovoid-oblong, about 2 cm. in diam. *Leaves* 3-6, contemporary with the flowers, linear, straight, bright green, 30 cm. long. *Peduncle* about as long as the leaves. *Spathe-valves* lanceolate, 2.5-3.5 cm. long. *Pedicels* not longer than the spathe-valves. *Flowers* 6-12 in an umbel; *perianth* 2.5-3 cm. long, bright red; *tube* slightly curved and slender at the base, dilated to about 5 mm. at the throat; *lobes* oblong, 5-6 mm. long, not at all spreading. *Stamens* biseriate, included. *Style* reaching to the tips of the segments, trifid. (Pl. 139,IV.)

Distribution.—Cape Province; mountains of the eastern Cape extending into Natal.

Notes.—This is, as the name implies, one of the smallest-flowered species in the genus, yet it is not unattractive. It has been figured both in *Curtis's Botanical Magazine* t. 7653 and by Marloth in his *Flora of South Africa* vol. 4. 1915. The closest relationship is with *C. O'Brieni* Baker.

11. C. SUAVEOLENS SCHONL. in Rec. Alb. Mus 3, 62 (1914), *C. Stayneri* L. Bolus in Ann. Bolus Herb. 4, 28 (1925).

Description.—Bulb about 2 cm. in diam. not sharply distinguished from the neck, 1-3 cm. long. *Leaves* 2-3, contemporary with flowers linear, obtuse 15-20 cm. long, about 5mm. wide, keeled on the lower surface, subglaucuos. *Peduncle* about equalling the leaves, *solid,* glaucous. *Spathe-valves* lanceolate, 2.5 cm. long. *Pedi-*

[3]**Var. nov.** periantho 4-4.5 cm. longo luteo distinguitur. **C. lutescens** var. **Cooperi** Baker in Fl. Cap. 6, 255 (1896) in part. Galpin—no. 654.

cels shorter than the spathe-valves. *Flowers* 3-4 in an umbel, suberect to pendulous, dusky (cherry) red with a strong scent of cloves (Brownlee) (blood red Stayner); *perianth* about 3.7 cm. long; *tube* dilated gradually to a throat about 3-4 mm. wide; *lobes* broadly ovate, obtuse, 3-4 mm., long reflexed. *Stamens* biseriate, subsessile, included. *Style* slightly exserted, trifid.

Distribution.—Eastern Cape Province; King Williams Town district, on the Perie and adjacent Mountains.

Notes.—The collector of the type specimen, Dr. J. Brownlee, remarked in a letter on the unusual feature of the solid peduncle, an observation omitted from the published description. A solid peduncle is also recorded for *C. rotundilobus,* a slightly larger species from the Transkei. (see also note under *C. rhodesianus* Rendle, No. 21.)

The bulbs, which produced the type material of *C. Stayneri,* which I have here considered as equal to *C. suaveolens,* were forwarded from King Williams Town by Capt. F. J. Stayner to the National Botanic Gardens, Kirstenbosch in 1921, where they flowered in November, two years later. It is of interest to repeat the salient points of the original description. These are as follows:

Leaves 4, more or less erect, recurved towards the apex, linear narrowed towards the base and apex, 24.5 cm. long, 0.7 cm. wide, canaliculate above, keeled on the lower surface; the keel consisting of three subprominent nerves; the margin somewhat recurved and thickened. *Peduncle* pink, conspicuously nerved, 23 cm. long, about 5 cm. diam. at the base. *Spathe-valves* oblong-lanceolate, about 3 cm. long. *Pedicels* 1-1.9 cm. long. *Flowers* 5 in an umbel, dull red, with the lobes dull green; *perianth* 2.8-3.1 cm. long, curved, gradually widened to the throat, 6-7 mm. wide; *lobes* decidedly recurved or subrevolute, broadly ovate, obtuse, the 3 outer with an apiculus with hairs, 5 mm. long, 4.5 mm. broad, the inner ones slightly shorter and narrower. *Stamens* biseriate, the lower row 5 mm. and the others 1 mm. within the throat, filaments very short. *Style* about equalling the tube in length.

The close similarity of the two type specimens and the proximity of the type localities leaves little doubt that only one specices is involved.

12. C. ROTUNDILOBUS *N. E. Br.* in Fl. Pl. S. Afr. I. t. 37 (1921.)

Description.—Bulb ovoid, 3 cm. in diam. produced into a neck about 3 cm. long. *Leaves* up to 4, contemporary with the flowers, linear, tapering to both ends, channelled above, keeled below, 16-30 cm. long, about 1.7 cm. broad. *Peduncle* about 14 cm. long, arising at the side of the leaves, *solid. Spathe-valves* ovate, acuminate, 2.5 cm. long. *Pedicels* up to 3 cm. long. *Flowers* about 11, in an umbel, reddish-scarlet; *perianth* 3 cm. long; *tube* 2.5 cm. long, more or less trumpet shaped, gradually dilated to a throat about 6 mm. wide; *lobes* suborbicular, 5 mm. long, 5 mm. broad, widely spreading. *Stamens* biseriate, inserted near the throat of the perianth-tube, subsessile. *Style* included, trifid. (Pl. 139,III.)

Distribution.—eastern Cape Transkei.

Notes.—This plant is said to be called the "Red-Dobo-lily" in the Transkei, for some reason unexplained. Its scientific name refers to the shape of the perianth lobes. In the description of the type this is said to have a solid peduncle which is most unusual for the genus, but is found also in *C. suaveolens,* from which it differs among other things in its more robust habit.

13. C. O'BRIENI *Baker* in Gard. Chron. 1894. 15, 716.

Description.—Bulb ovoid, "middle sized." *Leaves* contemporary with the flowers, 30 cm. long, 4-8 mm. broad, bright green. *Peduncle* longer than the leaves, terete. *Spathe-valves* lanceolate, 3.75 cm. long, scariose. *Pedicels* considerably shorter than the spathe-valves. *Flowers* 7-8 in an umbel, nodding; *perianth* 3.75 cm. long or more, bright pale scarlet; *tube* curved, dilated gradually to a throat about 4.5 mm. wide; *lobes* ovate 4-5 mm. long. *Stamens* and style included within the perianth tube.

Distribution.—Natal; extending along the Drakensberg into the eastern Cape about 5000-6000 ft. alt. in crevices of rocks.

Notes.—Bulbs of this plant were first imported into England by J. O'Brien from Medley Wood of Durban. It was said of O'Brien *(Gard. Chron.* 1892) after whom the species was named, that he was remarkable for his "success in flowering all kinds of rare Cape Plants."

With herbarium material to work with, I find it difficult to distinguish between *C. O'Brieni, C. Macowani,* and some forms of *C. parviflorus.* The characters employed in the key are differences mainly derived from a comparison of the original descriptions. *C. O'Brieni* appears to be a connecting link between the other two species.

14. C. MACOWANI *Baker* in Gard. Chron. 1875, 4, 98.

Description.—Bulb ovoid, 2.5 cm. diam. *Leaves* 1-3, contemporary with the flowers, linear, 15-30 cm. long, 3-7 mm. broad. *Peduncles* slender, about 30 cm. long, purplish. *Spathe-valves* 2, lanceolate, 2.5-3.75 cm. long, greenish. *Pedicels* up to about 2 cm. long. *Flowers* 6-8 in an umbel, nodding; *perianth* 3.5-4 cm. long, bright scarlet; *tube* curved, dilated gradually from the base to a throat 4-5 mm. wide; *lobes* broadly ovate or oblong, 5-7 mm. long, spreading. *Stamens* distinctly biseriate; filaments very short, the upper three anthers in the throat. *Style* slightly exserted, tricuspidate.

Distribution.—Cape Province; Fort Beaufort district on the Winterberg Mtn., extending northwards and eastwards in grassveld on the mountains in the Somerset East, Graaff Reinet and Murraysberg districts.

Notes.—It is difficult to differentiate between this species and *C. O'Brieni* and the latter may well be unworthy of specific distinction. *C. Macowani* extends some distance into the Karoo area but does so in mountainous grassveld habitats where conditions are not excessively arid.

15. C. EPIPHYTICUS *J. M. Wood,* in Kew Bull. 1913 p. 182; Bot. Mag. t. 9252 (1929).

Description.—Bulb oblong, 3-3.5 cm. in diam. with an elongated neck in all 9-11 cm. long, with dark chestnut-brown membranous tunics. *Leaves* usually 2, contemporary with flowers, flat, linear from a long narrow base and tapering to the apex, 30-50 cm. long, 1-2 cm. broad, green on the face, slightly glaucous on the back with prominent midrib. *Peduncle* subterete somewhat shorter than the leaves. *Spathe-valves* 2-3.5 cm. long. *Pedicels* 1.5-2.5 cm. long. *Flowers* 6-15 in an umbel, scarlet; *perianth* trumpet-shaped, slightly curved, 3-3.5 cm. long; *tube* gradually widened from the base to a throat 8 mm. wide; *lobes* suborbicular, obtuse, the outer ones apiculate, more or less recurved, 6-8 mm. broad. *Stamens* biseriate, unequally long, inserted about 6-7 mm. below the mouth of the corolla. *Style* filiform, shortly exceeding the anthers, shortly trifid. *Capsule* oblong, about 1.5 cm. long. (Pl. 140,I.)

Distribution.—Natal, near the East Griqualand border in the Ensikeni forests, about 3500 ft. alt.

Notes.—As the specific name implies this plant grows as an epiphyte, a remarkable feature almost without parallel in the Amaryllidaceae. It was discovered in 1912 by Mr. Walter Haygarth on branches of trees sometimes at an elevation of 20 m. (60 ft.) or more above the ground. In a letter sent to Kew the author of the species, Dr. J. Medley Wood, then Curator of the Natal Herbarium, states that it was found by Mr. Haygarth "growing on stems and branches of yellowwood trees *(Podocarpus* sp.) always in tufts of moss, which its roots penetrate, but do not, I think, even touch the bark of the tree. The only plants on the ground were a few, not many, that had been dislodged from the trees by the wind or by falling branches, and these were all still growing in the moss which had fallen with them. He also found a few growing in crevices of rocks, but again imbedded in moss."

In the account of the species accompanying the beautiful plate in *"Curtis's Botanical Magazine,"* cited above, Dr. Otto Stapf repeated the suggestion that *C. epiphyticus* would do well as a basket plant embedded in moss.

Its nearest affinity is apparently *C. Macowani* Baker, from which it is distinguished by its epiphytic habit, its generally larger size and more recurved perianth lobes.

16. C. RHODODACTYLUS *Stapf* in Bot. Mag. t. 9175 (1927).

Description.—Bulb globose, 2.5 cm. in diam. with dark brown tunics, produced into a neck up to 3 cm. long. *Leaves* usually two, attaining their full length after flowering, linear, acute, flatly channelled, 16-28 cm. long, 4-10 mm. broad. *Peduncle* erect, terete, 12-15 cm. long, green or brown, purple at the base. *Spathe-valves* 2, membranous, up to 4 cm. long. *Pedicels* slender up to 2 cm. long. *Flowers* 6-8 in an umbel; *perianth* trumpet-shaped from a slender base slightly curved, 4.5-5 cm. long, up to 2.5 cm. wide across the lobes, rose-scarlet or the face of the limb incarnate; *tube* 3.5-3.75 cm. long, dilated gradually to the throat 1 cm. wide; *lobes* spreading, more or less oblong-elliptic, obtuse with a minute apiculus, 1-1.2 cm. long. *Stamens* biseriate inserted within the mouth of the perianth; filaments 3-4 mm. long. *Style* exserted about 1 cm. beyond the tube, trifid. (Pl. 140,IV.)

Distribution.—South Africa; no definite locality.

Notes.—This attractive species, described for the first time by Stapf from cultivated specimens, under plate 9175 of *"Curtis's Botanical Magazine,"* has as yet, not been definitely localised. Stapf points out that it belongs to the group of species characterized by having slightly curved trumpet-shaped flowers with rather broad lobes and short filaments, among which the nearest affinity appears to be *C. epiphyticus* M. Wood. This differs in habit, has a larger ovoid-oblong bulb, more attenuated leaves and has brilliantly orange or scarlet flowers with recurved perianth-lobes. Another affinity is *C. Macowani* Baker which has smaller, strongly curved orange to orange-red flowers, with recurved or revolute perianth-lobes.

17. C. HUTTONI *Baker*, Handb, Amaryllid. 55 (1888); *C. Elliottii* Baker in Fl. Cap. 6, 220 (1896).

Description.—Bulb up to about 4 cm. in diam., not conspicuously contracted into a neck but the young leaf-bases progressively longer than the older ones forming a loose bulb up to 9 cm. long, increasing by budding from the base. *Leaves* 2 or 3, contemporary with the flowers, 50-60 cm. long, 2.5-4 cm. broad, tapering gradually to the apex. *Peduncle* 35-45 cm. tall, 1-1.5 cm. thick. *Spathe-valves* 2, oblong-lanceolate, up to 6 cm. long. *Pedicels* slender, nearly as long to longer than the spathe-valves. *Flowers* 12-20 in an umbel under normal conditions, nodding or often more or less pendulous on one side of the peduncle; *perianth* 3.5-4.5 cm long, orange red to dark red; *tube* curved near the base, gradually dilated above to a throat 6-8 mm. diam., 2.5-3 cm. long; *lobes* oblong, 1-1.5 cm. long, 4-5 mm. broad, slightly spreading. *Stamens* biseriate; filaments short, slightly exserted from the tube. *Style* not as long as the perianth, trifid. (Pl. 140,III.)

Distribution.—Eastern Cape Province; on Amatola and Winterberg ranges in moist crevices near streams.

Notes.—It will be observed from the above synonymy that two of Baker's species have been merged under one name. For some years, doubt has been expressed by various workers as to whether *C. Elliotii* should be regarded as specifically distinct from *C. Huttoni.* In *"Curtis's Botanical Magazine,"* under t. 7488 it is said to have been first sent to Kew by G. Hutton from the south eastern districts of the Cape Province. It may be assumed, with good reason, that Hutton collected the type material of the plant which bears his name, on the Katberg, where also the type of *C. Elliotii* was later collected.

Hutton sent bulbs to Kew where they flowered in 1864. The inflorescence was much weaker and the flowers smaller than described above, but Mr. D. G. Collett,

present S. A. Botanist at Kew, compared Baker's types at my request, and also came to the conclusion that they are not specifically distinct.

C. Huttoni is a beautiful species which should do well under cultivation. A light compost with free watering would be a near approximation of natural conditions. As is the case with other species growing naturally under moist conditions it increases by budding from the base.

18. C. BICOLOR *sp. nov.*[4] *C. parviflorus* Baker in Fl. Cap. 6, 221 (1896) in part.

Description.—*Bulb* ovoid, 1.5-2 cm. diameter, contracted into a neck 2-4 cm. long, covered with one or two brown membranous tunics. *Leaves* absent at or produced during flowering period, linear, shorter than the peduncles, 4-5 mm. broad, gradually narrowed to the apex and base. *Peduncles* one or two from a bulb, 5-25 cm. tall, slender, 4 mm. diam., hollow. *Spathe-valves* 2, lanceolate, 3-5 cm. long, membranous. *Pedicels* slender, 1.5-5.5 cm. long, suberect. *Flowers* 3-10 in an umbel, rarely more, nodding; *perianth* narrowly funnel-shaped, 2.5-3 cm. long, very rarely only 2 cm. long, divided 1/3 or 1/2 way down, red or yellow, or intermediate shades; *tube* 1.3-1.8 cm. long, slightly curved at the base, evenly expanded to a throat 7-8 mm. diam.; *lobes* 1-1.2 cm. long, the outer three lanceolate, with a minutely pubescent incurved apiculus, inner 3 oblong or oblong-lanceolate. *Stamens* biseriate, the upper three inserted in the perianth-throat; filaments about 3 mm. long. *Style* nearly equal in length to the perianth, trilobed. (Pl. 140,II.)

Distribution.—Transvaal, eastern area including Barberton, Lydenburg and Carolina.

Notes.—The specimen in the National Herbarium, Galpin 477, selected as the type of this species, was, according to the citation in *"Flora Capensis"* referred by Baker to his species *C. parviflorus*. The comparatively long perianth-lobes in proportion to the tube readily distinguish it from this species. Judging from Baker's descriptions it appears more closely allied to his *C. brachyscyphus*. Had not Baker cited Galpin 477 under *C. parviflorus*, I should probably have placed it, and other Transvaal specimens agreeing with it, under *C. brachyscyphus*. *C. bicolor* differs from the description of *C. brachyscyphus* in that it flowers in the absence of leaves, or the leaves (apparently only one to a bulb) are produced during the flowering period, whereas Baker records 3 leaves contemporary with the flowers in his species.

Galpin records the colour of the flowers as scarlet. This is evidently not constant in the species, since, on more than one occasion specimens have been collected in the wild state ranging from red to clear yellow, the red flowers often yellow tipped or yellowish within. Dr. F. van der Merwe collected a good selection illustrating this under No. 1675. It has been collected in flower during the months between March and October.

There is a specimen in the Bolus Herbarium, No. 12362, which is allied to *C. brachyscyphus* and possibly not specifically distinct. It consists of a peduncle with 3 flowers (4 originally) and a bulb with two leaves 35 cm. long and 9 mm. broad. It may represent a connecting link between *C. brachyscyphus* and *C. bicolor* and here again is a problem to engage the attention of the field worker.

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[4]**C. bicolor sp. nov.** affinis **C. brachyscypho** Baker plerumque folio uno hysterantho floribus bicoloribus differt.

Bulbus ovoideus 1.5-2 cm. diametro, in collo 2-4 cm. longo, productus, brunneus. **Folium** plerumque unum hysteranthum, lineare usque ad 15 cm. longum vel longis, 4-5 mm. latum. **Pedunculus** 5-25 cm. longus, 4 mm. diametro, fistulosus. **Bracteae** lanceolatae, 3-5 cm. longae. **Pedicelli** 1.5-5.5 cm. longi suberecti. **Umbella** 3-10 flora; flores cernui; perianthium 2-3 cm. longum, rubrum, vel luteum vel rubro-luteum; tubus 1.3-1.8 cm. longus superne gradatim ampliatus: lobi 1-1.2 cm. longi, exteriores lanceolati, interiores oblongi vel oblongo-lanceolati. **Stamina** biseriata, ad faucem perianthii inserta filamentis 3 mm. longis. **Ovarium** oblongum, circiter 5 mm. longum; **stylus** tubo perianthii exsertus trilobatus.

Distribution.—Transvaal; Barberton district, grassy Mtn. sides, Aug.-Sept., Galpin 477, in Nat. Herb. Pretoria (type); Nelsberg, Tafelkop, March, van der Merwe 1675; near Barberton, July, Hean in Nat. Herb. 24860; Lydenburg district, Sabie Valley, Oct., Gray in Nat. Herb. 4107; Carolina district, near Breyten, Sept., Dieperink 24.

In Fl. Pl. S. Afr. t. 211 (1926), a plant is figured under the name *C. collinus* Gawl., but it does not agree with the original description of this species. Judging by the specimen from which plate 211 was prepared, it seems probable that it represents a form of *C. bicolor;* the flowers in the plate have evidently been somewhat enlarged.

19. C. BRACHYSCYPHUS *Baker* in Handb. Amaryllid. 55. (1888).

Description.—Bulb ovoid. *Leaves* about 3, contemporary with the flowers, linear, 20-30 cm. long, 5-7 mm. broad. *Peduncle* about as long as the leaves, terete, glaucous. *Spathe-valves* 2, lanceolate 2.5 cm. long. *Pedicels* up to 2 cm. long. *Flowers* 6-8 in an umbel; *perianth* up to about 2.5 cm. long, pale red; *tube* funnel-shaped, dilated to a throat nearly 5 mm. wide; *lobes* oblong-lanceolate nearly as long as the tube. *Stamens* inserted near the throat of the tube; filaments nearly 5 mm. long.

Distribution.—Cape Province; Pondoland and possibly extending into the Transvaal.

Notes.—This is one of the smallest red-flowered species in the genus. It was introduced into cultivation from Pondoland in 1886, but I have seen no authentically named specimens. So far it has not been figured in any publication.

20. C. RECTIFLORUS *Baker* in Fl. Cap. *6,* 222 (1896).

Description.—Bulb ovoid 3.75 cm. in diam. *Leaves* 2, contemporary with the flowers, linear, 6-9 mm. broad. *Peduncles* slender, 30-45 cm. long. *Spathe-valves* 2, lanceolate, not exceeding the pedicels. *Pedicels* ascending, 1.5-3 cm. long. *Flowres* 8-10 in an umbel, suberect; *perianth* 2.5-3 cm. long, red; *tube* dilated gradually from the base to a throat 4-5 mm. wide; *lobes* oblong, half as long as the tube. *Stamens* distinctly biseriate; filaments very short. *Style* as long as the perianth; stigma trifid.

Distribution.—Cape Province; King Williams Town district near the Perie forest.

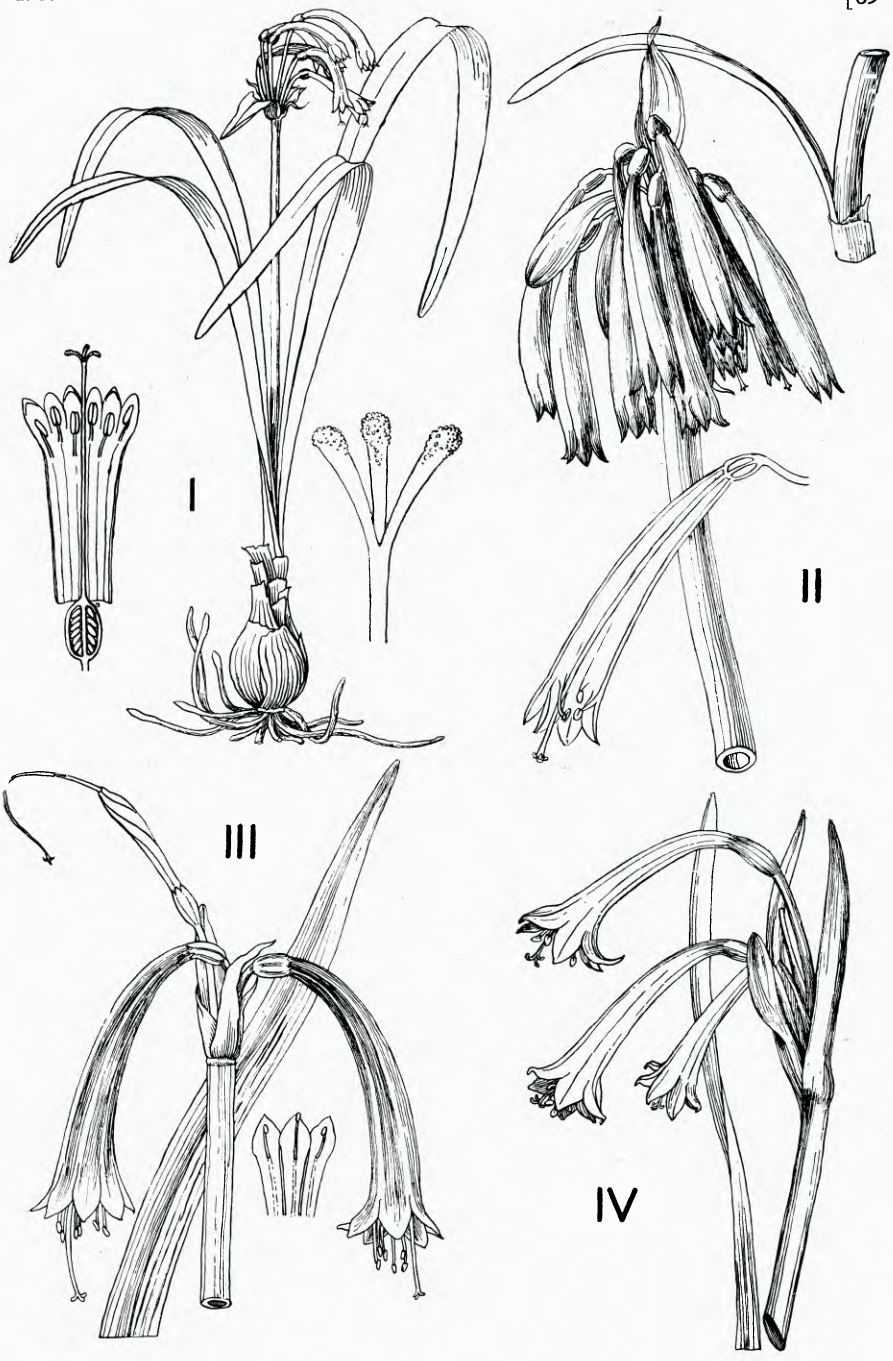
Notes.—I have seen no authentically named specimen of this species.

21. C. JUNODII *Beauverd* in Bull. Herb. Boiss. Ser. 2, 7, 437 (1907).

Description.—Bulb oval, 4 cm. in diam.. produced into a short neck. *Leaves* 4-5, contemporary with or, in certain circumstances, absent at the time of flowering, lorate-lanceolate, obtuse, 30-50 cm. long, 1.5-2 cm. broad. *Peduncle* 25-50 cm. tall. *Spathe-valves* 2, ovate-lanceolate, 2-3 cm. long. *Pedicels* approximately equal to the spathe-valves. *Flowers* 6-9 in an umbel, nodding or sub-pendulous; *perianth* 3.5-4 cm. long, the tube red, the lobes yellow; *tube* curved, gradually dilated to the throat; *lobes* oblong, "4-5 times shorter than the tube" that is about 8-9 mm. *Stamens* biseriate, inserted in the throat of the tube, not exceeding the lobes. *Style* exserted, stigma trifid, apex papillose. (Pl. 141,I.)

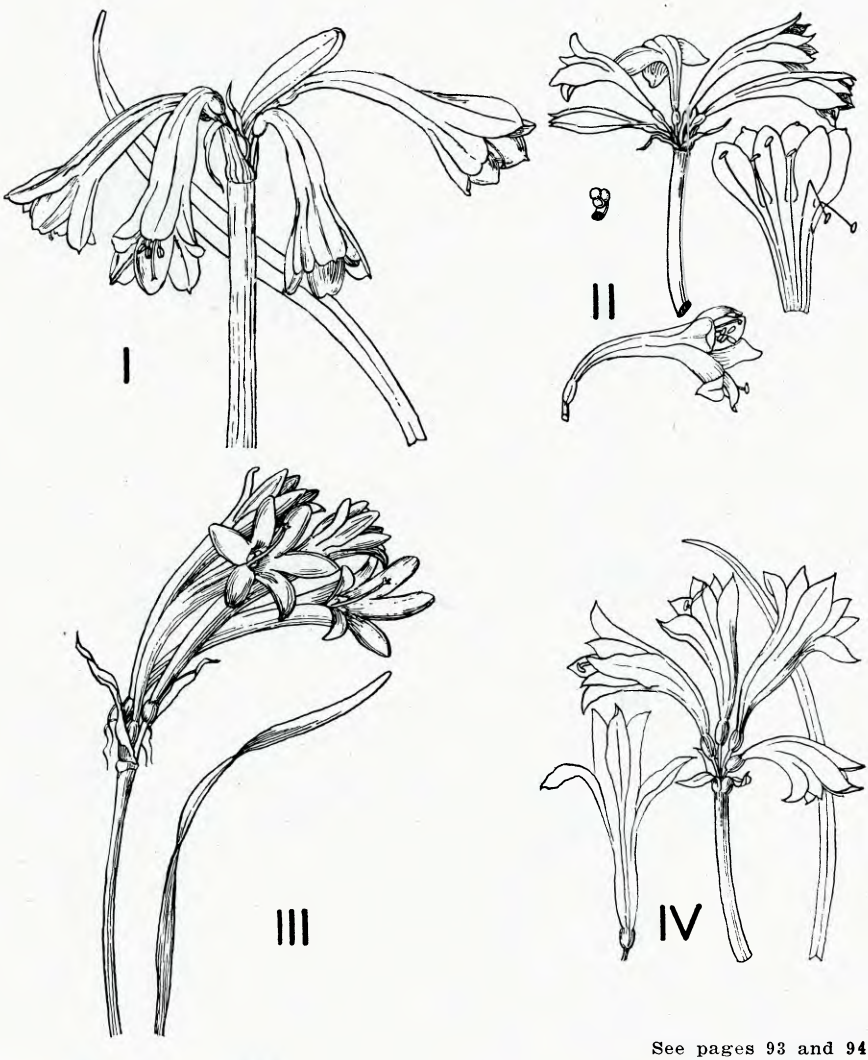
Distribution.—Transvaal ?; no definite locality.

Notes.—The Swiss Missionary, Henry Junod, forwarded the type plants from the Transvaal to Geneva, where they flowered in 1906. It is presumed that the specimens also originated in the Transvaal, although there is no actual proof of this. A plant collected at Baviaans Poort near Pretoria, appears to agree sufficiently well with the figure of the type to identify it as this species. Beauverd, when describing the species, stated that flowers were produced in September at the same time as the leaves, but other flowers were produced in February without leaves. The leaves grew in March and reached maturity in April. This effect was produced under greenhouse conditions and it is possible that this sequence would not be followed in nature.



See pages 88, 91 and **92**

I, **Cyrtanthus Junodii** Beauv. (After Bul. de L'Herb. Boiss. p. 438); II, **C. Tuckii var. transvaalensis** Verdoorn (After Fl. Pl. S. Afr. t. 680); III, **C. striatus** Herb. (After Bot. Mag. t. 2534); IV, **C. angustifolius** Ait. (After Bot. Mag. t. 271).
Plate 141



See pages 93 and 94

I, **Cyrtanthus pallidus** Sims (After Bot. Mag. t. 2471); II, **C. Fergusoniae** L. Bolus (After S. Afr. Gard. & C. Life, 1931); III, **C. odorus** Gawl. (After Bot. Reg. t. 503); IV, **C. inaequalis** O'Brien (After Gard. Chron. 1905, p. 261).

Plate 142

22. C. RHODESIANUS Rendle in Journ. Linn. Soc. Bot. 40, 211 (1911).

Description.—*Bulb* 1.5-2 cm. diam. extended into a neck, flowering before the leaves appear. *Leaves* undescribed. *Peduncle* 10 cm. long. *Spathe-valves* 2, lanceolate, nearly 3 cm. long, red. *Pedicels* slender, up to 1.5 cm. long. *Flowers* 2-3 or perhaps more in an umbel, bright red; *perianth* 3.5-4.5 cm. long; *tube* slender, gradually dilated to a throat 4 mm. wide; *lobes* narrowly oval, about 1 cm. long or longer, roughly ¼ the length of the tube. *Stamens* biseriate, filaments short, somewhat exserted from the perianth tube. *Style* about equal to the perianth in length, trifid.

Distribution.—Rhodesia; Chimanimani Mts. common amongst short grass at an altitude of about 7000 ft., flowering in September and October.

Notes.—Rendle states.—"Near *C. Welwitschii.* Hiern., but a much smaller plant with no leaves in the flowering stage. The flowers are relatively larger, with shorter pedicels and a narrower tube."

F. Eyles collected specimens, No. 416, in Mazoe district, Rhodesia, which may be this species. He records the following notes; "In marsh, soil black humus. Bulb white with fleshy roots. Single leaf longer than the scape, with double ridge in centre of back. Scape 6-12 inches above ground, green, *solid*, terete. Perianth crimson outside, slightly paler within." A duplicate of No. 416 in the Bolus Herb. has two leaves present which indicates *C. Welwitschii*, but the description of the perianth agrees better with that given for *C. rhodesianus.* Rendle. It may possibly represent an undescribed species.

23. C. WELWITSCHII Hiern ex Baker in Journ. Bot. 1878, 197.

Description.—*Bulb* ovoid, 2-3 cm. diam. *Leaves* about 4, contemporary with the flowers, linear, 30-45 cm. long, 6-9 mm. wide. *Peduncles* approximately as long as the leaves. *Spathe-valves* 2, lanceolate. *Pedicels* 2.5-3.75 cm. long. *Flowers* 3-8 in an umbel, erect. *Perianth* 3-3.75 cm. long, red; *tube* narrowly funnel-shaped; *lobes* oblong-lanceolate, rather shorter than the tube. *Stamens* biseriate, exserted from the perianth-tube. *Style* exserted from the perianth-tube, trilobed.

Distribution.—Angola; Nyasaland; on mountain ranges in moist places.

Notes.—I have not seen an authentically named specimen of this species. (See note under *C. rhodesianus.)* It would no doubt be of equal merit in horticulture as many of the allied species in South Africa.

24. C. TUCKII *Baker* in Journ. Bot. 1876, 183.

Description.—*Bulb* ovoid, up to 3.75 cm. diam. *Leaves* 2, contemporary with the flowers, linear, 30-45 cm. long, 6-9 mm. broad, green. *Peduncle* about equal in length to the leaves, 6-9 cm. in diam. *Spathe-valves* 2, lanceolate, 7.5-9 cm. long, green. *Pedicels* shorter than the spathe-valves. *Flowers* 10-15 in an umbel, occasionally less, nodding; *perianth* 3.75-5 cm. long, yellowish at the base, passing gradually upwards into deep blood-red; *tube* curved, dilated gradually from the base to a throat 8-9 mm. in diam.; *lobes* oblong, 6-9 mm. long, connivent. *Stamens* biseriate; filaments short, not exserted. *Style* exserted; stigma tricuspidate.

Var. a. TRANSVAALENSIS I. C. VERDOORN in Fl. Pl. S. Afr. t. 680 (1937); perianth red throughout. (Pl. 141,II.)

Var. b. VIRIDILOBUS I. C. VERDOON, l. c. sub t. 680; perianth-lobes green, tube red.

Distribution.—Cape Province; Somerset East district, on the Boschberg at 4500 ft.; var. a. Transvaal high-veld; var. b. Natal, grassveld extending to eastern Cape.

Notes.—The figure of this species in *"The Gardeners Chronicle"* 1892, is certainly not life-like and must be considered as a diagramatic representation.

Var. TRANSVAALENSIS I. C. VERDOORN in Fl. Pl. S. Afr. t. 680 (1937).

Miss I. C. Verdoorn states that this varietal form differs from the type in the perianth being red throughout, whereas the type is described by Baker as being "yellow at the base passing gradually upwards into deep blood-red." Further, the leaves of the type were present at the time of flowering whereas those of the variety appeared after the flowers. I do not think too much importance should be attached to the latter difference as Baker described from cultivated plants which might well account for the early leaf development. The bulb of the variety is relatively narrower and evidently has a longer neck than the typical form.

The variety *transvaalensis* occurs abundantly on the high grassveld of the Transvaal and has in the past been confused with *C. angustifolius* var, *grandiflorus* Baker. From this it differs in the connivent perianth-lobes and in this respect also, it differs from *C. contractus*, another Transvaal species. A further distinguishing feature from *C. contractus* is the latter's contracted perianth throat which does not occur in *C. Tuckii*.

Var. VIRIDILOBUS I. C. VERDOORN l. c. sub. t. 680.

This variety is distinguished by the green perianth-lobes and red tube. It is frequent in Natal and extends into the eastern Cape Province towards the locality of the typical form.

25. C. ANGUSTIFOLIUS *(L. f.) Ait.* Hort. Kew 414 (1789).

Description.—Bulb ovoid, about 4.5 cm. diam. contracted into a short neck. *Leaves* 2-3, contemporary with the flowers, about 45 cm. long when mature, rarely much longer, 0.7-2 cm. broad. *Peduncle* about equal to the leaves in height fairly stout. *Spathe-valves* 2, lanceolate, acute, 4-5 cm. long. *Pedicels* up to about the length of the spathe-valves. *Flowers* nodding or pendulous, 4-10 in an umbel; *perianth* cylindrical, curved, 4-5 cm. long, red; *tube* dilated gradually to a throat 0.8-1 cm. wide; *lobes* ovate-obtuse, spreading. *Stamens* biseriate, inserted towards the throat of the perianth-tube. *Style* exserted, trilobed. (Pl. 141,IV.)

Distribution.—Cape Province; western districts with headquarters on the mountains near Tulbagh.

Notes.—As mentioned in the introduction, I have not had the advantage of studying the material at Kew, which formed the basis of Baker's work in *"Flora Capensis."* In the case of *C. angustifolius* and Baker's two varieties *ventricosus* and *grandiflorus*, it is evident that at least 3 distinct species are concerned, namely, *C. angustifolius* ait. *C. ventricosus* willd. and *C. contractus* N. E. Br. The distribution records given by Baker for his varieties *ventricosus* and *grandiflorus* do not correspond entirely, however, with the distribution of the two species *C. ventricosus* and *C. contractus* (part of Baker's var *grandiflorus)* as understood here, which suggests that further research in this group is desirable.

26. C. STRIATUS *Herb.* in Bot. Mag. t. 2534. (1825).

Description.—Bulb ovoid, 2.5-3 cm. in diam., contracted into a short neck. *Leaves* 2, contemporary with the flowers, about 30 cm. long and 1 cm. broad, narrowed to both ends, keeled below. *Peduncle* less than the leaves in height, hollow, reddish. *Spathe-valves* lanceolate, up to 3.5 cm. long, reddish below to greenish towards the tips. *Pedicels* shorter than the spathe-valves. *Flowers* 3 or probably more in an umbel, nodding or pendulous; *perianth* 6 cm. long; *tube* curved, gradually expanded from the base to a throat 1 cm. or more in diam., 5 cm. long, red with yellow stripes extending from the sinuses of the lobes; *lobes* ovate, about 1 cm. long, spreading, yellow. *Stamens* biseriate, equal to or exserted beyond the perianth lobes. *Style* longer than the perianth, trifid. (Pl. 141,III.)

Distribution.—Cape Province, without definite locality.

Notes.—It is stated in the text under the plate cited above that *C. striatus* was imported by Mr. Lee and sold by him to many persons, labelled *Amaryllis falcata* by the error of the collector. Baker l. c., while maintaining it as a distinct species, suggests that it may be a variety of *C. angustifolius Ait.* If only for its distinctive colouration, it seems advisable to maintain its specific identity in the hope that this will facilitate its rediscovery in the wild state .

27. C. PALLIDUS *Sims* in Bot. Mag. t. 2471 (1824).

Description.—Bulb ovoid, 3-3.5 cm. in diam., contracted into a short neck. *Leaves* up to 5, produced after the flowers, linear, about 15 cm. long, 6-7.5 mm. broad, narrowed to the base and apex, keeled on the lower surface. *Peduncle* much the same length as the leaves, purplish. *Spathe-valves* 2, lanceolate, 2-2.5 cm. long. *Pedicels* as long or shorter than the spathe-valves. *Flowers* about 5 in an umbel, spreading or pendulous; *perianth* up to 4.5 cm. long, pale red; *tube* dilated gradually to a throat 6-7 mm. in diam.; *lobes* oblong, 1.75 cm. long, 6-7 mm. broad. *Stamens* exserted from the perianth tube. *Style* as long as the perianth, trifid. (Pl. 142,I.)

Distribution.—Cape Province without definite locality.

Notes.—This plant was introduced into cultivation in 1822 by Villette. In the original account, which, with the figure, is all we know of the species, special mention is made of the "regular dimention of size of the corolla from the limb to the base, without any sensible inflation of the middle of the tube, and the nearly equal proportion of the limb to the tube." The latter remark is the more important, though the figure does not illustrate it quite as clearly as one is led to expect.

28. C. ODORUS *Gawl.* in Bot. Reg. t. 503 (1820).

Description.—Bulb ovoid, 2-2.5 cm. in diam., with a short neck. *Leaves* 2-3, contemporary with the flowers, linear, 12-15 cm. long, 2.5-3 mm. broad, slightly and gradually contracted to the apex and base. *Peduncle* approximately equal in length to the leaves, slender. *Spathe-valves* 2, lanceolate, 2.5-3 cm. long. *Pedicels* less than half the length of the spathe-valves, or subobsolete. *Flowers* about 4 in an umbel, nodding; *perianth* 5-6 cm. long, bright red; *Tube* about 4 cm. long, curved, narrowly trumpet-shaped, dilated gradually from a very slender base to a throat 6-7 mm. wide; *lobes* narrowly oblong, 1.5 cm. long, 5 mm. broad, somewhat spreading. *Stamens* markedly biseriate, included; filaments short. *Style* exserted, trifid. (Pl. 142,III.)

Distribution.—Cape Province, from whence it was introduced into England about 1818 without definite locality.

Notes.—This is another case in which our information is restricted to the type figure and description. Baker, l. c. cites only two specimens, both from Natal, under this name. To me, it seems most unlikely that he should be correct, since at the time of discovery botanists had not penetrated within 300 miles of Natal. One would expect records from the Cape and intervening country. The exceptionally short pedicels, narrowly oblong perianth lobes and fragrant flowers are the most noteworthy characters of this species. It shows some affinity to *C. ochroleucus* Burch and *C. Mackenii Hook. f.* in habit.

29. C. INAEQUALIS *O'Brien* in Gard. Chron. 1905, p. 261.

Description.—Bulb globose, about 3.75 cm. in diam. prolonged into a neck 2.5 cm. long. *Leaves* 2-3, contemporary with the flowers, 30 cm. or more long, linear, narrowing to the base, green, tinged with purple at the base. *Peduncle* erect, 30 cm. tall. *Spathe-valves* 4, two large and two small, lanceolate. *Pedicels* 0.5-1.2 cm. long. *Flowers* 4 in an umbel (in type specimen), more or less erect; *perianth* 6.25-7.5 cm. long bright red; *tube* trumpet-shaped in the lower half; *lobes* nearly as long as the tube, the bottom lobe decurved, the lateral two spreading, the upper three *inclined forward over the style. Stamens* biseriate, 3 nearly extending to the tips of the segments. *Style* not protruding, tricuspidate. (Pl. 142,IV.)

Distribution.—Cape Providence; George district in the neighborhood of George.

Notes.—When the type specimen flowered in England in 1904, it was considered by some authorities to be *C. angustifolius*, var. *grandiflorus*. The author of the species, however, points out that it differs from this by the more or less erect habit of the flowers, the larger perianth-segments and especially in the manner in which the upper segments form a "pent-house" over the stigma and anthers. There is a striking resemblance to this in *C. Fergusoniae* L. Bolus.

30. C. FERGUSONIAE *L. Bolus* in S. Afr. Gard. and Country Life 1931, 21, 77.

Description.—*Bulb* ovoid, up to 4.5x3.5 cm., flowering in the absence of leaves. *Leaves* 1(?) from each bulb, linear, glabrous, 35 cm. or more long and about 5 mm. broad. *Peduncle* hollow throughout its length, 20-45 cm. long, 0.7-1.1 cm. diam. *Spathe-valves* up to 8 cm. long and 2 cm. broad. *Pedicels* 1-2 cm. long. *Flowers* 4-8 in an umbel, spreading or somewhat pendulous; *perianth* 6-8 cm. long, brilliant red; *tube* 4-5 cm. long, curved, gradually dilated to a throat 7-9 mm. wide; *lobes* obtuse, 2-3 cm. long, 0.9-1.3 cm. broad. *Stamens* biseriate; filaments 1.2-1.8 cm. long, the outer three attached to the base and the three inner ones well above the base of the perianth-lobes. *Style* about as long as the stamens; stigmas very short and rounded. *Capsule* sub-clavate-cylindrical, up to 3 cm. long, the seeds 8 mm. broad. (Pl. 142,II.)

Distribution.—Cape Province; Riversdale district, common on the sandy hills near Still Bay.

Notes.—Of this species Dr. L. Bolus writes in *"South African Gardening & Country Life"* 1931, that it is most nearly related to *C. ventricosus* Willd. (a species included in *C. angustifolius* by some authors) but that it is distinguished from this by the longer perianth lobes, sometimes nearly as long as the tube and the set is different. When first open the perianth lobes have a somewhat asymmetrical appearance unusual in the genus. The species is common on the sandy hills near Still Bay from which area the type material was collected by Mrs. E. Ferguson in January, 1931. It was collected in that area by Dr. John Muir in 1914 but his specimens have remained specifically unidentified until now. I have examined no authentically named specimen of *C. inaequalis* O'Brien, but judging by the description and figures given by the two respective authors, there can be little doubt that the two plants are very closely related. I have refrained from uniting the two forms under the one name owing to the difference in leaf production and other small differences in the descriptions. Field observations might well lead to the conclusion that only one species is concerned and in this case the name *C. inaequalis* would have priority.

31. C. CONTRACTUS *N. E. Br.* in Fl. Pl. S. Afr. 1, t. 4 (1921).

Description.—*Bulb* 4-6 cm. in diameter, ovoid, produced into a neck about 3 cm. long. *Leaves* 2-3, contemporary with or developed after the flowers, 30-50 cm. long, 0.8-1.2 cm. broad, linear, acuminate, narrowed to the base. *Peduncles* about 20 cm. long, 10 mm. in diameter, hollow, red. *Spathe-valves* linear, acute, 4.5-5 cm. long. *Pedicels* 2-4 cm. long. *Flowers* 4-10 in an umbel, pendulous; *Perianth* 6.5-7.5 cm. long scarlet red to carmine; *tube* 5-6 cm. long, somewhat inflated and widest about the middle, contracted towards the throat; *lobes* ovate-ellipsoid, 1.3-1.5 cm. long, about 7 mm. broad. *Stamens* inserted shortly within the throat of the perianth, slightly exserted. *Style* about the length of the perianth tube, trifid. (Pl. 143,I.)

Distribution.—Transvaal; Pretoria district in grassveld and in districts of the eastern Transvaal extending through Natal to the eastern Cape Province.

Notes.—In Flora Capensis this species was confused with *C. angustifolius* Ait., being considered by Baker as part of his variety *grandiflorus*. It is distinguished by the perianth tube being inflated in the middle and contracted towards the throat. Although it is usual for the flowers to appear before the leaves this is not invariably so, depending on the habitat conditions. Not all bulbs flower every year and those

not flowering may produce leaves when their neighbours are producing the first signs of a peduncle. According to my present conception, this is the commonest of the so called "fire-lilies" which are characteristic of grassveld burnt in the winter or early spring.

32. C. COLLINUS *Gawl.* in Bot. Reg. t. 162 (1816).

Description.—Bulb ovate, up to 4 cm. in diam. Leaves 3, contemporary with the flowers, linear, 15-25 cm. long, 5-8 mm. broad, glaucous, flattish towards the apex, channelled below. *Peduncle* hardly as long as the leaves, slender, glaucous. *Spathe-valves* 2, lanceolate, about 2.5 cm. long. *Pedicels* up to 2.5 cm. long. *Flowers* up to about 10 in an umbel; *perianth* more or less 5 cm. long, bright red with whitish lines extending along the perianth from the ovary; *tube* curved at the base, slender in the lower half, dilated above to a throat nearly 1 cm. wide; *lobes* oblong-obtuse, approximately 1.25 cm. long. *Stamens* indistinctly biseriate, filaments short. *Styles* shortly trifid. (Pl. 143,IV.)

Distribution.—Cape Province; Caledon district, near Genadendal and possibly extending to the eastern Cape Province.

Notes.—In the notes following the original description the author compares this species with *C. angustifolius* Ait., from which it is said to differ in having glaucous leaves, whitish lines extending along the perianth from the ovary, lobes of perianth elliptic oblong, obtuse, not ovate acute, etc. To me, even more important is his statement in the description, that the perianth tube is slender in the lower half, and dilated in the upper half to the throat; *C. angustifolius* having the perianth tube evenly dilated from the base to the throat. The figure in Fl. Plt. S. Afr. t. 211 (1926) does not illustrate the species correctly and probably represents a cultivated form of *C. bicolor.*

33. C. VENTRICOSUS *(Jacq.) Willd.* Sp. Pl. 2.49 (1799).

Description.—Bulb ovate-globose with a short neck, totalling 5 cm. long. *Leaves* produced after the flowers, 2, rarely only one, linear-lanceolate, up to about 16 cm. long and 4 mm. broad, more or less obtuse, somewhat canaliculate. *Peduncle* slightly compressed, dark red, glaucous, about 15 cm. tall, 6-7 mm. thick. *Spathe-valves* lanceolate, 4 cm. long, red. *Pedicels* shorter than the spathe-valves. *Flowers* 3-7 in an umbel, spreading or nodding; *perianth* 5-5.5 cm. long, red; *tube* curved narrowly cylindrical at the base, expanded above, and again contracted to a throat nearly 1 cm. wide, ribbed; *lobes* oval-oblong, 1.5-1.75 cm. long, about 0.75 cm. broad, spreading, three outer ones glandular within the apex. *Stamens* excluded, ascending and curved downwards towards the anthers. *Style* exserted, subtrifid, slightly longer than the stamens. (Pl. 145,I.)

Distribution.—Cape Province, on open hillsides from the Cape Peninsula eastwards to about Mossel Bay district.

Notes.—Baker included this species as a variety under *C. angustifolius* Ait. but I do not consider he was justified in doing so, especially as Willdenow gave good reasons for establishing his species. The ribbed, ventricose or inflated perianth-tube and comparatively large perianth-lobes, readily distinguishes it from *C. angustifolius.* It is evidently one of the more attractive of the south-western Cape species, although not large.

34. C. STAADENSIS *Schonl.* in Rec. Alb. Mus. 3, 61 (1914).

Description.—Bulb subglobose or oblong, 2-3 cm. in diameter. Leaves 2-3, contemporary with the flowers, narrowly linear, almost setaceous, 25-28 cm. long, 2 mm. wide, canaliculate above tapering to the base. *Peduncle* about 40 cm. tall. *Spathe-valves* broadly lanceolate, 2-5 cm. long. *Pedicels* 1.2-1.7 cm. long. *Flowers* usually 3 (rarely 4-6) in an umbel; *perianth* 4.5-5 cm. long; *tube,* lower portion narrow, curved and 6 mm. long, dilated above, somewhat hexagonal and inflated,

1 cm. broad in the broadest portion; *lobes* spreading, ovate-lanceolate, 1 cm. long. *Stamens* slightly biseriate, inserted near the mouth of the perianth-tube. *Style* nearly the length of the perianth, shortly trifid.

Distribution.—Cape Province; Uitenhage district, near Van Staadens.

Notes.—Although the author of the species did not mention the hexagonal or somewhat fluted nature of the perianth-tube in the description of the type, he recorded the fact in his MSS. notes. This character is most unusual in the genus. Like a number of other species the distribution records are meagre. The typical form has not been recorded outside the Uitenhage and Port Elizabeth districts. A plant with a very similar shaped corolla tube, except for the marked hexagonal fluting occurs near Grahamstown in the Albany district adjacent to Uitenhage, and it may represent a variety of *C. staadensis,* but data are insufficient as yet on which to arrive at a conclusion on this point.

35. C. SPIRALIS *Burch.* ex *Gawl.* in Bot. Reg. t. 167 (1816).

Description.—Bulb oblong, about 4 cm. in diam. *Leaves* 2-3, generally appearing after the inflorescence, linear, spirally twisted, 15-20 cm. long, about 1.25 cm. broad, glaucous green. *Peduncle* taller than the leaves, reddish, glaucous. *Spathe-valves* 2, lanceolate, 3 cm. long. *Pedicels* up to the length of the spathe-valves. *Flowers* 4-7 in an umbel; *perianth* about 4-7 cm. long, vermilion; *tube* slender at the base, curved, expanding above to a throat about 1 cm. diam.; *lobes* elliptic-oblong, about 1.25 cm. long, spreading. *Stamens* slightly exserted from the perianth tube. *Style* about equal to the stamens, trifid. (Pl. 143,III.)

Distribution.—Cape Province; Port Elizabeth, Uitenhage and Alexandria districts.

Notes.—The combination of narrow, spirally twisted leaves with curved trumpet-shaped red flowers, readily distinguishes this species from its near affinities. No other species with narrow trumpet-shaped flowers has spirally twisted leaves and the two which have twisted leaves, *C. helictus* and *C. Smithiae,* have somewhat bell-shaped pink flowers. The beautiful painting in the *"Botanical Register"* was made from plants collected by the famous naturalist, William Burchell, early in the 19th century, and cultivated at Fulham, England.

36. C. LEUCANTHUS *Schltr.* in Engl. Jahrb. 24. 454, (1898).

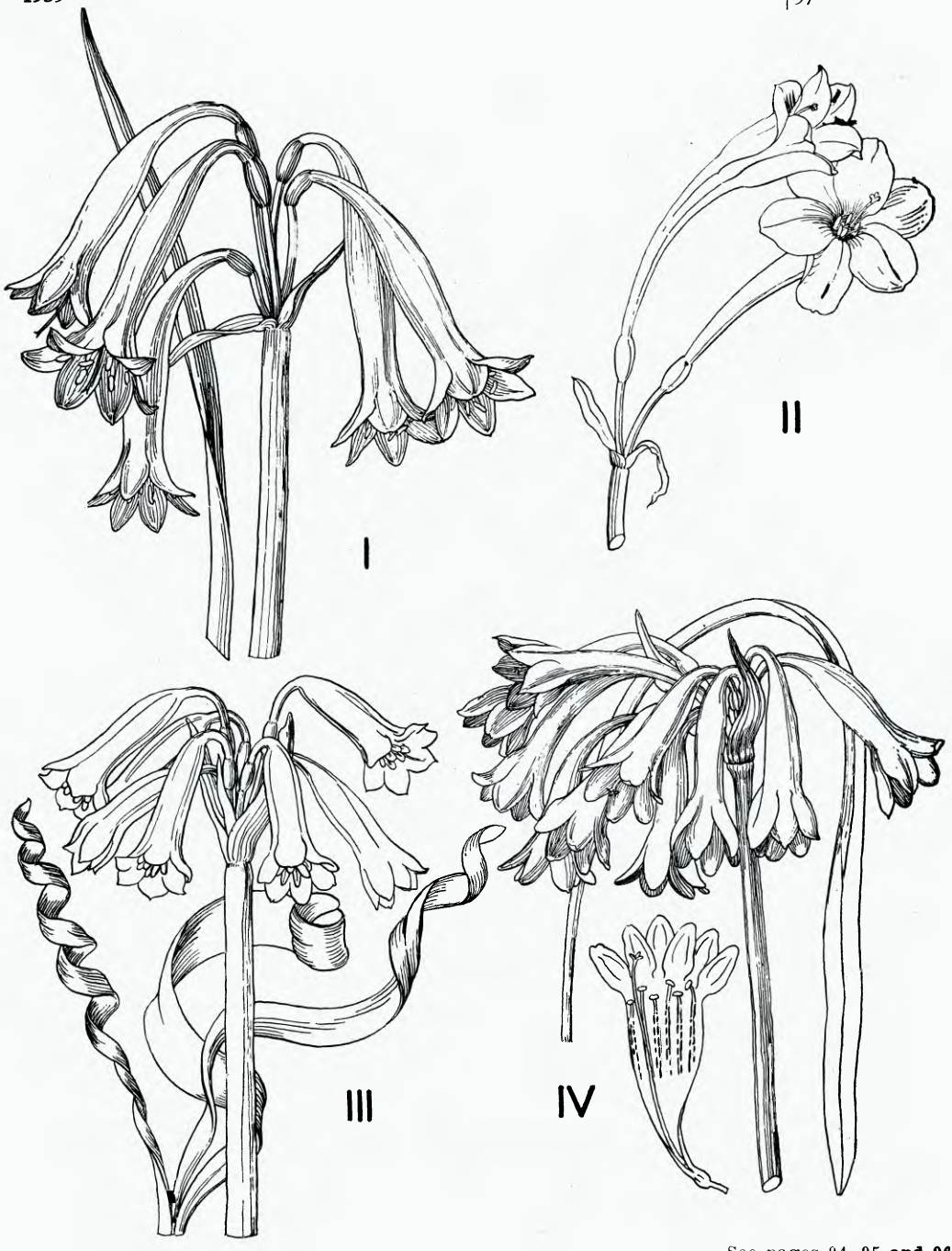
Description.—Bulb obovate, contracted into a neck. *Leaves* solitary, filiform, acute, shorter than the peduncle, 1 mm. broad. *Peduncle* "the thickness of a goose's quill," somewhat glaucous, 15-25 cm. tall. *Spathe-valves* longer than the pedicels. *Pedicels* erect, 1.3-1.5 cm. long, 1 mm. thick. *Flowers* 1-2 on a peduncle; *perianth* about 6 cm. long, white and "very beautiful;" *tube* cylindrical, 4 cm. long 3 mm. broad, curved, dilated from the base to a throat 6 mm. wide; outer lobes ovate-oblong, acuminate, 2 cm. long, 0.9-1.2 cm. broad, the inner ones obtuse and slightly shorter, *Stamens* biseriate, reaching the mouth of the perianth-tube. *Style* longer than the stamens, trifid. (Pl. 143,II.)

Distribution.—Cape Province; in stony places on Houwhoek Mt. at an alt. of 600m., flowering February.

Notes.—Schlechter points out that (according to Baker's classification) this species has the habit of the species in the *Gastronema* group and the flower of the *Monella* group. It is one of the connecting links referred to in the introduction which induced me to dispense with subgeneric or group names.

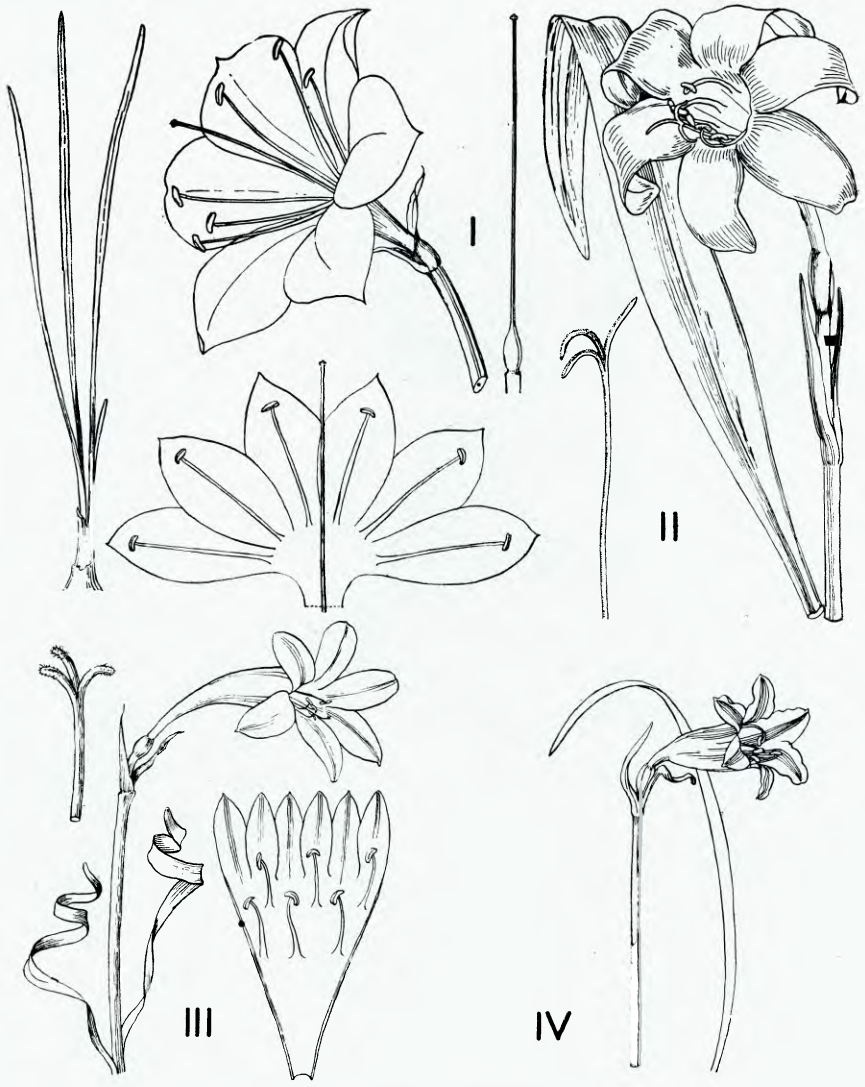
37. C. GUTHRIEAE *L. Bolus,* in Ann. Bolus Herb. 3, 79 (1921).

Description.—Bulb globose-ovoid, 3 cm. long, 2.5 cm. diam. *Leaves* produced after the flowers, linear, up to about 15 cm. long, 2 mm. broad. *Peduncle* about 11



See pages 94, 95 and 96

I, Cyrtanthus contractus N. E. Br. (After photo by H. King, 1936); II, **C. leucanthus** Schlecht. (After sketch in Bolus Herbarium); III, **C. spiralis** Burch. ex. Gawl. (After Bot. Reg. t. 167); IV **C. collinus** Gawl. (After Bot. Reg. t. 162).
Plate 143



See pages 99 and 102

I, **Cyrtanthus Guthrieae** L. Bolus (After drawing in Bolus Herbarium by Guthrie and Carter); II, **C. sanguineus** Lindl. (After Bot. Mag. t. 5218); III, **C. helictus** Lehm. (After Fl. Pl. S. Afr. t. 99); IV, **C. clavatus** R. A. Dyer (After Bot. Mag. t. 2291).

Plate 144

cm. long, curved. *Spathe-valves* 2, lanceolate, attenuate, 3.3 cm. long. *Flower* 1, rarely 2, sessile, bright red with a golden glitter; *perianth* about 8.5 cm. long; *tube* 4.3 cm. long, 4 mm. in diam. at the base, cylindric, gradually expanded above to 1.1 cm. diam. at the throat; *lobes* obovate-oblong, acute, 4.3 cm. long, 1.9 cm. broad. *Stamens* uniseriate; filaments 3-3.5 cm. long. *Capsule* (immature) cylindric, 1.5 cm. long, 0.7 cm. in diam.; the seeds dark brown, 7 mm. long. (Pl. 144,I.)

Distribution.—Cape Province, south-western Cape, Bredarsdorp.

Notes.—In this case I can do no better than quote the following notes which were published with the original description of the species. "A very distinct species, differing from all the rest in having sessile flowers, widely spreading perianth-segments which are as long as the tube, while the tube itself is proportionately much more slender. The spread of the perianth and the relatively long tube are more characteristic of *Vallota* than *Cyrtanthus*, but there is no doubt the two genera are very closely related, and *C. Guthrieae* may almost be considered a connecting link. In *Vallota* the filaments are often adnate to the perianth-segments."

It is evidently a very local species.

38. C. CLAVATUS *(L'Herit.) comb. nov. Amaryllis clavata* L'Herit. Sert. Angl. 11 (1788). *Cyrtanthus uniflorus* Gawl. in Bot. Reg. t. 168 (1816); Baker in Fl. Cap. 6, 226, (1896), et syn.

Description.—Bulb ovoid, 1.7-2.5 cm. in diam., produced into a short neck. *Leaves* 1-2, contemporary with the flowers, linear, about 1-3 mm. broad. *Peduncle* slender, 8-20 cm. long, hollow. *Spathe-valves* 2, linear-lanceolate to lanceolate, 2-4 cm. long. *Pedicels*, if flowers solitary, about half the length of the spathe-valves, if more than one flower, up to 3 cm. *Flowers* 1-3 on each peduncle; *perianth* 4-6 cm. long, more or less horizontally spreading, with 6 conspicuous red, reddish-brown or green stripes extending down the perianth-tube and along the lobes; *tube* 2.5-3.5 cm long with a short slender base from which it is dilated somewhat abruptly and thence gradually to the throat 1.5-2 cm. wide; *lobes* ovate-oblong, 1.5-2.5 cm. long. *Stamens* biseriate, somewhat exserted. *Style* exserted, trilobed. (Pl. 144,IV.)

Distribution.—Cape Province; eastern area, mainly in coastal grassveld.

Notes.—In this case we have the unfortunate necessity of a name change. The specific epithet *clavatus* was the earliest validly published and has priority under the International Rules of Nomenclature. Herbert noted the priority of L'Heritier's specific epithet *clavatus* in his *"Amaryllidaceae"* (1837), but there he transferred it from *Amaryllis* to a separate genus *Gastronema*.

C. clavatus occurs commonly in certain grassveld areas of the eastern Cape Province, but only under favourable climatic conditions is there a profusion of flowers. The normal flowering period is either December or January. It is another of the attractive species introduced to England by Masson, who made joint botanical expeditions at the Cape with Karl Peter Thunberg, a Swede, later termed the Father of South African Botany.

39. C. HELICTUS *Lehm.* Delect. Sem. Hort. Hamburg. (1839).

Description.—Bulb ovoid, 2-3.75 cm. in diam., contracted into a neck 1-3 cm. long, sometimes budding and growing in clumps. *Leaves* 2-4, contemporary with the flowers, linear, 8-14 cm. long, 3-5 mm. broad, spirally twisted. *Peduncle* arising at the side of the leaves and usually somewhat shorter than them, terete, hollow. *Spathe-valves* lanceolate, about 3 cm. or more long. *Pedicels* shorter than the spathe-valves. *Flowers* 1-3 on a peduncle; *perianth* 4.5-6.5 cm. long, white with brown or green stripes extending from the tube along the lobes; *tube* 2.5-4.5 cm. long, narrow and curved at the base, dilated gradually to a throat 1-1.3 cm. in diam.; *lobes* oblong, 1.5-2 cm. long. *Stamens* markedly biseriate, exserted. *Style* exserted further than the stamens, trilobed. (Pl. 144,III).

Distribution.—Cape Province; south eastern districts of the Cape extending to Queenstown and Idutywa, usually under semiarid conditions.

Notes.—Except for the spirally twisted leaves *C. helictus* is very similar to *C. clavatus*. While both species occur in the same geographical regions, the former shows a preference for semiarid areas with a rainfall of less than 20 ins. per annum, whereas the latter is more restricted to grassveld areas with an annual rainfall of over 20 ins.

40. C. Smithiae *Watt ex Harv.* Gen. S. Afr. Pl. 338 (1838). *C. Smithianus* Herb. in Bot. Mag. sub. t. 3779 (1841); Baker in Fl. Cap. 6, 227. (1896).

Description.—*Bulb* ovoid 3.5-5 cm. in diam., with a short neck. *Leaves* 2-4, contemporary with the flowers, linear, 15-30 cm. long, 5-8 mm. broad, spirally twisted, somewhat glaucous. *Peduncle* about the same length as the mature leaves. *Spathe-valves* 2, lanceolate. *Flowers* 2-3 to a peduncle, more or less horizontally spreading; *perianth* 8-10 cm. long, white or pale pink with red or reddish-brown stripes extending along the lobes from the tube; *tube* slender at the base and slightly curved, broadened above to a throat about 2.5 cm. in diam.; *lobes* oblong, about 2.5 cm. long. *Stamens* biseriate. *Style* trilobed.

Distribution.—Cape Province; south-eastern districts in arid or semi-arid habitats.

Notes.—It will be noted that the name Smith has been Latinized in two different ways in naming this plant. The specimens on which the two names were founded had the same origin, but Herbert was evidently unaware of Harvey's specific publication. Harvey, writing of *Cyrtanthus* in his Genera, 1838, includes the statement: "There are several species, one of the most elegant of which, *C. Smithiae*, Watt M.S.S., was brought from Cafferland by Mrs. Col. Smith in 1836, and blossomed in Mr. Watt's garden at Rondebosch last year. It has large white flowers, each segment marked with a rose coloured band, and spiral, strap-shaped leaves" (Mrs. Col. Smith was Col. Sir Harry Smith's wife.)

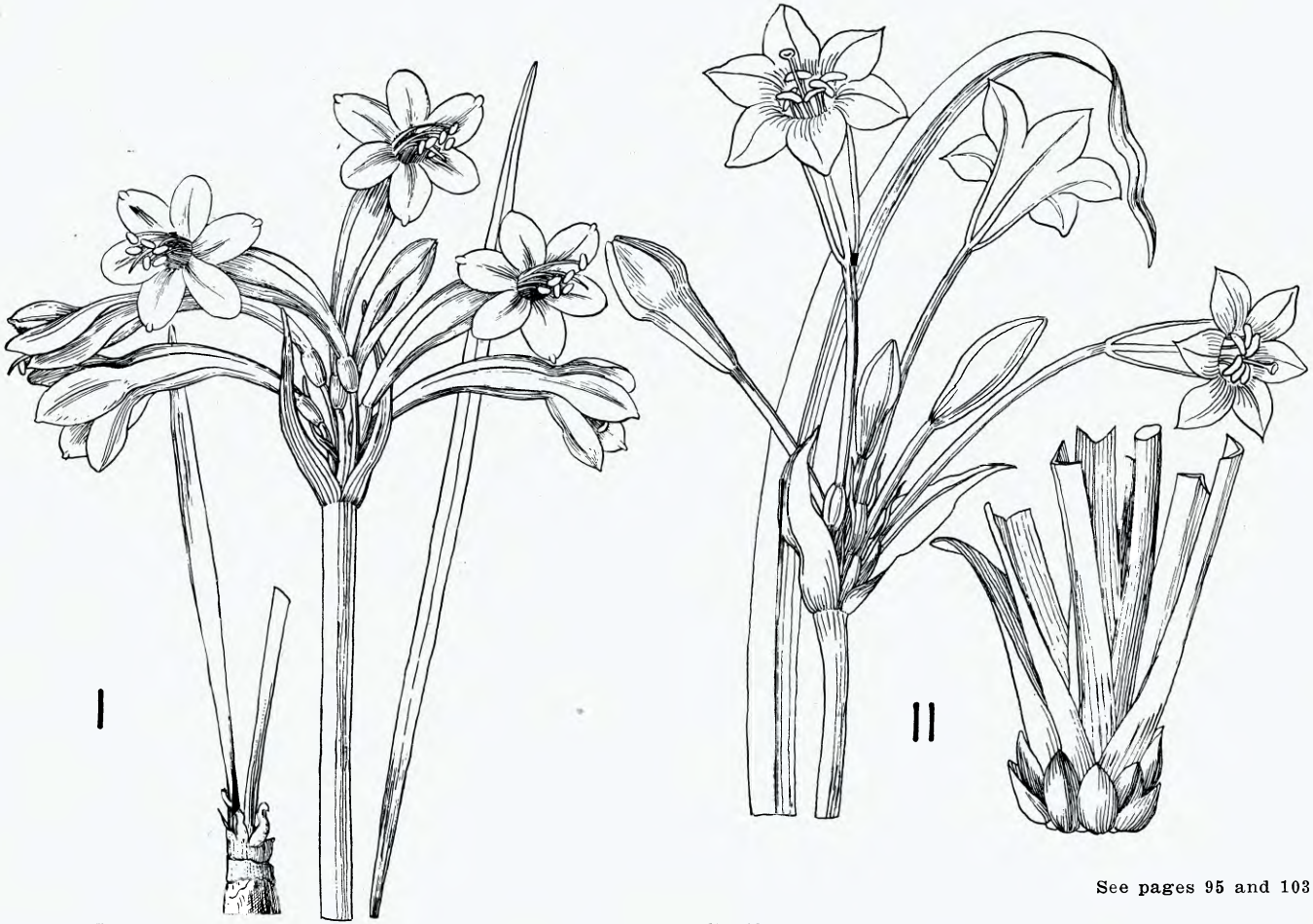
C. Smithiae is similar to *C. helictus* Lehm. and has been confused with it in several collections, but is altogether more robust than it. The confusion is no doubt partly attributable to Baker who gives the distribution record in Flora Capensis as, "Lorenco Marques; Lombobo Mountains, Mrs. K. Saunders" without any mention of "Cafferland" (eastern Cape). The two localities are approximately 500 miles apart and I very much doubt whether Baker's identification of the Saunders specimen is correct. Several specimens agreeing with Harvey's concise description have been collected in the eastern Cape and I am personally able to support Harvey's statement, that it is one of the most elegant species in the genus. To see it in a setting of dusty karroid scrub in the Fish River Valley in the Albany district, is indeed a pleasant surprise.

41. C. Thorncroftii *C. H. Wright* in Kew Bull. 1909. p. 421.

Description.—*Bulb* subglobose, 2 cm. diam. with a neck 3-5 cm. long and 7 mm. thick. *Leaves* 2, contemporary with the flowers, linear, acuminate and tapering to the base, 15-20 cm. long and 5 mm. broad. *Peduncle* slightly compressed, about 25 cm. tall, 3 mm. thick. *Spathe-valves* about 3.5 mm. long. *Pedicels* up to 2 cm. long. *Flowers* 1-2 uniformly pale salmon pink; *perianth* about 3 cm. long; *tube* 1.7-2 cm. long, narrow at the base for about 5 mm., curved, expanding sharply to the throat, funnel-shaped; *lobes* equal or slightly shorter than the tube, elliptic-oblong, acute. *Stamens* inserted in the throat of the perianth-tube, outer filaments 2 mm. long, the inner ones 4 mm. long. *Ovary* triangular. *Style* 3 cm. long with recurved branches 4 mm. long.

Distribution.—Transvaal, hills 3500 ft. alt., near Barberton.

Notes.—This species was described by Wright from a plant which flowered in Ireland in July 1908, evidently having been received there from Mr. George Thorncroft of Barberton, Transvaal. Mr. Thorncroft first collected plants in that area as early as 1890. Although *C. Thorncroftii* was first collected so many years ago, there are very few subsequent records.



See pages 95 and 103

Plate 145 I. **Cyrtanthus ventricosus** Willd. (After **Jacq. Pl. Rar. t. 76); II, C. vittatus Desf.** (After Redouté Lil. 1807).

Wright compared the species with *C. clavatus (C. uniflorus)* which he evidently considered its nearest affinity. It appears to be more closely related to *C. Galpini,* which occurs in the same district. It is, however, readily distinguished from this by the size and shape of the flowers.

42. C. GALPINI *Baker* in Kew Bull. 1892, p. 83. *C. Balenii* Phillips in Fl. PL. S. Afr. 1929, t. 343.

Description.—Bulb ovoid, 2-3 cm. in diam., contracted into a short neck. *Leaves* usually one from each bulb, usually produced somewhat later than the peduncles, linear, up to about 20 cm. long and 3 mm. broad, tapering to a filiform base. *Peduncle* up to 20 cm. long, 3-5 mm. diam., terete, hollow. *Spathe-valves* 2.5-4 cm. long, membranous. *Pedicels* shorter than the spathe-valves. *Flowers* solitary or occasionally 2 on a peduncle; *perianth* 5-8 cm. long, bright red to pink; *tube* narrow and curved in the basal portion which is 1.3-2 cm. long, abruptly dilated above to about 1.3 cm. wide at the throat; lobes ovate, about 2 cm. long. *Stamens* attached to the corolla-tube for varying distances, imperfectly biseriate. *Style* exserted further than the anthers, trifid.

Distribution.—Transvaal; Barberton district to northern Natal on the coast and inland, growing socially in grassveld and scattered in stony scrubveld.

Notes.—In *"Herbertia"* 3, 36 (1936) this plant appeared under the name *C. Balenii.* Since that time it has been possible to study further material, and it is now felt that the plants originally described as *C. Balenii* are not specifically distinct from *C. Galpini.* The height of the insertion of the filaments in the perianth-tube varies; the thickness of the peduncles is also a variable character and it was on these features that the two plants were at first thought to be distinguishable.

The typical form of *C. Galpini* collected in 1889 in the Barberton district by Dr. E. E. Galpin was recorded by him as being "scarlet in colour dusted with gold." The colour varies in different localities from crimson to pink, and it was the latter colour-form which was figured in Fl. Pl. S. Afr. t. 159 (1924).

43. C. SANGUINEUS *(Lindl.) Hook.* in Bot. Mag. t. 5218 (1860).

Description.—Bulb ovoid, comparatively large for the genus, up to 8 cm. in diam., contracted into a cylindrical neck up to 10 cm. long. *Leaves* 2-4, contemporary with the flowers, linear-lanceolate, up to 40 cm. long and 1-2 cm. broad, tapering gradually to both ends, channelled down the upper surface, keeled down the back. *Peduncle* up to 30 cm. tall, hollow. *Spathe-valves* usually 2, lanceolate, up to 8 cm. long. *Pedicels* from nearly obsolete to 3 cm. long, rarely up to 4 cm. long. *Flowers* 1-2, rarely 3 on a peduncle, suberect; *perianth* 7.5-10.5 cm. long, bright red; *tube* subcylindrical towards the base, straight or somewhat curved, dilated above to a throat 2.5-3 cm. wide; *lobes* oblong, 3-4 cm. long, 1.25-1.75 cm. broad, spreading or recurved. *Stamens* biseriate, reaching the throat of the perianth-tube. *Style* exserted, trilobed. (Pl. 144,II.)

Distribution.—Eastern coastal districts of the Cape Province, extending into Natal, usually found in or near scrub bush in river valleys; also recorded from British East Africa by Baker.

Notes.—It is among the most handsome members of the genus and from the time of its discovery has attracted attention in horticulture, with the result that it has been figured in several important works. Lindley describes, and his accompanying figure depicts, a single sessile flower on a peduncle. All the specimens examined by me in South African herbaria show pedicellate flowers. The pedicel is, however, occasionally very short. Mr. D. G. Collett made the same observation after an examination of the material at Kew. Whether Lindley's flower was sessile or subsessile does not appear of great consequence since the eastern Cape specimens agree with the description and figure otherwise of his plant from "Caffraria."

C. sanguineus has on more than one occasion given rise to an intergeneric hybrid with *Vallota speciosa* Dur. & Sch. *(V. purpurea).*

44. C. VITTATUS *Desf.* ex Red. Lil. t. 182 (1807).

Description.—*Bulb* globose, up to 4 cm. in diam. *Leaves* 5-6, contemporary with the flowers, linear. *Peduncle* terete, 15-25 cm. long. *Spathe-valves* 2, lanceolate, 3-4 cm. long, greenish. *Pedicels* very short. *Flowers* 5-6 in an umbel; *perianth* about 7.5 cm. long, white striped with red-brown; *tube* slender in the lower half, dilated gradually to a throat about 1.25 cm. in diam.; *lobes* oblong, 1.25 cm. long. *Stamens* exserted from the throat of the perianth-tube. *Style* exserted beyond the stamens. (Pl. 145,II.)

Distribution.—Unknown.

Notes.—The type figure, an adaptation of which is reproduced here, does not convey to me the impression of a species of *Cyrtanthus*, and it differs from all others in the very long and slender basal portion of the tube, which is abruptly dilated in the uppermost third. The stigma also appears distinctive. In recording my doubt as to whether it is a plant native to South Africa, a free translation is given here of the original French account for the information of those interested.

"The plate which we present here is copied from a drawing made by Mlle. Basseporte, and preserved among the records of the Natural History Museum. We have never seen the plant in question, but according to the drawing which we have on hand, one sees plainly that this plant belongs to the genus *Cyrtanthus;* and from the first glance, it is distinguished from the known species by the longitudinal bands which decorate the limb of the flower.

Its country is unknown; the analogy (i.e. identification as *Cyrtanthus*) might permit one to think that it is indigenous to the Cape of Good Hope."

Is the artist or the botanist at fault?

INDEX TO SPECIES IN ENUMERATION

Nat'l Bot. Gardens, Kirstenbosch See page 105

Agapanthus orientalis in the National Botanic Gardens, Kirstenbosch; Frances M. Leighton appears on right.

Plate 146

A BRIEF REVIEW OF THE GENUS AGAPANTHUS

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Bolus Herbarium, University of Cape Town

Our conception of the Agapantheae as a tribe of the Amaryllidaceae dates only from the publication of Dr. J. Hutchinson's classification of the Monocotyledons in 1934. The group Agapantheae comprises the genera *Agapanthus* and *Tulbaghia* which show greater morphological affinity with the Amaryllidaceous Genus *Clivia* than with any members of the Liliaceae.

The history of *Agapanthus* as a garden plant is a fascinating study. It appears to have been one of the earliest of the Cape flowers to be introduced into European gardens. This is not surprising since *Agapanthus africanus* (L.) Hoffmgg grows plentifully on the slopes of Table Mountain and the vivid violet-blue colour of its flowers would immediately have attracted the attention of the sailors who first landed on these shores.

As far as I know the first reference in literature to *Agapanthus* is to be found in Jakob Breynius' Prodromus Fasciculi Plantarum Rariorum (1679). He calls it the blue African Hyacinth and says that it flowered in the previous year in the garden of the most illustrious and excellent Master Hieronymius a Beverningk. In 1739 his son, Johannes Phillip, republished the Prodromus with further illustrations of some of the plants mentioned by his father and amongst these is *Agapanthus africanus*. The species is referred to in Hermann's Catalogue of the Leyden Botanic Garden published in 1687. In Plunkenets Almagestum 1696 there is a figure of *Agapanthus africanus* and under it the statement that this species was in cultivation in Hampton Court Gardens in 1692. In all these works and also in those of Seba and Van Royen it appears under the name of *Hyacinthus*. In 1653 Linnaeus in his Species Plantarum published a description of the plant as *Crinum africanum*. L'Heritier in his Sertum Anglicum established the genus *Agapanthus* and overlooking Linnaeus' specific name of *africanus* bestowed the epithet *umbellatus* on the species. *Agapanthus umbellatus* was the name accepted for the species until quite recently, although, L'Heritier's error had been rectified by Hoffmansegg in 1824.

In the meantime a second species of *Agapanthus* had been introduced into European gardens and this was also included under the name *A. umbellatus*. This is the species which has recently been described as *A. orientalis* (See Plate 146). It differs considerably from the original *A. africanus* in the size and growth form of the plant and in the colour of the flowers. Soon this newcomer had usurped the rightful place of *A. africanus* which was made a variety or even a new species. Loddige publishes an excellent figure of *A. africanus* in his Botanical Cabinet (1817) No. 42 and describes it as a new species, *A. minor*. In the works of Kunth, Willdenow, Roemer and Schultes, species and varieties of *Agapanthus* were made, shuffled and interchanged. Durand and Schinz in their Conspectus Florae Africae (1895) recognised three species while

Baker in the Flora Capensis (1897) holds the view that there is one species with four varieties.

In 1910 Beauverd described a new species of *Agapanthus* from the Transvaal. This was the first species to be described in which the flower has a long tubular perianth. Similar species which have since been published are *A. Weillighii* Hort. (1911), *A. pendulus* L. Bolus (1924) (See Plate 147), *A. Walshii* L. Bolus (1925) and *A. Hollandii* Leighton (1934). With the exception of *A. pendulus* in which the flowers are of a rich purple all these species have deep blue flowers.

All other members of the genus so far as it is known at present have flowers in which the perianth segments spread out from the apex of the tube and are as follows:—*A. africanus* (L.) Hoffmgg (1824), *A campanulatus* Leighton (1934), and *A. orientalis* Leighton (1939).

The species which is usually grown in gardens is *A. orientalis* Leighton which flowers in summer and is very decorative. As well as the varying shades of blue there is a form of this species with pure white flowers which has never been found in the wild state and would seem to be a mutant. Many of the smaller forms such as *A. longispathus* Leighton (See Plate 147) are becoming popular in South African gardens. They are less massive and give a better display of flowers than *A. orientalis* since the plants are small and many can be grouped in the space occupied by a single plant of *A. orientalis*. The species *A. africanus* which grows on Table Mountain and in other parts of the South Western Region of South Africa is less well known in cultivation but it is well worth growing for the deep violet-blue colour of its flowers. Some of the most attractive species both in form and colour are the undescribed species which are closely allied to *A. campanulatus* and which grow in Natal and the Orange Free State. Descriptions of these will appear as soon as further knowledge of them can be acquired.

Most species of *Agapanthus* are deciduous in Winter. In cultivation, however, where the climatic conditions are somewhat altered, this does not occur every year. The leaves usually die down after the flowers are produced. *A. orientalis* and *A. africanus* are exceptions in this respect as they remain evergreen.

In studying the genus *Agapanthus* it has been found that it is essential, for purposes of taxonomy, to work with plants which come from the field for plants respond very quickly to garden conditions and their growth is very luxuriant. In addition the species hybridise with one another.

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Nat'l Bot. Gardens, Kirstenbosch

See page 106

Agapanthus longispathus, left; Agapanthus pendulus, right, in the National Botanic Gardens, Kirstenbosch.
Plate 147

SOUTH AFRICAN AMARYLLIDACEAE DISCOVERED SINCE 1888

WINSOME F. BARKER,

National Botanical Garden, Kirstenbosch

Arranged according to Dr. Hutchinson's system—

AGAPANTHEAE

AGAPANTHUS L'Her.

1. *Agapanthus caulescens* Spreng. (1901).
2. " *inapertus* Beauv. (1910).
3. " *Weilligii* Hort. (1913).
4. " *Walshii* L. Bolus (1920).
5. " *pendulus* L. Bolus (1921).
6. " *campanulatus* Leighton (1934).
7. " *longispathus* Leighton (1934).
8. " *Hollandii* Leighton (1934).
9. " *orientalis* Isaac (1939).

TULBAGHIA Linn.

1. *Tulbaghia natalensis* Baker (1891).
2. " *leucantha* Baker (1896-97).
3. " *Galpinii* Schltr. (1897).
4. " *campanulata* N. E. Br. (1901).
5. " *Simmleri* Beauv. (1909).
6. " *calcarea* Engl. & Krause (1910).
7. " *Luebbertiana* Engl. & Krause (1910).
8. " *tenuior* Krause & Dinter (1910).
9. " *pauciflora* Baker (——).
10. " *karasbergensis* Glover (1915).
11. " *Dieterlenii* Phillips (1917).
12. " *pulchella* Barnes (1930).
13. " *fragrans* Verdoorn (1931).

AMARYLLIDEAE

BRUNSVIGIA Heist.

1. *Brunsvigia Insizwae* A. Zahlbr.
2. " *natalensis* Baker (1896-7).
3. " *sphaerocarpa* Baker (1896-7).
4. " *Rautanenii* Baker (1903).
5. " *Bosmaniae*, Leighton (1932).
6. " *appendiculata* Leighton (1932).
7. " *undulata* Leighton (1934).

NERINE Herb.

1. *Nerine pancratioides* Baker (1891).
2. " *appendiculata* Baker (1894).
3. " *angustifolia* Baker (1896-7).
4. " *brachystemon* Baker (1896-7).
5. " *duparquetiana* Baker (1896-7).
6. " *Schlechteri* Baker (1903).

7. " *Huttonii* Schonl. (1903).
8. " *Bowdeni* W. Watson (1904).
9. " *Veitchii* Hort (1911).
10. " *Ridleyi* Phillips (1913).
11. " *pusilla* Dinter (1914).
12. " *Frithii* L. Bolus (1921).
13. " *Masonorum* L. Bolus (1930).
14. " *angulata* L. Bolus (1930).
15. " *Krigei* Barker (1932).
16. " *falcata* Barker (1933).
17. " *gaberonensis* Ober. & Brem. (1935).
18. " *Peersii* Barker (1935).
19. " *tulbaghensis* Barker (1935).
20. " *Breachiae* Barker (1935).
21. " *alta* Barker (1935).
22. " *filamentosa* Barker (1935).
23. " *gracilis* Dyer (1937).
24. " *hesseoides* L. Bolus (1938).

CRINEAE

CRINUM Linn.

1. *Crinum acaule* Baker (1896-7).
2. " *Menyharthi* Baker (1901).
3. " *amboense* Baker (1903).
4. " *nerioides* Baker (1903).
5. " *ondongense* Baker (1903).
6. " *polyphyllum* Baker (1903).
7. " *crispum* Phillips (1934).

AMMOCHARIS Herb.[1]

1. *Ammocharis coccinea* Pax. (1889).
2. " *Taveliana* Schinz (1890).
3. " *Herrei* Leighton (1932).

CYRTANTHUS Ait.

1. *Cyrtanthus parviflorus* Baker (1891).
2. " *Galpinii* Baker (1892).
3. " *O'Brieni* Baker (1894).
4. " *Elliotii* Baker (1896-7).
5. " *Flanagani* Baker (1896-7).
6. " *rectiflorus* Baker (1896-7).
7. " *stenanthus* Baker (1896-7).
8. " *leucanthus* Schltr. (1898).
9. " *inaequalis* O'Brien (1905).
10. " *Junodii* Beauv. (1907).
11. " *Thorncroftii* C. H. Wright (1910).
12. " *epiphiticus* J. M. Wood. (1913).
13. " *staadensis* Schonl. (1914).
14. " *suaveolens* Schonl. (1914).
15. " *contractus* N. E. Br. (1921).
16. " *Guthrieae* L. Bolus (1921).

[1]The genus is being revised by G. Milne-Redhead and H. G. Schweikerdt.

17. " *rotundilobus* N. E. Br. (1921).
18. " *Stayneri* L. Bolus (1925).
19. " *rhododactylus* Stapf. (1929).
20. " *Balenii* Phillips (1929).
21. " *Fergusoniae* L. Bolus (1931).
22. " *flavus* Barnes (1931).

ZEPHYRANTHEAE

GETHYLLIS Linn.

1. *Gethyllis pusilla* Baker (1896-7).
2. " *multifolia* L. Bolus (1929).
3. " *unilateralis* L. Bolus (1929).
4. " *linearis* L. Bolus (1929).
5. " *grandiflora* L. Bolus (1929).
6. " *longituba* L. Bolus (1929).
7. " *campanulata* L. Bolus (1929).
8. " *lanuginosa* Marloth (1931).
9. " *setosa* Marloth (1931).
10. " *verrucosa* Marloth (1931).
11. " *lata* L. Bolus (1932).
12. " *Herrei* L. Bolus (1933).

HAEMANTHEAE

HESSEA Herb.

1. *Hessea Schlechteri* Kuntze (1893).
2. " *bachmanniana* Schinz (1896).
3. " *brachyscypha* Baker (1786-7).
4. " *Leipoldtii* L. Bolus (1930).
5. " *Mathewsii* Barker (1931).
6. " *Karooica* Barker (1935).
7. " *unguiculata* Barker (1935).

STRUMARIA Jacq.

1. *Strumaria bidentata* Schinz (1896).
2. " *Watermeyeri* L. Bolus (1921).
3. " *phonolithica* Dtr. (1923).

BUPHANE Herb.

1. *Buphane longepedicellata* Pax (1889).

HAEMANTHUS Linn.

1. *Haemanthus candidus* Hort. (1894).
2. " *Nelsonii* Baker (1898).
3. " *splendens* Dinter (1923).
4. " *avasimontanus* Dinter (1923).
5. " *otaviensis* Dinter (1931).
6. " *sessiliflorus* Dinter (1931).
7. " *sacculus* Phillips (1934).
8. " *Nortieri* Isaac (1937).

EUCHARIDEAE.

Klingia namaquensis Schonl. (1919).

CHANCE MEETINGS WITH AMARYLLIDS IN FOUR CORNERS OF THE SOUTH AFRICAN VELD

I. C. VERDOORN,

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In July 1936, two colleagues and I made a swift botanical trip through Swaziland and Zululand. The days usually found us in the hot, low plains and valleys where our progress was constantly being arrested by exceptionally interesting species in the vegetation. As the night approached we would anxiously consult map, speedometer and watches for we must get to the "next place with an hotel" by 8 o'clock, the dinner hour limit in such places. There was no time during the daylight to spend in eating and drinking but by night we were always ready for our dinner! In these regions the "towns" which often consisted merely of an hotel, a police station and a couple of stores, are situated high in the mountains because of the heat and fever in the valleys. Such a place was the isolated Magut which we reached one night only just in time. The hotel was clean and pleasant. There was only one other guest besides ourselves. As we went in to dinner we were struck by the beauty of the unusual table decoration. It consisted of bowls of *Cyrtanthus Galpinii!* The lovely rosy perianths dusted finely with gold and borne erect on their pale green peduncles were an exquisite and unique sight. The proprietress said natives had brought bunches of these flowers to her in the morning. She did not know where they grew. A day or two after, when winding down from Nongoma to the Black Umfolozi, we saw them growing, scattered richly on some of the grassy slopes. A few specimens were gathered and they are now pressed and dried and lodged in the National Herbarium, Pretoria.

February of the next year found me surveying the grazing plots at the Grootfontein School of Agriculture, Middleburg, Cape Province. These plots lie in the open Karoo veld some distance from the School. In the late afternoon when returning from this camp I noticed, at some distance from the road and near the foot of a low range of hills, a spot of bright colour midst the prevailing light brown and grey-green aspect of the Karoo in late summer. I hurried across the veld and reaching the spot a truly lovely sight met my eyes, a group of *Brunsvigia Cooperi* in full bloom. Stout peduncles under a foot in height, rose directly from the ground and bore umbels of up to 40 flowers beautifully disposed on stiff 6 inch pedicels. The pedicels were suffused with the same colour as the flowers, a colour difficult to describe. In this particular patch it seemed to be deep red but in others which I saw later it seemed a dark rich pink. A representative specimen collected at this spot may be seen in the National Herbarium, Pretoria filling a whole herbarium sheet in spite of several amputations. The leaves which are 4-5 inches broad and 9-12 inches long, appear after the flowering period.

July 1937 found the three, who were east in Zululand the year previous, near the west coast of the continent in the wild and mountainous region of Namaqualand. During one of the stops near Stein-

kopf on a rocky outcrop rich in succulents, Dr. R. A. Dyer came across two lorate leaves. He immediately realised they could belong only to an amaryllid and I could practically sense HERBERTIA readers uppermost in his mind as he worked carefully and persistently until he had removed from its stronghold the strange bulb with thick bifarious scales. We treasured this plant through the rest of the trip and were rewarded when it flowered in the garden of the National Herbarium in the following March. As he "half suspected" it has proved to be an undescribed species of Haemanthus. The flowers appear before the leaves and are borne on a reddish peduncle about 4 inches long. The flowers and bracts which grow erect forming the paint brush type of umbel are red. Early next year the species will appear in *Flowering Plants of South Africa,* for which publication it has been figured and described.

My most recent chance-encounter with an amaryllid in the veld took place when a group of Biologists from the Netherlands were touring South Africa last year. I was fortunate enough to be one of the local party to accompany them into the northern Transvaal during October. We had crossed the Zoutpansberg range via the famous Wylies Poort, the thrill of the first Baobab, that grotesque tree *Adansonia digitata,* was over and we had travelled some miles through Mopane bush when suddenly there was a cry of "halt!" from the botanists. Close to the road among some dark rocks was a group of *Haemanthus sacculus,* a coloured illustration of which may be seen in *Flowering Plants of South Africa,* plate 431. The umbels of vivid colour and intricate design were like gems in that setting. It may be a beautiful amaryllid in cultivation but in its natural habitat it is superb. The leaves appear after the flowers. Two or three inflorescences were forced to leave this little colony and were put into the botanical presses. Now botanical specimens from this locality may be seen in one or two herbaria in Holland and also in the National Herbarium, Pretoria.

In the South African veld, no matter what the climate or soil, there is hardly a corner in which some species of Amaryllidaceae does not flourish.

NOTES ON GETHYLLIS

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The genus *Gethyllis* is one of the ornaments and at the same time one of the oddities of what Peattie truly calls "the incredible flora of the Cape." Twenty species have been described, of which only nine appear in the Flora Capensis (Vol. VI, 1896), the rest having been discovered since. Several others still await naming and description. Most of them grow in the south-western coastal belt, usually in sandy soil, but several are found on the Karroo and in Little Namaqualand. The name *Gethyllis* was evidently taken by Linnaeus from the Greek Gethullis

(latinized as Gethyllis) which is a diminutive of gethuon, meaning a leek. The long necks shown in our illustration of *G. afra* (the type for the genus) probably suggested "little leeks" to him. One can thus refer to them in general as Gethyllids, the anglicized version of the Greek plural "Gethyllides."

Looking through the material of this genus at the Bolus Herbarium, University of Cape Town, and the Herbarium of the South African Museum, there emerges a composite picture of *Gethyllis* as a white bud piercing the bare earth in the dry season, and opening soon after it emerges into a delicate star-like flower, pure white or flushed with pink, scented like jasmine, and about three inches across. There is no stalk to this flower; the petals spread out an inch or two above ground at the end of a long slender perianth-tube which arises deep down in the bulb. Each bulb forms only one flower, which lasts one or two days, then vanishes, leaving the earth bare again. Several months later the ground is pierced by the tip of a long club-shaped object, usually orange-coloured, with a semi-transparent skin, through which can be seen numerous seeds, the size of small shot, embedded in a soft pulp. This is the elongated berry of *Gethyllis,* which has grown up from deep down in the base of the bulb. Like the flower, it is strongly and deliciously sweet-scented. It is pleasant to the taste (somewhat like a mixture of banana and pineapple) and is eaten by birds and animals, the hard-coated seeds being thus dispersed.

The next event in this strange cycle is the appearance of a bunch of linear leaves, usually very narrow and of a dark polished green, and more or less spirally twisted. The bunchy effect is due to their being enclosed below in a strongly-developed sheath which is often conspicuously spotted with dark purple or brown. Their rudiments can be seen waiting down below if one pulls out the fruit, and they come up after the rains have well begun. With the advent of the dry season they wither and vanish, and the earth is bare once more till the starry flowers again pierce it and shed their fragrance abroad.

So individual a habit has *Gethyllis* that this general description is enough to enable one to recognise the genus in the field. In several species the flower is smaller, only about two inches across, (*G. afra* of our illustration, Plate 148, varies from two to three inches) while in the splendid *G. grandiflora* L. Bolus it may be over six inches in diameter. But in all cases it is stalkless and single, and sent up without attendant leaves. In that perhaps lies its special appeal, coming up as it does in the dry season like a promise of resurrection among the withered remains of the spring glory of the veld.

The Gethyllids show other interesting peculiarities. One is the presence of numerous stamens in some of the species, a characteristic unique in the *Amaryllidaceae.* Thus in *G. afra*, while occasionally there are just six ordinary stamens, it is much more usual for some or all of them to be duplicated or even broken into three or four by the division of the filament. Other species may thus form up to more than sixty stamens, arranged in six "parcels." Another peculiarity is the curious coating of lacerate scale-like hairs on the leaves of several species which

grow in drier regions, where even the rainy season has long spells of dry weather. There is however, always dew at night, and Dr. Marloth has shown by experiment that these elaborate trichomes absorb this dew very effectively. They are described and figured by him in "South African Gardening," Vol. 21, pp. 40-41, 1931, and "Berichte der Deutsche Botanische Gesellschaft," Vol. 44, pp. 448-455, Tafel XI, 1926.

But it is through its fruit that *Gethyllis* is best known to South Africans, and known under the name of "Kukumakranka," a word probably adopted from the Hottentots, to whom it was an important seasonal addition to their food supply. (The spelling varies and the meaning is not known). The fruit takes several months to develop down in the base of the bulb. The two species commonest in the south-west Cape, *G. afra* L. (the subject of our illustration, Plate 148) and *G. spiralis* L. f., flower in December-January, and their fruit begins to appear at ground level in the latter half of April, when the first rains have softened the ground. Its stalk elongates so that it is gradually pushed up out of the bulb, looking like an orange-coloured finger poking straight up through the earth, till at length it flops over and lies flat. In *G. afra* it has then the appearance of a slender semi-translucent carrot (the broad end at the top), three to five inches long, with a delicious fruity scent. Thunberg said that this "resembled in some measure wild strawberries, and filled the room." But it is richer than the scent of strawberries, more like custard-apple *(Anona)* with a dash of port wine. The form and colour of this fruit and of the larger club-shaped fruit of *G. ciliaris* are shown in Marloth's "Flora of South Africa," on plate 35 of Vol. IV.

But before half its length has emerged it has probably been collected by the country children (and grown-ups) who scour the veld for Kukumakrankas in April and May. They hunt them both by sight and by scent, and far-seeing youngsters will have taken the precaution of surrounding each flower in December with a ring of stones. They eat them, or press and dry them as a present for their mothers, to use like lavender to scent handkerchiefs or linen-cupboard; or sell them to men to put into brandy, for several left in a bottle for a few months give it a delicate liqueur-like flavour and aroma. This, or a draught made by steeping Kukumakrankas in boiling water, is considered a very good remedy for stomach-ache.

Several species of *Gethyllis* used to grow quite commonly in the neighborhood of Cape Town. The traveller Burchell in 1811 noted: "On Green Point, and on the Flats in the Neighborhood of Cape Town, grows a celebrated little plant, which still preserves its original Hottentot name, being known by no other than Kukumakranki. It has a flower much resembling the common *Colchicums* of our gardens, and has also a bulbous root, close to which is produced a long, yellow soft fruit, of the length and size of a lady's finger, its tip just appearing above the ground. The taste of it is somewhat pleasant, but its smell is delightful, having a perfumed odour of ripe fruit, for which it is chiefly valued. The children of Cape Town sometimes go out in search of kukumakrankies; and as it is difficult to find them, being very inconspicuous amongst the herbage,

E. J. Steer, South Africa

See page 117

Gethyllis afra, "Kukumakranka" or Christmas Star. Approximately three-fourths natural size.

Plate 148

they consider it a little triumph to return home with a few; and the kukumakranki season never passes unnoticed." (W. J. Burchell: Travels in the Interior of Southern Africa." Vol. I, pp. 55-56. 1822).

Now, alas, Kukumakrankas are rare round Cape Town and its suburbs, having been ousted by the spread of houses and of the imported wattles and pines, as well as the depredations of bulb-hunters. But they can still be found if one searches in the right place at the right time, and one such place is a common close to my home in the suburbs. This common, the resort of golfers, footballers, and cricketers, surrounded by houses and busy motor-roads, and crossed daily by scores of people, is one of the refuges of *Gethyllis afra*. It is about Christmas time that its perfumed stars dot the common, whence they have earned another familiar name, "Christmas Star."

I have observed the flowering of these plants for a number of years, and there is a rather entertaining precision about it. December is a dry month, but there is usually some rain about Christmas time. The flower buds seem to be formed by the middle of December, but they wait underground till rain gives them the signal to emerge, when they rush up, some overnight, others the next day, while a few laggards may go on appearing during the next few days. But each flower only lasts for a couple of days, and the whole lovely show is over within a week to ten days after the rain has given the signal for it to begin. This sensitive reaction of the bulbs to rain, once their normal flowering season has been reached, seems to be characteristic of the genus. Dr. Marloth in his "Flora of South Africa" (Vol. 4, p. 121) tells of six bulbs of *G. ciliaris* he had in cultivation; these had been dormant for four months, till one day in December there was a shower of rain; next day five buds had appeared above ground, opening a few hours after sunrise. (The sixth bulb, cut open, proved to be still without a bud). Nearly a hundred of these flowers, each representing a bulb, can be counted each year on the common. The bulbs are fortunately deep-seated, and though occasionally one sees that a passer-by, attracted by the beauty of the flower, has tried to scratch down through the sandy soil to the bulb, they never succeed. And each year as Christmas approaches the writer waits eagerly for rain, and in the dusk of the next day searches for the first Christmas Stars. (In the dusk, for to drink in their perfume it is necessary to literally prostrate oneself at the shrine!)

I wonder if members of the Amaryllis Society have ever tried growing *Gethyllis*. Perhaps a plant which produces only one flower a year, and that lasting only a couple of days, is rather a dubious horticultural proposition. But should anyone be attracted by this odd plant, they would probably find it easy to cultivate, as it has been grown and flowered in Europe. *G. afra* was apparently described by Linnaeus from a plant growing over 200 years ago in Clifford's garden in Holland.

In Edwards' "Botanical Register," for 1826 (Vol. 12, plate 1016), appears a coloured plate of a plant in flower, grown by a London nurseryman, and Baker's "Handbook of the Amaryllideae" there is a record of one that flowered at Kew in 1887. Of *G. spiralis* there is a very good painting in "Curtis's Botanical Magazine" for 1808 (Vol.

27, plate 1088), again from a plant grown by a nurseryman near London; this is copied (reversed) in Mrs. Loudon's "Ladies' Flower Garden" (plate 184). Jacquin in his "Plantarum Rariorum Horti Caesarei Schoenbrunnensis" gives a fine painting (plate 79 of Vol. I, pub. 1797) of *G. ciliaris,* which had flowered in this Austrian garden.

In none of these paintings is the fruit shown, and possibly artificial pollination is necessary in cultivated plants; in their native home pollination is carried out by long-tongued moths. The time of flowering in Europe is variously given as June to August, and Curtis notes that "very few species are known in our gardens, and those have rarely bloomed." No wonder, with their constitution upset by being transferred as (presumably) mature bulbs to a climate where the seasons are reversed. With all South African bulbous plants grown in the northern hemisphere, the golden rule is to grow from seed, so that they can acclimatise themselves from the beginning. *Gethyllis* seeds germinate very easily, but how long they would take from seed to flower I cannot tell, for there is no record of this. Mr. Charles van der Riet of Stellenbosch, who has raised hundreds of seedlings during the last four years, tells me that his four-year-olds show only three or four leaves, and there is as yet no indication of their flowering.

South African botanists are very few in comparison with the multitude of problems raised by the vast and varied flora of their country, and there are many points in the life-history of *Gethyllis* about which they would welcome information. If any member of the Amaryllis Society has the patience to try growing one species from seed to fruit, keeping notes and drawings, he would earn the gratitude of his colleagues in South Africa. A deep pot of sandy loam would be suitable, and the only attention the plants would need is storage of the pot in a warm dry place during the winter months. In Florida they could presumably grow out of doors all the year round, unless the winter months (which would be the equivalent of our dry season) are very rainy.[2]

Our illustration (Plate 148) is from a photograph taken by Mr. E. J. Steer at Christmas time nearly thirty years ago. (One hastens to add that the bulbs shown had to be dug up to make way for a house). It has been used to illustrate a charming article on *Gethyllis afra* by Dr. L. Bolus in her "Second Book of South African Flowers," and I am much indebted to author and illustrator for permission to use it here, and to Dr. Bolus, and to Mr. Pillans of the Bolus Herbarium, for information about *Gethyllis.*

[2]The Florida winter months are relatively dry.—Ed.

AMARYLLIS KROMERII SP. NOV.

Bulbs of an amaryllid gathered July 1899 by Mr. Kromer or one of his employees in Brazil were sent to Arthington Worsley at Isleworth by Mr. Kromer from the Roraima Nursery Gardens, W. Croyden, in flower, April 1901. These bulbs flowered again in Febrary 1903. Comparison of the blooms with other species indicated that this constituted

a new species of the Genus *Amaryllis*. The species was named for Mr. Kromer, and is allied with the *Amaryllis organensis* group, especially with *Amaryllis correiensis* (Bury fig. 9). It shows some possible alliance with *Amaryllis procera* in the resemblance to the rhododendron-like markings that are to be noted on the segments, but in general the coloration of the flowers most nearly resembles that of *Amaryllis correiensis* although not so brilliant.

Description.—Amaryllis Kromerii sp. nov.,[3]—Bulb medium sized or rather small with produced neck; leaves 4 to 5, glaucous, indistinguishable from those of small forms of *Amaryllis psittacina*, except in not having blunt apices, and in having the narrow pinkish cartilaginous edges of *Amaryllis correiensis* and *Amaryllis procera;* flowers a pair, regular, mostly red, rosy and green, copiously spotted externally towards the base with red on the green ground-color, suddenly dilated close to the nectary thus giving a campanulate effect to the flower; tube very short, naked, but quite closed up by the basal parts of the stamens; stamens somewhat spreading; ovules very numerous; fruit and seeds unknown.

Habitat.—Banks of Upper Rio San Francisco, highlands of Minas Geraes, Brazil.

Type material.—None available; description was made from living plants by Arthington Worsley at Isleworth, England, in 1903.

—*Arthington Worsley.*

[3]**Amaryllis Kromerii sp. nov.** aff. **A. organensis;** bulbus mediocris vel parvus, collo producto; folia 4 vel. 5, glauca, marginibus cartilagineis angustis incarnatis; flores gemini actinomorphi; perianthium rubrum, incarnatum et viridis, basi externe viridi dense rubromaculatum, nectarium versus dilatatum, tubo brevissimo nudo, intus clauso, squamellis circa filamentorum basin amplis patentibus; ovulae numerosae; fructus et semina ignota.

WORSLEYA, SUBGENUS NOV., GENUS AMARYLLIS (LINN. EX PARTE) AMARYLLIDACEAE

HAMILTON P. TRAUB,[4] *Florida*

Amaryllis procera, the so-called Blue Amaryllis, is of great interest to the plant breeder on account of its beautiful lilac-colored flowers. However, all attempts to cross it with the other species of *Amaryllis* have apparently failed. This fact and other peculiarities of this plant to be taken up later have led to a reconsideration of its position in the classification of the species of the Genus *Amaryllis.*

The species was first described by Duchartre in 1863 from plants sent to him by M. Binot from Brazil. The latter had suggested the name "Impératice du Brézil", but this was not in harmony with the rules of botanical nomenclature. Duchartre first proposed the name *Amaryllis gigantea,* but he found later that this name had been used

[4]The writer wishes to acknowledge with thanks the loan of photoprints from Mr. Wyndham Hayward.

by van Marum in 1805 to designate the plant that later was named *Brunsvigia gigantea* (van Marum) Traub [=*Amaryllis gigantea van Marum;*= *Amaryllis Josephinae* Redouté;= *Brunsvigia Josephinae* (Redouté) Gawl.] He therefore proposed the name *Amaryllis procera.* Up to 1929, there was no published description of the seed character of *Amaryllis procera.* Mr. Arthington Worsley made a special trip to Petropolis, Brazil, about 1925 to study this plant in its native habitat, and he wrote about his findings in 1929. He had previously flowered *Amaryllis procera* repeatedly at Isleworth, had set seeds on it by self pollination, and had raised seedlings. In his article (Gard. Chron. London. May 1929, pp. 377-379, figs. 188 and 189) he included illustrations showing the fruit and seed structure.

According to Mr. Worsley, the fruit dehisces in five months and contains 44 to 45 jet black D-shaped seeds. These are much thicker than in other species of *Amaryllis,* not at all winged, but very acutely angled, with all edges raised. He also notes that the gestative period is about two and one-half times as long as is the case in other *Amaryllis species.* These characters together with sickle-shaped leaves, and the failure to cross with other related species is used as a basis for proposing the new Subgenus *Worsleya*[5] with *Amaryllis procera* as the type species.

The late W. Watson once proposed to Mr. Worsley that a monotypic Genus, named in his honor, be created to accomodate this species, but Mr. Worsley, being a very modest man, discouraged him. We agree with the late W. Watson, and propose that the new Subgenus be named in honor of Mr. Worsley who has done more than any other to bring *Amaryllis procera* into cultivation, and who was the first to figure the fruit and seed structure of this species, characters that are now used as the basis of the new Sub-group.

[5]**Amaryllis** subg. **Worsleya subg. nov.** Distinguit foliis falcatis, seminibus D-formibus, crassiusculis, apteris sed acute angulatis, marginibus elevatis. Typus: **Amaryllis procera** Duch. (Jour. Soc. Imp. Cent. D'Hort. 9:425-438.1863, t. 17.)

(L. van Houtte in Flore de Serres. 20:53-54, 1874, t. 2077-78; Traub and Uphof in Herbertia 5:128.1938, t. 112. Syn.: **Amaryllis gigantea** Duchartre (non van Marum), in Jour. Soc. Imp. Cent. D'Hort. 9:77.1863; **Amaryllis Rayneri** J. D. Hooker in Curtis's Bot. Mag. t. 5883.1871; **Hippeastrum procerum** Ch. Lemaire in L'Illus. Hort. t. 408.1864; W. Watson in The Garden, London, 1894, p. 350, t. 959; Worsley in Gard. Chron. London, May 1929, pp. 377-379, figs. 188 and 189.)

COOPERIA SMALLII

At last we have a yellow flowering species of Cooperia as a result of the botanical activities of Robert Runyon of Brownsville, Texas who sent bulbs of it, collected in southern Texas in 1930, to the late Dr. John Kunkel Small of the New York Botanical Garden. The publication of the species was apparently delayed on account of the death of Dr. Small. In April of the present year Dr. Alexander published the species *Cooperia Smallii,* named in honor of Dr. Small, in Addisonia (21: 7-8, t. 676, Apr. 1939):

Description—"Small's *Cooperia* is a scapose, bulbous herb, the bulb seated some two or three inches underground, obovoid, about an inch

(Continued on page 135)

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Zephyranthes bifolia (Aublet) Roemer

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Plate 149

ZEPHYRANTHES OF THE WEST INDIES

H. Harold Hume

That a plant, placed from time to time in the genus *Zephyranthes,* was present in the West Indies became known as early as the end of the seventeenth century. Carolus Plumier, on one of his voyages to America of which he made three, visited the island of Santo Domingo and found a species that has been placed rightly or wrongly as *Z. bifolia.* He furnished a manuscript description (1689-1697) of this species beginning with the words, "Lilio narcissus bifolius purpureus". Gawler (1813) brought a second species to notice as "*Amaryllis tubispatha*" although he confused it with another plant from South America, the identity of which is doubtful, described by L'Heritier (1788) under the same name. Later Gawler's plant was transferred to *Zephyranthes* by William Herbert (1821) as the type or co-type of the genus. John Lindley added *Z. rosea* in 1824 and J. G. Baker described *Z. Wrightii* in 1888. C. H. Wright published a description of *Z. cardinalis* in 1914 from material that had come originally from a garden in the Bahamas. Now, it has been decided that this plant is identical with Plumier's plant from Santo Domingo. It is proposed to add *Z. insularum* and *Z. Plumierii* as new species to the West Indian list.

Of those named in the above chronology, *Z. bifolia* (Plate 149), *Z. insularum* (Plate 150), *Z. tubispatha* (Plate 153), *Z. Plumierii* (Plate 151), *Z. rosea* (Plate 152), and *Z. Wrightii* (Fig. 36), are regarded for the present as native. Besides these at least two other species of the genus, *Z. grandiflora* Lindley (*Z. carinata* Herb.) from Mexico and *Z. citrina* Baker (*Z. Eggersiana* Urban), first known from British Guiana but probably native elsewhere on the Central American-Mexican side of the Gulf of Mexico rim, are widely distributed as introduced species and highly regarded as garden plants. A few species belonging to related genera are also cultivated.

Species believed to be native in the West Indies present certain characters in common. In all six, the tubular portion of the spathe is shorter than the stipe, the stigmas elevated above the anthers are trifid, and the leaves are bright shining green in color. In these important particulars they form a homogeneous group. Distinctions by which they are to be set apart from one another must be sought in other characteristics than those indicated.

ZEPHYRANTHES BIFOLIA (Aublet) Roemer

Familiarum naturalium—synopses monographiceae 4:125. 1847.

Lilio narcissus bifolius purpureus, Bot. Am. descr. Mss. et ic. to 3, f. 137 in Bibliotheca Kewensis. 1689-1697.

Amaryllis bifolius Aublet. Historie des plantes de la Guiane Francaise. 3: 304. 1775.

Zephyranthes rosea Lindl. var. 2 *bifolia* Herb. Amaryllidaceae 173. 1837.

Zephyranthes cardinalis C. H. Wright. Botanical Magazine t. 8553. 1914.
Atamosco bifolia Britton. Flora Bermuda 79. 1918.
Atamosco cardinalis Britton. Flora Bahamas 78. 1920.
Habranthus cardinalis (Wright) Sealy. Jour. Royal Hort. Soc. 62:208. 1937.

Plate 149*

Bulb copiously rough-coated, dark, 2.5-3.5 x 2.5-4 cm., neck 3-12 cm. long, showing characters of dry land bulb; leaves 1-3, curved, concave on upper surface, apex tapered, shining green, 5.5 mm. x 11-35 cm.; scapes subterete or distinctly flattened, pink below, greenish pink above, 5 mm. x 8 cm.; spathe membranous, pink tinted, shorter than stipe, 2.5 cm. long, inflated larger than the stipe, tubular portion 1.7 cm. long, tips bilateral, slender, 8 mm. long; stipe slender, 2.5 cm. long; flower declined, broadly funnelform, cardinal red with small greenish throat, 6.5 cm. long; perianth tube green at base, green tinted upward, somewhat bluntly triangular, 1.6 cm. long; sepals cardinal red, spathulate, rounded at apex with prominent white cohering keels, margins incurved, 2 x 4.5 cm.; petals cardinal red, greenish tinted on inner surface towards base, ovate-spathulate, 1.8 x 4.2 cm., apex rounded, margins incurved; stamens declinate, attached below top of the tube; filaments slightly incurved, all six of nearly same length, white above, green tinted below, 2.5 cm. long; anthers yellow at anthesis, 6 mm. long; ovary short, 5 mm. long, bluntly triangular, bright green; style extending 1 cm. above anthers, thickened, upward, white; stigmas trifid, marked with 2 slight ridges, papillate, violet tinted, thickened, somewhat recurved, the ends rounded, 7 mm. expanded; capsule depressed above and below, deeply trilobed, lobes smooth, broad and rounded, 1.2 cm. long, 1.8 cm. wide; seeds black, shining, flattened, 3 x 7 mm.—Description based on fresh and dried material.

For many years after its discovery, apparently no reference was made to Plumier's plant until Fusée Aublet (1775) listed it and established the binomial *Amaryllis bifolius*. M. le Chevalier Lamarck (1783) described "Amarillis a deux feuilles" from a Plumier drawing and notes. William Herbert (1837) placed this plant as a variety of *Z rosea*. Taking his information from previously published sources, M. J. Roemer (1847) described it as a doubtful species in the genus *Zephyranthes*. C. S. Kunth (1850) followed Herbert in placing it as a variety of *Z. rosea* and J. G. Baker (1888) also indicated his belief that such disposition was correct. No new information concerning this plant was added until Ignatius S. Urban (1907) wrote a new description from plants collected in the same general area in Haiti as that in which Plumier had first seen the species. Urban based his description on three sheets of specimens, Picarda 1087, Buch 366 and Buch 579 now in the Museum botanicum Berolinense.

*See also Plate 48, **Habranthus cardinalis**, Herbertia 4:72. 1937.

C. H. Wright (1914) described *Z. cardinalis* as a new species of *Zephyranthes* based upon material flowered at Kew, the bulbs of which had come indirectly from a garden in the Bahamas. His description is accompanied by a very satisfactory colored plate. Careful study of Wright's plate, his description, herbarium material from the same Bahama source, Florida Experiment Station No. 10731, U. S. National Herbarium 1556601, New York Botanical Garden Cultivated Plants No. 22632, No. 13095 and New York Botanical Garden Exploration of the Bahamas No. 268, and from Santo Domingo a large number of herbarium specimens, U. S. National Herbarium Nos. 1300281 1300830, 1148088, 1149489, 1149511, 1149876, 1453086, the three sheets cited by Urban listed above and E. L. Ekman Plantae Indiae Occidentalis No. 11929 in the Museum botanicum Berolinense and Plants of Haiti No. 8959 in the New York Botanical Garden Herbarium, brings to light that all represent the same plant and *Z. cardinalis* C. H. Wright passes as a synonomy. Moreover, the large stigmas, the rounded apices of the perianth and the declinate flower shown in Plumier's drawing, and his description leave no reasonable doubt that Plumier's plant, *Zephyranthes bifolia* (Aublet) M. J. Roemer and *Z. cardinalis* C. H. Wright are all the same plant and that it is native in Santo Domingo.

When all the characters of this plant are considered, it does not fit clearly into any genus now established. It differs from *Zephyranthes* in having stigmas that are quite broad and thickened, (not filiform, thread-like or lobed), in filaments that are slightly curved at the tips (not upright), in a definitely declinate flower, (not erect or sub-erect) and a spathe with bilateral tips (not unilaterally bifid). It differs from *Hippeastrum* in its tubular, inflated spathe (not two opposite single valves). Sealy (1937) has placed it in Habranthus, but it does not fit there exactly. It differs in its broad stigmas, its inflated spathe bilateral at the tips and in having filaments in two sets of lengths, not in four different lengths. For the present and until additional time and opportunity are afforded for study, it is here left in *Zephyranthes*.

It has been suggested that *Z. bifolia* (*Z. cardinalis*) may be an hybrid (Sealy 1937). Since the nativity of the plant has been established, there does not appear to be satisfactory basis for this assumption.

ZEPHYRANTHES INSULARUM n. sp. Plate 150

Bulbs subglobose, 2.5 x 2.7 cm., the neck 4.7-7 cm. long, dark brown, producing numerous offsets; leaves bright green, at first suberect, declinate when old, brownish near bases, 4-7 mm. wide, 9-21 cm. long, upper surfaces shallowly concave, under surfaces striated and slightly keeled, apex obtuse; scapes 1 or more, green, brownish pink toward base, subterete, slightly tapered upward, 3 mm. wide, 12-15 cm. long; spathe membranous, light green, tubular portion 1 cm., tips bifid, 1 cm., the whole two thirds as long as stipe; stipe light green, slender, 3 cm. long; perianth tube bright green, very short, 2-4 mm. long; bud light pink, blunt-pointed; flower declined, funnelform, 3.7-4.5 cm. expanded, 4.2 cm. long (ovary included), white, flushed pink on outside and green at base; sepals oval, 1.6-2 cm. wide, 3.8 cm. long, rounded at apex, white flushed pink along the center and toward apex on outside; petals white,

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Zephyranthes insularum n. sp. ***The difference in the setting*** *of the petals and sepals is noteworthy.*

Plate 150

green at base, oval, rounded to apex, 1.8-1.9 cm. wide, 3.1 cm. long; stamens shorter than perianth; filaments incurved, green below, white above, 9 mm.-1.2 cm. long; anthers yellow, 1 cm. long; style green at base, white above, 2.5 cm. long; stigma white, trifid, slightly recurved, 4.5 mm. expanded; ovary trilobed, lobes rounded, 4 mm long.—Description based on fresh material secured from Key West, Florida and Santiago de las Vegas, Cuba.

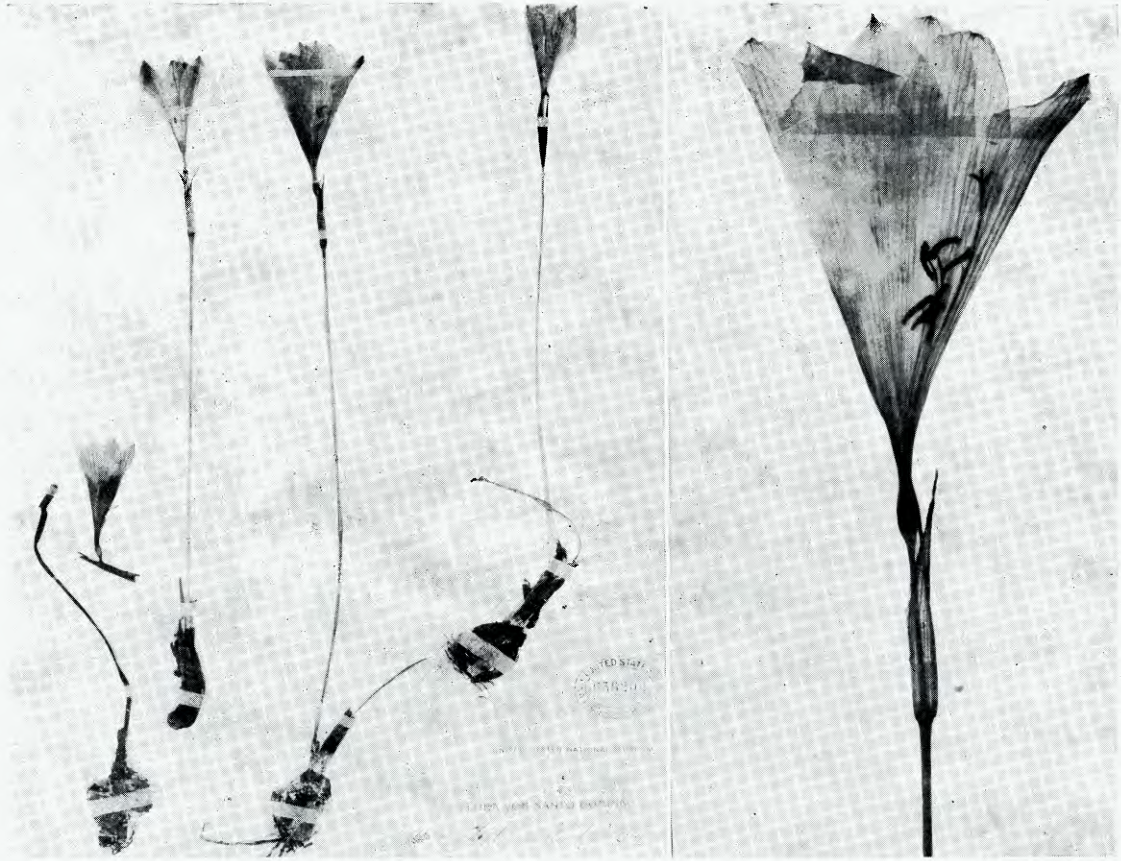
This interesting Zephyranthes was first observed May 9, 1935, in a garden in Key West, Florida. Immediately it was noted as distinct from all other white or whitish flowered species that had been studied. Since that time additional bulbs have been secured and these have flowered abundantly in the writer's garden and the first opinion has been confirmed. There is some reason to believe that this plant has passed as *Z. tubispatha* though in no instance has a specimen of it so labeled been found in any herbarium.

Later, through the kindness of M. Fortun, it was received from Cuba under the name *Z. tubispatha* from which species it is distinct. The flowers of *Z. tubispatha* are white at anthesis. *Z. insularum* the buds are pink and the three outer parts of the perianth are flushed with pink and this color deepens as the flowers fade. The segments in *Z. tubispatha* taper to a blunt point, while those of *Z. insularum* are rounded. Placed side by side in a fresh state, the flowers of one cannot be mistaken for those of the other. The perianth segments of *Z. insularum* stand out distinctly in two circles in the open flower and this character is accentuated as the flower ages. Those of *Z. tubispatha* appear as though in one circle.

Flowers of *Z. insularum* during the two days they are open follow a distinct rhythmic movement not so clearly observed in any other species. In common with other Zephyranthes their flowers open in the morning. The tips of the perianth segments are held together by the cohering keels (Hume 1937) on the three outer ones until all are fully developed. The buds expand until the pressure releases the keels whereupon the flowers open quickly to their full expansion with inner (petals) and outer (sepals) segments showing in two circles. In this condition they remain through most of the day. Toward evening the flowers close partially. On the second morning the sepals open practically as widely as on the first morning, but the petals do not. Instead they stand up by themselves separate and distinct from the three sepals. The appearance is of two flowers, a smaller inner one set within a larger outer one, each with three floral parts. With the coming on of evening the flowers close and do not open again.

Foliage of *Z. tubispatha* at 22°F. remained green and showed no cold injury; that of *Z. insularum* at the same temperature disappeared entirely.

Nothing is known concerning the native home of *Z. insularum*. It is not native in Key West; it may be native in Cuba. Relations between the two islands are close. In Key West *Z. rosea*, a Cuban plant, is also common in gardens and the two species are often found growing together. Both flourish in alkaline soil. *Z. insularum* is a most excellent garden subject.



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Zephyranthes Plumierii n. sp. Type sheet U. S. National Herbarium No. 656,200. Flora von Santo Domingo, H. von Tuerkheim No. 30 42, left; enlarged flower of Z. Plumierii, showing marked difference in length of two sets of filaments, right.

Plate 151

ZEPHYRANTHES PLUMIERII n. sp. Plate 151

Bulb globose to ovoid, thick-coated, dark brown, 2.5-3.5 x 3.5 cm., neck short, 1.5-2.7 cm. long; foliage sparse, leaves 1-3, linear-filiform, erect, 6-23 cm. long, 1.5 mm. wide; scapes slender, erect, 17-27 cm. long; spathe membranous, 3-4.3 cm. long, the tip usually subtending the ovary and sometimes the perianth tube, tubular portion 1.3-2.9 cm. long, tips erect, slender, usually fenestrate; stipe slender, 2.0-3.5 cm. long, usually hidden in the spathe; flower erect, broadly funnelform, 5-6 cm. long; perianth tube bluntly triangular, 2 cm. long; sepals not imbricated, spathulate or narrowly obovate, 1-1.3 x 3.5-4 cm. apex acute, prominently apiculate; petals spathulate, apex acute, 1 cm. wide, same length as sepals; stamens in two distinct sets, one set 6-10 mm. longer than other; filaments slender, short set 1.3-1.5 cm. long, long set 1.8-2.3 cm. long; anthers yellow 5-7 mm. long, slightly curved; ovary narrowly oblong, bluntly triangular in X-section, 3 mm. broad, 4-6 mm. high; style white, 4 cm. long, exceeding stamens by 6-9 mm., stigmas trifid, linear, 6-8 mm. expanded; capsule depressed above, bluntly triangular, 12 mm. high, 13 mm. broad. . . . Description based on herbarium material. H. von Tűrckheim, Flora von Santo Domingo No. 3042—U. S. National Herbarium No. 656200—is here designated as the type sheet.

A study of sheets of *Zephyranthes* in important herbaria has brought to light the existence of a species not heretofore recognized. It is native in the island of Santo Domingo. In all cases observed it has been labeled *Z. bifolia* and while some sheets represent the new species only, others have *Z. bifolia* and *Z. Plumierii* n. sp. on the same sheet. To this species are referred the following specimens: H. von Tűrckheim, Plantae Domingenses No. 3042 in Museum botanicum Berolinense and the same collector's number with a slightly different label in the New York Botanical Garden Herbarium. In the United States National Herbarium the following are listed as belonging here: No. 1077975 Constanza, Santo Domingo; No. 1273755 in part (two specimens center of sheet), Moncion, Dominican Republic; No. 1077991 Constanza, Santo Domingo; No. 1075238 in part (right hand flower), St. Marc, Haiti and No. 656200 H. von Tűrckheim, Santo Domingo.

The outstanding characteristic of the species is the marked difference in the length of the two sets of filaments. So great a difference occurs in no other West Indian species and it has not been noted elsewhere except in the case of the Mexican *Z. concolor* (Lindley) S. Watson.

This plant is named for Carolus L. Plumier, the early explorer for American plants.

ZEPHYRANTHES ROSEA Lindley

Botanical Register t. 821. Aug. 1, 1824

Atamosco rosea Greene. Pittonia 3:188. 1897.

Plate 152

Bulb small, smooth, dark-coated, producing offsets freely; leaves 3-6, bright green, linear, decumbent, 5 mm x 10-20 cm.; buds bright green; scapes 1-3, slender, terete, green, 2-3 mm. x 10-15 cm.; spathe thin, pink, 2.2 cm. long, about half length of the stipe, tips sharp-pointed, 1 cm. long; stipe 3.5 cm. long; perianth tube much abbreviated, greenish; flower broadly funnelform, tips rose pink with light throat, 3.5-4 cm. long, 3 cm. expanded; sepals rose pink in the upper portion, light colored or almost white below, oval to slightly obovate, gradually round-tipped to apex, 1.2 x 3-3.5 cm.; petals rose pink, oval to obovate. apex rounded, 1 cm. x 3-3.5 cm.; filaments white, 1.3 cm. long; anthers yellow, 7-8 mm. long; ovary faintly trilobed, 4 mm. long; style longer than the filaments, subtending anthers by about 1 cm., white below, light pink in upper portion; stigmas trifid, light pink, slightly reflexed, 5-6 mm. expanded; capsule short, rounded or broadly 3-lobed; seeds small, shining black, thick when fresh, 4-8 in number. Season late summer or early autumn in northern Florida. Description from fresh material.

Bulbs of *Zephyranthes rosea* were collected at Havana, Cuba, by George Don who brought them to England in 1823 for the garden of the Royal Horticultural Society where flowers were secured in June, 1824. John Lindley (1824) published a description accompanied by an illustration. Seven years later William Herbert (1831) also published a description and an illustration.

Although regarded as native in the mountains of Cuba, *Z. rosea* is widely distributed as a cultivated and feral plant, particularly in the West Indies. Britton and Millspaugh (1920) report it from "New Providence and Grand Turk where it was observed carpeting a pasture over five acres in extent."

Its standing as a species has never been questioned nor has it been confused with other plants of the same genus. In its glossy green, round-pointed decumbent leaves, bright deep pink flowers of medium size, pink style, spathes about half as long as the stipes, and bulb propagation by abundant offsets, it is distinct from other species. Seeds in small numbers are usually produced.

Commonly it produces its first burst of bloom in late August or early September in northern Florida. In old well-established plantings, flowers may be so numerous as to cover the ground. Scattered flowers follow until stopped by cool weather, when the foliage also disappears for the winter.

Unfortunately in the bulb trade *Z. grandiflora* Lindley (*Z. carinata* Herb.) commonly is substituted for or sold under the name *Z. rosea*. So often is this the case that it is difficult to secure *Z. rosea* through usual trade channels.

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Zephyranthes rosea Lindley

Plate 152

Z. rosea is one of the daintiest and most beautiful of the genus. Two peculiarities in the plant are worthy of note. The leaves and scapes show no purpling toward the base, and the style and stigmas are tinted pink. It is a fine subject for both garden and pot culture.

ZEPHYRANTHES TUBISPATHA (Gawler) Herbert
Amaryllidaceae 171. 1837

Amaryllis tubispatha Gawler. Botanical Magazine t. 1586. 1813.

Plate 153

Bulb globose, 2.5-3.5 x 2.3-3.3 cm., rounded abruptly to the neck, neck 2.3 cm. long, tunics dark brown to black; leaves 3-5, linear, upright, edges thin, channeled on upper surface, rounded on lower, apices tapered, rounded and somewhat slightly keeled on underside, pink tinted at base, 4-8 mm. wide, 12-33 cm. long; buds greenish white, blunt-pointed; scapes light green, pink to pinkish brown at base, slightly subterete, 4-5 mm. x 12-15 cm.; spathe thin, membranous, violet gray-green, 2.7 cm. long, the tubular portion 1.2-1.7 cm., ½ to 2/3 length of stipe, tips slender, fenestrate or bifid, 1.5 cm. long; stipe light green, slender, 3.5 cm. long; perianth tube short, green, 4 mm. long, constricted at its union with ovary; flower funnelform, declinate, white with bases bright green within and without, 4.2-4.8 cm. long, 4.5-5.5 cm. expanded; sepals faintly striated, light green on lower third, oval, somewhat carinate, 1.7 x 4.5 cm., apex blunt-pointed; petals white, green about a third to half the length from base, oval, tapering to apices, 1.3-1.5 cm. x 4-4.4 cm.; filaments incurved, green tinted on lower third, white above, 1.1-2.0 cm. long; stamens in two sets differing about 7 mm. in length; anthers yellow, 6 mm. long; ovary green, bluntly trilobed, 4 mm. long; style declinate, light green at base, white above, 3.2-3.5 long; stigmas trifid, white, slightly recurved, 5 mm. expanded; capsule deeply 3-lobed, 8 x 7 mm.; seeds small, black, 4 x 5 mm.—Season in northern Florida May-June. Description based on fresh material.

As now understood, *Z. tubispatha* first became known in England from the description by Gawler (1813). He had secured a specimen which he illustrated and described from a Mr. Griffin of South Lambert, who in turn had received a bulb or bulbs from Jamaica and had flowered it in July 1813. In Jamaica it was said to grow "on one of the back settlements in the blue mountains of that island."

Gawler believed it to be the same as the specimen from Buenos Aires in the Commerson Herbarium that had been described under the same name by L'Heritier (1788). Later Herbert (1837) concluded that L'Heritier's plant was *Habranthus robustus* and placed *Amaryllis tubispatha L'Herit.* as a synonym. The specific name for Gawler's plant having been established, Herbert (1821) carried it over as *Z. tubispatha* when he transferred it to *Zephyranthes*. Baker (1888) concurred in this, and at an earlier date (1878) placed both *Amaryllis tubispatha* L'Herit. and *Habranthus robustus* Herb. as synonyms of *Hippeastrum tubispathum.*

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Zephyranthes tubispatha (Gawler) Herbert

Plate 153

Strictly speaking, under the rules the plant which Gawler had in hand and which now passes under the name *Z. tubispatha,* was left by him without a name, as it was not identical with L'Heritier's plant. There may be some question concerning the identity of the L'Heritier specimen as the description is inadequate. However, since the genus in which it is now placed is a different one and no confusion can result, it is left as *Z. tubispatha,* a name that has been applied to it for more than a century. Incidentally it is worth mentioning that this plant may be regarded as the type species of *Zephyranthes,* since it was listed first under the genus when set up by Herbert.

Z. tubispatha is widely distributed as a garden and feral plant in the West Indies. Outside that area, it has on one occasion been secured from an old Florida garden and it has been received without name from Central America. No information is available to indicate exactly where it may be native, but its wide distribution in the West Indies supports the belief that it is or was, native somewhere in those islands.

The species is unusual in its coloring. Flowers of white zephyranthes usually either are tinged with pink or become pink tinted as they fade. Baker (1888) wrote of *Z. tubispatha,* "Perianth—white slightly tinged with green, never with red," an observation which appears to be entirely correct. However, when far advanced in fading a faint pink tint develops. In no living flowers at full anthesis and in no herbarium specimens of this species has pink or red color been observed by the author and large numbers have been examined.

ZEPHYRANTHES WRIGHTII Baker
Handbook Amaryllideae. 32. 1888.

Zephyranthes cubensis Urban. Sym. Ant. seu Fund. Florae Indiae Occid.292. 1907.

Figure 36

Bulb small, subglobose, dark brown, 1.5-2 x 1.8 cm., the neck short to medium, 1.5-4 cm. long, coats thin; leaves green, linear, slightly tapered, apex tapering, 2-4 mm. x 10-25 cm., erect; scape slender, terete, green, 1.5-3 mm. x 9.5-30 cm.; spathe light pink, membranous, 1.6-2.8 cm. over all, tubular portion 9 mm.-2.1 cm., tips bifid, 4-9 mm. long, shorter than, or usually about 2/3 as long as stipe; stipe slender, 2-4.5 cm.; flower pink, erect, 4-6 cm. long; perianth pink, funnelform, tube short, 4 mm. long; sepals elliptic-ovate, pink, 8-12 mm. wide, 3.5-5.5 cm. long, apex rounded or slightly tapered, blunt; petals pink, elliptic-ovate, slightly smaller than sepals; stamens much shorter than perianth segments; filaments in two sets nearly equal in length, slender, white, 1.8 cm. long; anthers yellow, linear, 8-10 mm.; stigmas trifid, white, linear, recurved, surmounting anthers by 1-1.2 cm., expansion 6-10 mm.; ovary ovoid, small, 3-5 x 4-6 mm.—Description based on E. L. Ekman No. 10734, Wright No. 3246 (Museum botanicum Berolinense), Baker & Dymmock No. 1847, A. H. Curtiss No. 452 and Wright No. 3247.

Locality: Cuba—Isle of Pines. Habitat: From the character of the bulbs, it grows in rather moist soils.

Charles Wright, the American plant explorer, spent eleven years (1856-1867) in Cuba collecting specimens for various herbaria. Near Herradura in the Province of Pinar del Rio, he collected specimens of a zephyranthes, No. 3247, from which J. G. Baker (1888) described the species *Z. Wrightii.* Six specimens of this number belonging to Wright's collections of the period 1860-1864, two on one sheet in the Herbarium of the Royal Botanic Garden, Kew, two on one sheet in the British Museum (Natural History) Herbarium, one sheet with one specimen in the Gray Herbarium (Harvard) and one sheet with one specimen in

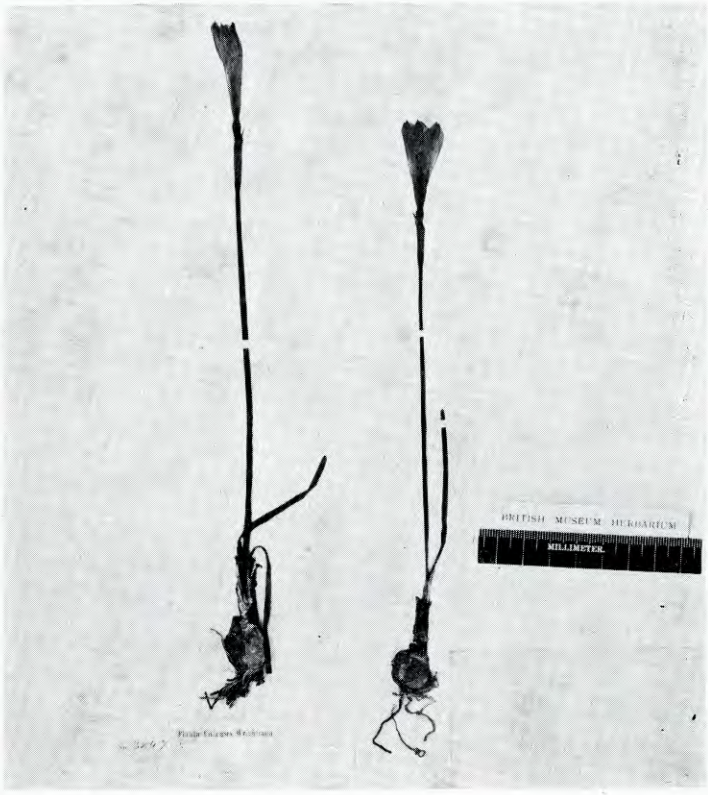

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Fig. 36. Zephyranthes Wrightii Baker. Type collection, Wright No. 3247 in the British Museum Herbarium.

the Museum botanicum Berolinense have been examined. These six specimens are unusually similar and are all that have been found of the type collection. They were distributed as the Mexican *Z. Lindleyana* Herb. from which, however, they are distinct. Careful examination also shows that they are different from other species of approximately the same color range known from the West Indies, native or introduced,

viz., *Z. rosea, Z. bifolia, Z. grandiflora,* and *Z. Plumierii* that from time to time have been found wild or cultivated in the West Indies.

Based upon Wright No. 3246 and Baker and Dymmock No. 4847 also from Herradura, Cuba, Ignatius Urban (1907) described *Z. cubensis* as a new species. Previously Baker (1888) cited Wright No. 3246 under *Z. grandiflora* Lindl. *(Z. carinata* Herb.) to indicate the wide distribution of that species as a cultivated plant. Urban in his description referred to this placement by Baker. Now it comes about that Baker had in hand Wright No. 3246 in the Herbarium of the Royal Botanic Gardens, Kew, which is *Z. grandiflora,* as he said it was, while Urban had another sheet of the same number, now in the Museum botanicum Berolinense, which is the same as Baker and Dymmock No. 4847 and Wright No. 3247, and which is not *Z. grandiflora.* Apparently Wright No. 3246 is a mixed distribution because two numbers in the U. S. National Herbarium, No. 933896 and No. 36466 (Wright's No. 3246) are *Z. rosea.* As a matter of fact, three species, *Z. Wrightii (Z. cubensis), Z. grandiflora,* and *Z. rosea* were mixed and distributed under Wright's No. 3246.

Fine specimens of *Z. Wrightii* were collected by A. H. Curtiss near Neuva Gerona, Isle of Pines, April 20, 1904, and widely distributed as *Z. rosea* under his No. 452. These show the range of size for the species from small specimens corresponding to those represented in Wright No. 3247 (Kew Herbarium, British Museum and Gray Herbarium) and No. 3246 (Museum botanicum Berolinense) up to those of much larger size.

Acknowledgment is hereby tendered to those Herbaria that have assisted in the preparation of this paper by lending many and valuable sheets: Cambridge Botanical Museum, Herbarium of Royal Botanic Gardens (Kew), Herbarium of the British Museum, Gray Herbarium (Harvard), Museum botanicum Berolinense, Herbarium of New York Botanical Garden, United States National Herbarium, and the herbaria of the Field Museum, the Missouri Botanical Garden and the University of California (Berkeley). Thanks are also due Lillian E. Arnold and Erdman West for assistance in the preparation of herbarium material of this group and other aid.

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(Cooperia Smallii—continued from page 119)

high and broad, white with a membranous brown coat. The leaves are bright green, one-sixteenth to one-eighth of an inch wide and six inches long, acute, channeled on the upper side, the underside rounded and several ribbed. The scape is erect, six to eight inches tall, slightly flattened, bright green and somewhat glaucescent, topped by a solitary flower. The spathe is membranous, an inch and a half long, greenish tan, entire and short acuminate at the apex, finely nerved. The flower terminates a stout pedicel an eighth to a fourth of an inch long. The ovary is cylindric, bluntly three-angled, and about three-eighths of an inch long. The perianth-tube is green, three-fourths of an inch long, abruptly expanded into the limb. The perianth is lemon-yellow, its divisions broadly ovate, the outer three segments slightly the larger, often flushed reddish, with a green rib outside near the apex which extends into a short green apiculate hood. The stamens are erect, the filaments subulate, about three-sixteenths of an inch long, greenish and fleshy; the anthers linear, pale yellow, about five-sixteenths of an inch long. The style is slender, about one inch long, green with a whitish apex. The three stigmas are globular and whitish. The capsule is strongly three-lobed, obovoid in outline, three-fourths of an inch long, the valves striate. The seeds are thin and wafer-like with a thin, glossy black coat."

THE TRIBE GILLIESIEAE OF AMARYLLIDACEAE

JOHN HUTCHINSON

Keeper of Museums of Botany, Royal Botanic Gardens, Kew.

When travelling in South Africa in the year 1928 I found growing on a moist rocky ledge in the Katberg a great quantity of *Agapanthus africanus* Beauv. I wondered then why this plant should not be included in the *Amaryllidaceae*, like the *Cyrtanthus Huttoni* Bak. which grew alongside, and I determined some day to look into the matter.

The opportunity did not come until some years later when I was making a study of the whole of the Monocotyledons for the second volume of my *Families of Flowering Plants*. I then became convinced that the character of the superior and inferior ovary to distinguish the *Liliaceae* and *Amaryllidaceae* was somewhat artificial, and that a much more homogeneous *Amaryllidaceae* would accrue from the use of the umbellate inflorescence as the distinguishing feature.

This involved the transference from the *Liliaceae* of most of the tribe *Allieae*, which embraced also the small South American subtribe *Gilliesieae*. In doing that I little thought that my action would bring me the honour of a Fellowship in the American Amaryllis Society, and later a request from the Secretary for a paper on the *Gilliesieae*. This I am glad to be able to accede to, but had it been for the whole of the tribe *Allieae*, in other words for an account of all the Onions, my loyalty not only to the Society, but to my own convictions of its taxonomic position would have been indeed strained to the utmost.

In Bentham and Hooker's *Genera Plantarum* the *Gilliesieae* were the third subtribe of the *Allieae* and were included in the family *Liliaceae*. It was distinguished from the other three subtribes by the stamens:—"Androecium valde obliquum vel uno latere tantum antheriferum."[1]

At that time there were seven genera known, some of them very imperfectly. Even today we know very little more about the group, and only two additional genera have been described, these being *Speea* Loesner *(Geanthus* Philippi, non Reinw.), and *Schickendantziella* Spegazz. *(Schickendantzia* Spegazz. non Pax), both the original names selected for these genera having been used previously. There is thus an opportunity for those members of the Amaryllis Society who are interesting themselves not only in the acquisition of handsome and showy members of the family but also of botanical rarities. As I have pointed out in the notes accompanying some of the genera good herbarium specimens are very much desired and also material preserved in spirit. Bulbs for growing at Kew would also be very welcome and should be sent to the Director and not to me personally.

As a lengthy paper was published by Karl Reiche in Engler's Botanisches Jahrbuch in 1893[2], I shall give only a few generalisations relating to the group.

[1]Bentham & Hooker f. Genera Plantarum 3: 750 (1883).
[2]Karl Reiche, Beiträge zur Kenntnis der Liliaceae—Gilliesieae, Engl. Bot. Jahrb. 16: 262-277 (1893).

As noted above the tribe *Gilliesieae* has hitherto been included in the *Liliaceae* because of the superior ovary. In all other respects, however, they agree with *Amaryllidaceae* (sensu stricto), where I have included them. Their most striking feature is the more or less zygomorphic androecium which gives the flowers of some of the genera a certain degree of obliquity. This is most highly developed in *Gilliesia*.

The inflorescence is always an umbel subtended by a pair of bracts. As a rule there are several flowers, but one genus is very advanced in this respect, *Speea*, where the umbel is reduced to a single flower as in the Snowdrop. Usually there are six perianth-segments, though rarely one pair are united *(Gilliesia)* and then there are seemingly only five, but in *Trichlora* the number is reduced to three. The presence of small corona-segments seems to me important and an interesting parallel with those higher *Amaryllidaceae* which have inferior ovaries. The filaments of the stamens are always more or less united, and the number of anthers varies from six to two, the sterile filaments being broader than the others and often almost petaloid. The gynoecium calls for no particular comment.

Nearly all the genera of *Gilliesieae* are found in Western Chile, but we know very little about their habitats in that region. Exceptions are *Trichlora*, from Peru, and *Schickendantziella*, from the Argentine. It is very often the case that plants peculiar to Chile are represented by closely allied genera or species in New Zealand and Eastern Australia, or even in California. But a review of the genera of both *Liliaceae* and *Amaryllidaceae* in these countries does not reveal any close relations, and therefore the tribe *Gilliesieae* stands apart as a very distinctive group.

KEY TO THE GENERA OF GILLIESIEAE

A. Corona absent:
  B. Umbels long-pedunculate, several- to one-flowered:
    C. Perianth-segments 6, subequal, united into a short tube.
      D. Anthers short and rounded; leaf solitary; staminodes minute; style undivided ---------- *Solaria.*
      D.D. Anthers linear; leaves about 3; staminodes elongated, subequalling the perianth-segments; style divided ---------- *Erinna.*
    C.C. Perianth-segments 3, free:
      E. Fertile stamens 6; stigma entire ---------- *Schickendantziella.*
      E.E. Fertile stamens 3 or rarely 4, the filaments partly united; stigma 3-horned ---------- *Trichlora.*
  B.B. Umbels subsessile, 1-flowered; fertile stamens 6; perianth-segments equal, caudate-acuminate ---------- *Speea.*

A.A. Corona present, composed of narrow scales outside the stamens:
F. Fertile stamens 6; filaments united into an oblique urn-shaped tube; perianth-segments subequal, acuminate *Miersia.*
F.F. Fertile stamens 3 or 2:
G. Perianth-segments equal sized, narrow, free; leaves very large (from descr. 1.5 m. or more long) ------ *Gethyum.*
G.G. Perianth-segments unequal, two sometimes united; leaves smaller than above:
H. Perianth-segments free; fertile stamens 3, with 3 staminodes, the staminal tube split down one side ------ *Gilliesia.*
H.H. Perianth-segments united into a short tube; fertile stamens 2, with 1 staminode ------ *Ancrumia.*

General References:—Baker in Journ. Linn. Soc. Bot. 17: 506-510 (1879); Benth. & Hook. f. Genera Plantarum 3: 804-6 (1883); Reiche in Engl. Bot. Jahrb. 16: 262-277 (1893); Krause in Engl. & Prantl, Pflanzenfam. ed. 2, 326-329 (1930).

DESCRIPTION OF SPECIES

SOLARIA Philippi in Linnaea 29: 72 (1857); Baker l. c. 509; Benth & Hook. f. l. c. 805; Reiche l. c. 271; Krause l. c. 326. Syn. *Symea* Baker in Saund. Ref. Bot. t. 260 (1871); *S. gilliesioides* Baker, l. c.

The rootstock is a fleshy corm, with a single linear leaf, a slender scape a few centimetres long, and 3-4 flowers in an umbel subtended by a pair of linear membranous bracts; perianth of 6 subequal green spreading segments; stamens 3, with 3 very minute staminodes; the ovary is immersed in the perianth-tube, and 3-locular; ovules 2 in each loculus; style as long as the ovary, not divided.

The type species, *Solaria miersioides* Philippi, is found in Chile, and was first collected by Germain at Santiago, and later by E. C. Reed. The genus was named in honour of Francisci de Borja Solar, of the Mathematical Faculty of the University of Chile. It was also described by Baker as *Symea* in Saunders Refugium Botanicum t. 260 in 1871, to commemorate the name of J. T. Boswell Syme, who edited the third edition of Sowerby's *English Botany*, and to connect his name with a family *(Liliaceae)*, the European members of which he had for many years studied carefully under cultivation.

A second species, *S. major* Reiche, collected by Philippi at Canquenes in October 1867, is probably not distinct.

The morphology of the root system of this plant is interesting. The old corm is retained at the base of that of the current season and is a

smooth obvoid fleshy structure. The flowering corm is narrowly ovoid and enclosed with a similarly shaped funnel-like smooth thin sheath, from the top of which emerges the single leaf and scape. At one side of the base of the flowering corm is a mass of roots.

The solitary leaf distinguishes this genus from all others of the group.

ERINNA Philippi in Linnaea 33 : 266 (1864) ; Baker l. c. 510; Benth & Hook. f. l. c. 805; Krause l. c. 326.

A monotypic genus, with a tunicated bulb, 3 radical leaves, a peduncle 12 cm. and a funnel-shaped shortly tubular perianth with 6 linear 1-nerved spreading segments; 3 perfect stamens with *linear* anthers on short filaments, and 3 sterile stamens reduced to filiform filaments; the flowers are several in an umbel, yellowish green, and subtended by 2 dry unequal-sized involucral bracts.

Only one species known, *E. gilliesioides* Philippi, from Chile; collected in the St. Ramon valley, in the Andes near Santiago.

Specimens of this species are much desired for herbaria, for there is none at Kew or the Natural History Museum, London.

SCHICKENDANTZIELLA Spegazz. in An. Mus. Nacion. Buen. Air. Ser. 3, 2 : 8, in obs. (1903). Syn. *Schickendantzia* Spegazz. in Rev. Fac. Agron. Veter. n. 23 & 24, p. 386, (1896), et Plantae Novae v. Crit. Reipub. Argent. Decas 3 : 7 (1897), non Pax (1889).

This is known to me only from Spegazzini's description of which I give a translation :— . . . Bulbous, scapigerous, bibracteate, few-flowered, with a perianth of three free filiform elongated segments; androecium tubular, 6-lobed at the apex, lobes about equal and all bearing introrse bilocular anthers; ovary cylindric, 3-locular, ovules many; style rather long, crowned by a thickened entire stigma.

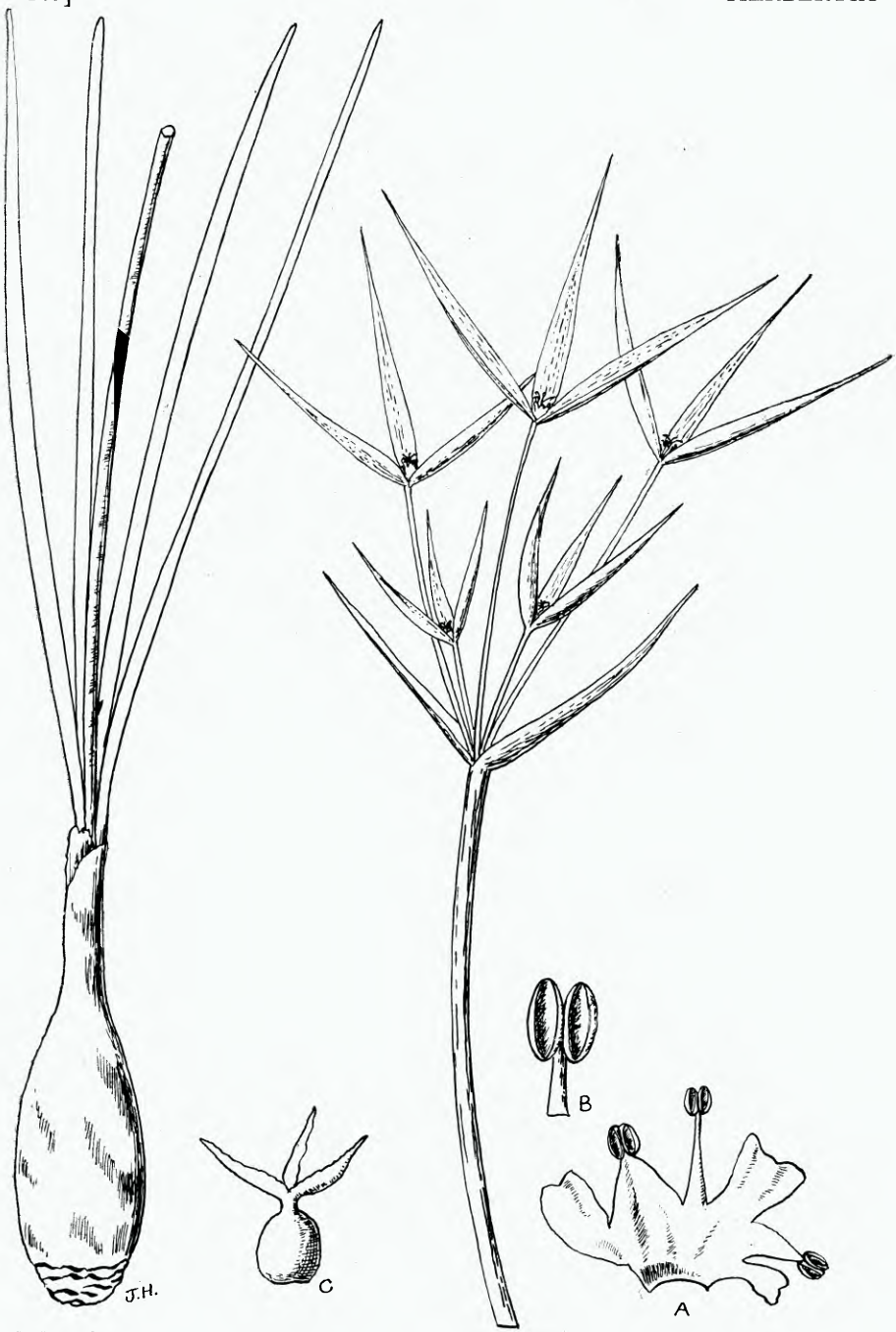
In the description of the solitary species, *S. tricosepala* (Spegazz.) Spegazz. The scape is said to be 1-2-flowered, the flowers nodding, and the margins of the base of the perianth-segments are violet and fimbricate, the filiform upper part being purple; the androecium is green and thin and encloses the ovary, the anthers are yellow and the style green.

Argentine : in fissures of rocks in *Alnus* woods in Tucuman Province.

This genus is not mentioned in Krause's account in Engler's Pflanzenfamilien ed. 2.

TRICHLORA Baker in Hook. Ic. Pl. t. 1237 (1877) ; Baker l. c. 508; Benth. & Hook. f. l. c. 805; Reiche l. c. 272; Krause l. c. 326.

A peculiar monotypic genus with a narrow tunicated bulb; scales forming a narrow tube from the top of which emerge about 3 or 4 linear leaves and a slender scape bearing an umbel of about 5 flowers with 3 large lanceolate-acuminate green nearly free perianth-segments; the stamens are united into a tube irregularly split into 6 lobes, usually only 3 lobes bearing fertile anthers (See Plate 154) ; the style rather resembles the cyathium of a *Euphorbia,* with 3 spreading ligulate arms.



J. Hutchinson, Kew.

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Trichlora peruviana Baker

A, androecium spread out; B, anther; C. gynoecium. Drawn from a dried specimen in the Kew Herbarium; dissections enlarged.

Plate 154

One species, *Trichlora peruviana* Baker, (Plate 154) worth cultivating if only for the peculiar structure of its flowers. Found at Lima, in Peru, by Mathews, and in the Natural History Museum at South Kensington there is a specimen collected by Pavon.

MIERSIA Lindl. in Miers, Trav. 2: 529 nomen (1826); Bot. Reg. sub t. 992 (1826); Kunth Enum. Pl. 4: 486 (1843); C. Gay Fl. Chile t. 68 (1854); Baker l. c. 506; Benth. & Hook. f. l. c. 804; Reiche l. c. 274; Krause l. c. 328.

Corm ovoid, about 2.5 cm. long, with about 5 long-linear leaves and 1 or 2 scapes bearing 4-5 umbellate flowers subtended by 2 equal bracts; perianth-segments subequal, lanceolate, acuminate; corona of 6 narrow filament-like scales slightly adnate at the base to the staminal tube; stamens 6, the filaments united into an oblique urn-shaped body contracted at the mouth and bearing 6 small stipitate anthers beyond which the style just protrudes; ovary 3-locular, style a little longer than the globose ovary, with a small disk-like stigma; ovules several. Capsule truncate, slightly 3-lobed.

There are two species, both from Chile, *M. chilensis* Lindl. and *M. myoides* Bert., (the latter reduced to a form of *M. chilensis* by Reiche l. c.); the former is better known and is beautifully figured in Gay's Flora of Chile, quoted above. For those who are interested in floral structure this is a desirable species for cultivation. The most striking feature is the androecium, in which the filaments are united into an oblique tube giving the flower a zygomorphic appearance; on the inner rim of the tube the small anthers are shortly stalked.

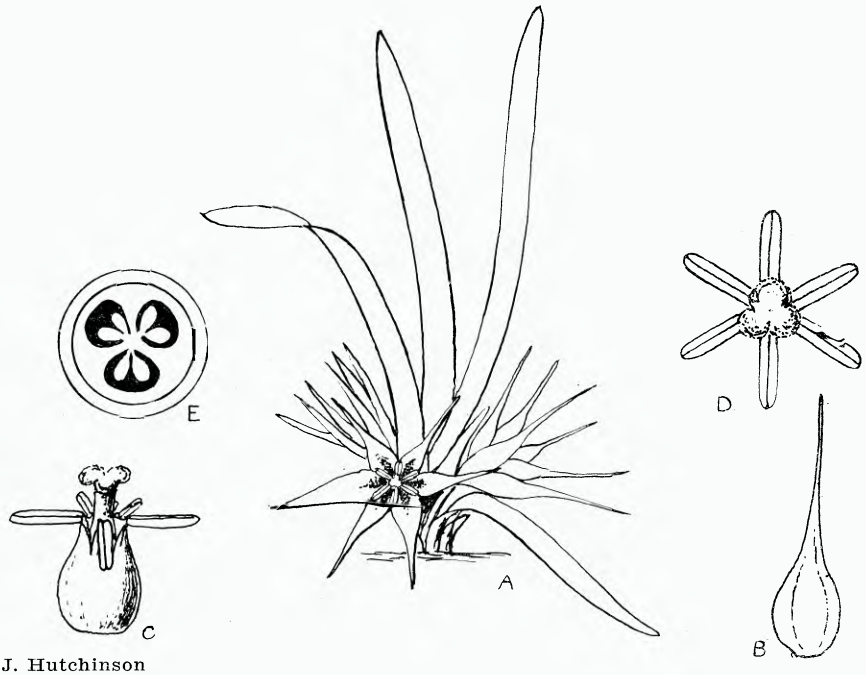
M. chilensis is recorded from the mountains near Valparaiso. Spirit specimens are desirable of genera such as these, as they do not dry very well.

SPEEA Loesner in Notizbl. Bot. Gart. Berlin 10: 63 (1927); Krause l. c. 326. *Geanthus* Philippi Descr. Pl. Nuev. Chil. (Reimpr.) 7 (1884), non Reinw.

Bulb grey, the size of a walnut; peduncles radical, 1-flowered, short, with one bract at the base of each, and each 1-flowered, appearing before the leaves; leaves 4, broadly linear, about 7.5 cm. long and 7 mm. broad; perianth-segments 6, 2-seriate, equal, broadly ovate at the base, abruptly long-acuminate, green, violet towards the base; stamens 6, monadelphous; filaments connate in a tube closely enveloping the ovary; anthers linear, pale violet, spreading horizontally and opening laterally; ovary 3-locular; ovules biseriate; style with a peltate thick obscurely lobed stigma, pale violet.

One species, *Speea humilis* (Philippi) Loesner ex K. Krause in Engl. & Prantl, Nat. Pflanzenfam. ed. 2, 15a: 326 (1930). Syn. *Geanthus humilis* Philippi l. c. (See Fig. 37).

Philippi tells an interesting story about the discovery of this genus in a letter to Sir Joseph Hooker in the Kew herbarium. "By a singular casuality I have discovered a new genus of Liliaceous plants, which grows in the cordillera of Santiago, and which offers very prominent characters. I had received during the last summer a lot of bulbs of *Phycella* and *Habranthus*, which I sent to several correspondents of mine; one was forgotten and I put it in a flower pot. My surprise was great, when in the beginning of August I noticed flowers coming out of the earth, first without any trace of leaves. During six weeks there came out about ten flowers and four leaves; unhappily not a single flower was



J. Hutchinson

Fig. 37. Speea humilis (Philippi) Loesner—A, whole plant; B, perianth-segment; C, stamens and style; D, anthers and stigmas from above; E, transverse section of ovary. From a drawing by Philippi in the Kew Collection; dissections enlarged.

fertilized, and they all fell down, so that I can say nothing about the fruit and the seeds. My son suggested for this plant the name of *Geanthus humilis*, which I have adopted."

Unfortunately the name *Geanthus* had already been used by Reinwardt in 1823 for a genus of *Zingiberaceae* and now reduced to *Amomum*, so the new name *Speea* was provided by Loesner in honour of the German Admiral Maximilian Graf von Spee.

Accompanying the letter to Hooker was a coloured drawing by Dr. Philippi, and I give a black and white copy of it to give the reader some idea of this very remarkable genus. The inflorescence is apparently reduced to a single flower as in the common Snowdrop.

GETHYUM Philippi in Anal. Univ. Chile 43: 549 (1873); Baker l. c. 509; Benth. & Hook. f. l. c. 805; Reiche l. c. 273; Krause l. c. 328.

I have not seen a specimen of this genus which seems to stand out from its relations in having very large leaves (described as 5 ft. long and 1½ inch. broad); the bulb is tunicated, and the scape is elongated, with several flowers in an umbel, on long pedicels; and the perianth-segments dark-purple above the green base are very narrow and spreading, there are 6 violet corona-scales, and 3 perfect stamens united together with 3 sterile ones into a membranous sheath; ovary 3-locular; capsule globose, opening into the loculi at the apex; seeds black, smooth.

Described from a single specimen collected by Philippi at Peñalolen at the foot of the Cordillera of Santiago, in Oct. 1871.

If this rare plant be still in existence it would be very desirable to have it in cultivation and specimens preserved in spirit for herbarium purposes.

GILLIESIA Lindl. Bot. Reg. t. 992 (1826); Bot. Mag. t. 2716 (1827); Kunth Enum. Pl. 4: 487 (1843); Baker l. c. 507; Benth. & Hook. f. l. c. 804; Poepp. & Endl. Nov. Gen. et Sp. 2; t. 137 (1836); Reiche l. c. 275; Krause l. c. 328.

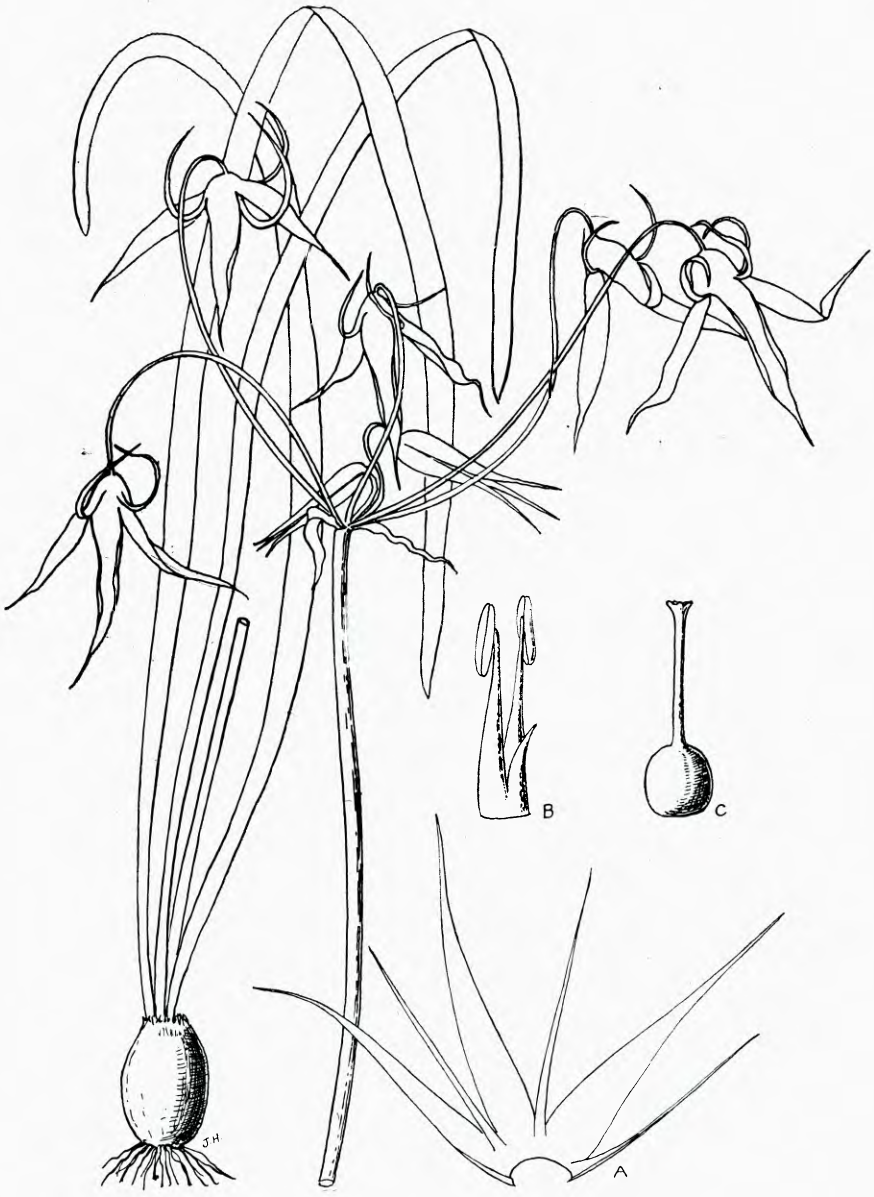
Bulb narrowly ovoid, covered with thin tunics; leaves usually 2, linear, very slender towards the base, about 10-nerved; scape very slender, longer than the leaves; umbel subtended by a pair of very unequal-sized bracts; flowers several (up to 9) on long slender pedicels; perianth-segments 6 (sometimes only 5), ovate, unequal-sized; corona of separate linear scales outside the staminal tube, the latter split at one side and bearing only 3 fertile anthers; ovary globose, 3-locular, style as long, minutely trifid; ovules several in each loculus; capsule ellipsoid, seeds smooth, black.

In this genus there is a corona of narrow scales outside the staminal tube; the latter is very remarkable, being split on one side to the base, the lobes bearing only 3 fertile anthers. This and the occasional union of a pair of the perianth-segments gives the flower a very zygomorphic appearance.

The type species is *G. graminea* Lindl., a native of Chile, and recorded from Valparaiso, Cuesta de Chacabuco, and Catapilco.

According to Reiche there are three other species, *G. montana* Poepp. (Nov. Gen. 2, t. 138), from the Antuco Volcano in South Chile; *G. Gaudichaudiana* Kunth (Enum. Pl. 4: 391); from Valparaiso; and *G. monophylla* Reiche, from Constitución. Of the last mentioned there are two forms, *atropurpurea* and *viridescens*. I am very doubtful if there are so many species as made out by Reiche, however, the differences given being very slender.

ANCRUMIA Harv. ex Baker in Hook. Ic. Pl. t. 1227 (1877); Baker l. c. 510; Benth. & Hook. f. l. c. 806; Reiche l. c. 273; Krause l. c. 329.



J. Hutchinson, Kew

See page 143

Ancrumia cuspidata Harv.

A, perianth opened out; B, androecium; C, gynoecium. From a drawing by John Buchanan in the Kew Collection; dissections enlarged.

Plate 155

A tall plant about 35 cm. high, with 1-2 long narrow linear leaves from an ovoid bulb; the flowers are several in the umbel, which is subtended by a pair of slightly unequal bracts, and are nodding, pale green and stained with purple at the base; pedicels very long and slender; perianth segments 6, connate at the base into a campanulate tube, the outer segments (about 4 cm.) narrowly lanceolate and subpatent, papillous inside, the inner much narrower and shorter and recurved; stamens 2, monadelphous, with the rudiment of a third filament; anthers oblong; ovary 3-locular, enveloped by the staminal tube; style with a triquetrous stigma; capsule 1 cm. long, valves emarginate; seeds subglobose, black, with a large straw-coloured funicle.

One species, *A. cuspidata* Harv., from Guayacan, Coquimbo, in Chile. (See Plate 155).

According to a note in the Kew Herbarium by J. Buchanan this striking species flowers in July and August and grows on sandy and stony soil usually under *Cactus* bushes and other shrubs; at the time of its discovery it was very common in the neighborhood of Guyacan, and it has been collected there in fruit by Dr. C. Grandjot as recently as September 1934.

CORRECT SPELLING OF BOÖPHONE

Boöphone Herb. App. 18 (1821). There has been a great difference of opinion as to the correct spelling of this generic name, the incorrect spelling *Buphane* having been used more than any other. Herbert's original spelling was *Boophane*. Since his first species was *Haemanthus toxicarius* Linn. f., Bot. Mag. t. 1217, which is there stated to be fatal to horned cattle, it is clear that Wittstein's derivation from βοῦς = ox and φονή = murder is correct. The spelling *phane* therefore, is without doubt an unintentional orthographic error and should be corrected to *phone* under Article 70 of the International Rules of Botanical Nomenclature, a correction which Herbert himself made in 1825 (Bot. Mag. post t. 2606) when he spelt the name *Buphone*. There is however no justification under the International Rules for his altering *Boo* to *Bu*, since the former is the uncontracted stem of βοῦς. Marloth's derivation (Fl. S. Afr. 4. 115 1915) of the name "Bupho" (i. e. Bufo) = toad is an uninspired guess.

The Herbarium,
Royal Botanic Gardens,
Kew

G. Milne-Redhead.

FURTHER REVISION OF THE GENUS AMARYLLIS (LINN. EX PARTE) (SYN. HIPPEASTRUM HERB.)

HAMILTON P. TRAUB AND J. C. TH. UPHOF

In a previous paper (Herbertia 5: 114-131. 1938) descriptions of most of the species of *Amaryllis* proposed since 1888 were included, and a tentative revision of the genus was attempted. The purpose of the present article is to complete the work as far as is possible at this time. The real need for this is shown by the fact that at least three specific names have been used twice within the genus—*angustifolium, soratense* and *laetum*. If this genus had received proper attention in the past this could hardly have happened. Many of the species have been carelessly described, and have been proposed without due comparison with those previously published. This may mean that many of the proposed species will most likely have to be reduced to the rank of varieties or synonyms later on when a more thorough study can be made. Such a further revision should be based on the examination of living material as well as on the literature and the existing herbarium specimens.

We wish to take this opportunity of expressing our appreciation to the Librarian and associates of the United States Department of Agriculture, Washington, D. C. for much efficient help in locating references, and to the Bibliofilm Service that has made it possible to secure photoprints of all the literature required for this research.

After a general discussion of the species remaining to be considered, there follows a key to the subgenera and species, and the descriptions of the eighteen species not previously reprinted in Herbertia. All of the species of *Amaryllis* can now be found by referring to volumes 1, 5 and 6 of Herbertia.

GENERAL CONSIDERATIONS

In the previous article, the following 14 species were considered, but were not described in detail, and were not classified,—

Species proposed by Dr. Philippi:

A. ananuca
A. araucana
A. Bakerii
A. coloniana
A. consobriniana
A. laeta
A. Moellerii
A. Philippiana
A. popetana
A. purpurata
**A. Solisii* (=*A. flava*)
A. tenuiflora

Species proposed by others:

A. Forgetii (Worsley)
A. splendens (Renjifo)

Since the last report, the following additional species have come to light,—

**Hippeastrum ambiguum* Herb.
**Amaryllis Blumenavia* (C.Koch et Bouche ex Carr.) Traub
**Hippeastrum decoratum* Lemaire
**Habranthus fulgens* J. D. Hooker
**Amaryllis Kromerii* Worsley
**Hippeastrum (Rhodophiala) laetum* Philippi

In the above lists, the species that have been starred (*) have not been fully considered in the previous article, and will be very briefly discussed here together with two newly proposed subgenera.

Dr. Philippi proposed *Habranthus flavus* in 1865, but later, in 1890, he proposed the name, *Hippeastrum Solisii* (=*Amaryllis Solisii)* based on this species, that must now give way to the combination *Amaryllis flava* as indicated later in this paper. *Hippeastrum ambiguum* Herb. was reduced to the rank of a hybrid, *Amaryllis solandriflora* X *Amaryllis vittata,* by Baker in 1888. Recently Claude Hope (Nat'l Hort. Mag. Oct. 1938) has made the suggestion that this may be entitled to specific rank in line with Herbert's description. However, the case has not been conclusively proved. It may be that this is a variety of *Amaryllis solandriflora* with a somewhat shorter tube. Sealy (Curtis's Bot. Mag. 1937) has shown that *Griffinia Blumenavia* belongs in the genus *Amaryllis,* and is identical with *Amaryllis iguapensis. Hippeastrum decoratum* Lemaire, and *Habranthus fulgens* J. D. Hooker, both described before 1888, were apparently overlooked by Baker. The former, proposed by Lemaire in 1854, is apparently a variety of *Amaryllis psittacina.* The latter, described in 1866, by J. D. Hooker, is near to *Amaryllis phycelloides* from which it differs particularly in the structure of the corona as well as in other characters. The new combination, *Amaryllis fulgens,* is proposed in place of *Hippeastrum fulgens.* Although the description of *Amaryllis Kromerii,* belonging to the *Amaryllis organensis* group, was made by Arthington Worsley as far back as 1903, it was not published until the present year in this issue of Herbertia. Baker, in 1888, suggested that *Rhodophiala laetum* Philippi, described in 1873, was identical with *Amaryllis pratensis,* but the description is lacking in important details. Final disposition of it can not be made until the type specimen can be examined in the Museum of the University of Chile. In 1890, Dr. Philippi made the combination *Hippeastrum (Rhodolphiala) laetum,* but earlier in the same paper he proposed the combination *Hippeastrum (Habranthus) laetum.* The former is unnamed, and the new name, *Amaryllis atacamensis* is proposed for it.

Traub (Herbertia 5: 131.1938) has found it logical to consider *Amaryllis Blumenavia* as the type on which he based the subgenus *Sealyana,* and in this issue of Herbertia he has proposed the subgenus *Worsleya* on the basis of the seed structure of *Amaryllis procera,* the type of this monotypic subgenus.

KEY TO THE SUBGENERA AND SPECIES OF THE GENUS AMARYLLIS

The following classification now includes all the subgenera and species of the Genus *Amaryllis.* Although 77 species have been tentatively admitted, it is likely that this number will be reduced considerably later on when the whole group has been studied critically.

Classification of the Subgenera and species of the Genus Amaryllis (Linn. ex parte) (syn. Hippeastrum)

A. Leaves linear to slightly lorate, tube always short;

B. Perianth openly funnel-shaped, stigma trifid. . . . SUBGENUS 1. CHILANTHE *(Traub & Uphof)*

C. Umbel 3-10 flowered;

1. *Jamesonii*
2. *Bertroana*
3. *Bagnoldii*
4. *bifida*
5. *advena*
6. *pulchra*
7. *marginata*
8. *ananuca*
9. *consobriniana*
10. *Moellerii*

CC. Umbel 1-2 flowered;

11. *lineata*
12. *rosea*
13. *chilensis*
14. *soratensis*
15. *andicola*
16. *splendens*
17. *flava*
18. *purpurata*

BB. Perianth openly funnel-shaped; stigma capitate; . . . SUBGENUS 2. RHODOPHIALA *(Presl)*

D. Umbel 2-6 flowered;

19. *montana*
20. *pratensis*
21. *atacamensis*
22. *Bakeri*

DD. Umbel 1-2 flowered;

23. *uniflora*
24. *rhodolirion*
25. *modesta*
26. *araucana*
27. *coloniana*
28. *Popetana*

BBB. Perianth narrowly funnel-shaped. . . . SUBGENUS 3. PHYCELLA *(Lindl.)*

E. Stigma trifid to minutely tricuspidate;

29. *gladioloides*
30. *granatiflora*
31. *bonariensis*
32. *Gayana*
33. *Herbertiana*
34. *Elwesii*
35. *tenuiflora*
36. *Philippiana*
37. *laeta*
38. *fulgens*

EE. Stigma capitate;

39. *bicolor*
40. *phycelloides*

AA. Leaves sickle-shaped, or distinctly lorate, or petiolate; perianth-tube long or short;

F. Corona wanting or obscure; perianth-tube long or short;

G. Perianth-tube long . . . . SUBGENUS 4. MACROPODASTRUM *(Baker)*

41. *solandriflora*
42 *candida*
43. *viridiflora*
44. *tucumana*
45. *Haywardii*

G.G. Perianth-tube short;

H. Stigma trifid; seeds compressed, winged, or sub-globose;

I. Seeds compressed, winged, leaves lorate . . . . SUBGENUS 5. LAIS *(Salisb.)*

46. *Canteraii*
47. *breviflora*
48. *vittata*
49. *Harrisonii*
50. *petiolata*
51. *flammigera*
52. *rutila*
53. *Damaziana*
54. *angustifolia*

II. Seeds sub-globose, leaves petiolate . . . . SUBGENUS 6. SEALYANA *(Traub)*

55. *Blumenavia*
56. *reticulata*

HH. Stigma capitate; seeds compressed, D-shaped, not winged, leaves sickle-shaped . . . . SUBGENUS 7. WORSLEYA *(Traub)*

57. *procera*

FF. Corona intermediate in development, usually of scales, but sometimes fimbriate; perianth-tube short . . . . SUBGENUS 8. ASCHAMIA *(Salisb.)*

J. Stigma trifid; perianth-tube very short, above an inch long;

58. *belladonna*
59. *reginae*
60. *crociflora*

JJ. Stigma capitate; perianth-tube ½ to 1 inch long;

61. *stylosa*
62. *Leopoldii*
63. *Mandonii*
64. *scopulorum*
65. *miniata*
66. *Andreana*
67. *Muesseriana*

FFF. Corona incurved, sometimes closing in the throat, perianth-tube short . . . . SUBGENUS 9. OMPHALISSA *(Salisb.)*

K. Stigma trifid;

68. *calyptrata*
69. *psittacina*
70. *platensis*
71. *organensis*
72. *Kromerii*
73. *aulica*

KK. Stigma capitate;

74. *Forgetii*
75. *pardina*
76. *fusca*
77. *Cybister*

DESCRIPTION OF SPECIES

(Baker in 1888 described 38 species, and these were reprinted in Vol. 1, Herbertia, 1934; one of these species has been transferred elsewhere, leaving 37 species; of the species proposed since 1888, 23 species were reprinted in Herbertia Vol. 5, 1939, but one of these, *A. iguapensis*, proved to be synonomous with *A. blumenavia* which is described below together with 17 additional species.)

8. A. ANANUCA (Phil) Traub & Uphof in Herbertia 5;130.1938; syn. ***Hippeastrum (Habranthus) ananuca*** Phil. in Anal. Univ. Chile 1890.

Description.—Bulb almost globose, 4 to 4½ cm. in diam.; leaves not contemporaneous with the flowers, 5 mm. wide; scape 20 to 22 cm. high; spathe 4 cm. long; umbel 2-5 flowered; pedicels relatively long; perigone 67 mm. long, deep lemon yellow, the middle vein of the segments a lively red. Tube 3 mm. long; segments 10 mm. wide; stamens equal to ½ the perigone, declinate with the style and ascending; style longer than stamens, equal to ¾ of the perigone, stigma slender, curved backward, 3 mm. long; fruit and seeds unknown.

Habitat.—Chile; common in the Province of Atacama near Caldera, Carrizal, etc., including Ananuca.

Notes.—Philippi claims that it can be easily distinguished from *Amaryllis Bagnoldii* of the Province of Coquimbo.

9. A. CONSOBRINIANA (Phil.) Traub & Uphof in Herbertia 5:131.1938; syn. *Hippeastrum (Habranthus) consobrinum* Phil. in Anal. Univ. Chile 1890.

Description.—Bulb and leaves unknown; scape 9 mm. diam.; spathes two, 55 mm. long, pale green with veins somewhat pronounced; bracts linear, membraneous; pedicels 35-55 mm. long; umbel 6-flowered; perigone 55 mm. long, bell-shaped, less open than in *Amarayllis fulgens,* the general aspect of the flower is scarlet, and the outside lower one-third is quite green, the color gradually changing to scarlet upwards; in the inside, the segments are pale yellow at the base, with a streak of deep yellow in the center of the scarlet upper portion; corona of scales, very small, near the base of the filaments; stamens and style declinate, then ascending, almost equalling the perigone; filaments and style white at base, red in upper part; stigma trifid, 2 mm. wide, lobes very short; fruit and seeds unknown.

Habitat.—Chile; generally distributed in the Andes in the Province of Santiago.

Notes.—Philippi points out that it has long pedicels like those of *Amaryllis phycelloides.*

10. A. MOELLERII (Phil.) Traub & Uphof in Herbertia 5:131.1938; syn. *Hippeastrum (Habranthus) Moelleri* Phil. in Anal. Univ. Chile 1890.

Description.—Bulb unknown; leaves contemporaneous with the flowers, 9 mm. wide, almost equalling the scape in length; scape up to 25 to 30 cm. high, 4 to 6 mm. in diam; spathe valves 2, as long as the pedicels which are 33 mm. long; umbel 3-5 flowered; perigone 45 mm. long, funnel-shaped, rose red, white at base; corona of small appendages at the base of the stamens; the longer stamens about two-thirds as long as the perigone, declinate; stigma trifid, lobes slender and recurved.

Habitat.—Chile; was collected in Araucania.

16. A. SPLENDENS (Renjifo) Traub & Uphof in Herbertia 5:131.1938; syn. *Habranthus splendens* Renjifo in Anal. Univ. Chile 1884, t. 65, p. 300; *Hippeastrum (Habranthus) splendens* (Renjifo) Philippi in Anal. Univ. Chile 1890.

Description.—Bulb egg-shaped, scales dark; leaves 7-13 mm. wide, 15 to 90 cm long, or longer, green or grayish green, with two to four veins, flat, striated (with two to four veins); scape 13 mm. in diam. and 30 to 60 cm. or more in length; spathes 2, lanceolate-ovate, marcescent; umbel 1-3 flowered; pedicels unequal, erect, 13 to 55 mm. long; perigone erect or slightly declinate, funnel-shaped, briefly tubulose, tube 3-5 mm. long; corona of oblong orange-yellow appendages, irregularly lacinate at apex, 5-7 mm. long; segments more or less equal, lanceolate, reflexed expanded above; 8 cm. or more long, 15 to 27 mm. wide, with the three sepaline segments rather pointed at the apex, barbate; the petaline segments obtuse; lower half of perigone yellow-green marked with red lines, the upper half brilliant vermilion-orange; stamens unequal, declinate, red, white at base, three rather longer but shorter than style; style declinate, red above, almost as long as the perigone; stigma trifid, obtuse; fruit and seeds unknown.

Habitat.—Chile; Province of Curico.

Notes.—Philippi states that this might be identical with *Amaryllis pratensis,* but he points out that according to the description of the latter in Gay Bot. VI. p. 70, the perigone of *Amaryllis splendens* is shorter, and differs at first sight from *Amaryllis pratensis* in having red filaments and style in place of yellow.

17. AMARYLLIS FLAVA (Phil.) Traub & Uphof, comb. nov.; syn. *Habranthus flavus* Phil. Anal. Univ. Chile XXVII. p. 333. 1865; *Hippeastrum (Habranthus) solisi* Phil. Anal. Univ. Chile 1890; *Amaryllis Solisii* (Phil.) Traub & Uphof, Herbertia 5: 131.1938.

Description.—Bulb unknown; leaves serotinous, scarcely 2 mm. wide, flat and obtuse. 5 cm. long; scape 15 to 20 cm. high; spathe valves two, equal, scarious and without color at the base, reddish at the apex, 26 to 35 mm. long, longer than the pedicels; umbel 1-flowered; perigone 48 mm. long, yellow, the tips of the sepaline

segments recurved, somewhat mucronate, 44 mm. long, the petaline segments with 7 veins; stamens 24 to 27 mm. long, style 3 cm. long; stamens and style declinate; fruit and seeds unknown.

Habitat.—Chile; discovered near Chillan by Man. Ant. Solis de Obando.

Notes.—First described by Philippi as *Habranthus flavus* in 1865; later in 1890 he applied the epithet *Solisi* which must give way to the combination *Amaryllis flava.*

18. A. PURPURATA (Phil.) Traub & Uphof in Herbertia 5: 131.1938; syn. *Hippeastrum (Rhodophiala) purpuratum* Phil. Anal. Univ. Chile 1890.

Description.—Bulb ovate, 23 mm. in diam., scales blackish; leaves three, contemporaneous with the flowers, 2 mm. wide, and as long as the scape; scape 35 cm. high; spathe valves whitish, 26 mm. long; pedicels 5 mm. long; umbel 1-flowered; perigone 36 mm. long, erect, segments of normal shape, purple; stamens about ½ as long as the perigone; style not much longer, thickened toward the apex; stigma trifid, thick, dark in color.

Habitat.—Chile; grows on eastern slope of Andes in the region known as de Linares, where it was collected in January 1874 by P. Ortega.

21. AMARYLLIS ATACAMENSIS (Phil.) Traub & Uphof, comb. nov.; syn. *Rhodophiala laeta* Phil. in Florula Atacamensis 1860; *Hippeastrum (Rhodophiala) laetum* Phil. in Anal. Univ. Chile 1890.

Description.—Bulb and leaves unknown; scape more than a foot high; umbel 3-5 flowered; spathe valves scarious, the exterior tinged purple; longer than the pedicels; perianth tube very short, the perianth segments lanceolate and equal; perigone violet-purple, immaculate; stamens half as long as the perianth segments, and ascending like the style which is much longer.

Habitat.—Chile; a plant of the hills of Atacama; found in a grassy region near Paposo about 1200 ft. above sea level.

Notes.—This species was first described as *Rhodophiala laeta* in 1860; in 1890, Philippi described *Hippeastrum (Habaranthus) laetum* in the Anales Universidad Chile, and further on in the same paper, made the combination *Hippeastrum (Rhodophiala) laetum* based on the species that he first described in 1860. Apparently the latter species is without a name and it has been named for the Province of Atacama.

Baker (1888) suggests that this species may be a variety of *Amaryllis pratensis.*

22. A. BAKERII (Phil.) Traub & Upholf in Herbertia 5:130.1938; syn. *Habranthus Bakerii* Phil. in Anal. Univ. Chile 1890.

Description.—Bulb 30 mm. in diam., scales membraneous, black; leaves, contemporaneous with the flowers, 3-7 mm. wide, length unknown, but probably as long as the scape; spathe 2-valved, equal to the pedicels, 35 mm. long; umbel 3-5 flowered; perigone funnel-shaped, yellow, as long as the pedicels; stamens not very unequal, two-thirds as long as the perigone or longer; stigmatic lobes short and thickened; fruit and seeds unknown.

Habitat.—Chile; Philippi's son Fredericus found it at the foot of Mt. Descabezado del Maule in the Province of Talca.

Notes.—Philippi states that this species can be distinguished from *Amaryllis advena var. pallida* by its funnel-shaped perigone. The leaves of the specimen upon which Philippi based his description were incomplete because the terminals had been eaten by cattle.

26. A. ARAUCANA (Phil.) Traub & Uphof in Herbertia 5: 130.1938; syn. *Hippeastrum (Habranthus) araucanum* Phil. in Anal. Univ. Chile 1890.

Description.—Bulb diam. 27 mm.; leaves contemporaneous with the flowers, 4 mm. wide, equalling the scape, which together with the flowers is 30 cm. high, and is comparatively slender, the thickness being scarcely more than 2 mm.; spathe valves 2, 32 mm. long, almost equalling the pedicels; umbel 2-flowered; perigone 37 mm. long, funnel-shaped, erect, rose colored, green at base; the longer stamens are half and the style three-fourths as long as the perigone; structure of stigma not indicated; fruit and seeds unknown.

Habitat.—Chile; collected by Volckmann in the Andes of Araucania l. d. Cupulhue.

Notes.—Philippi states that it differs from *Amaryllis rosea,* native to the Isles of Chiloe, which has a more openly funnel-shaped perianth.

27. A. COLONIANA (Phil.) Traub & Uphof in Herbertia 5:130.1938; syn. *Hippeastrum (Habranthus) colonum* Phil. in Anal. Univ. Chile 1890.

Description.—Bulb egg-shaped, 2 cm. in diam.; leaves contemporaneous with the flowers, 3 mm. wide, often equal in length to the scape; scape 30 cm. high; spathe valves 2, grassy green, 2½ cm. long; pedicels equalling the spathes; umbel 1-2 flowered; flowers in November in Chile; perigone funnel-shaped, segments regular, fiery red, base yellow, the yellow part in the interior covering one-fourth to one-third the length of the flower; stamens and style equal to three-fourths of the perigone, declinate, then ascending; filaments yellow; upper part of style red; stigma club-shaped, almost three-lobed; fruit and seeds unknown.

Habitat.—Chile; frequent in Araucania from Renaico to Temuco.

Notes.—Philippi states that the "divisions of the single lobes form beards to the apex."

28. A. POPETANA (Phil.) Traub & Uphof in Herbertia 5:131.1938; syn. *Hippeastrum (Rhodophiala) Popetanum* in Anal. Univ. Chile 1890.

Description.—Bulb unknown; leaves unknown, not present during flowering time (January in Chile); scape 20 cm. high; spathe valves two, reddish, herbaceous, reaching to half the perigone length; pedicel 8 mm. long; umbel 1-flowered; perigone 7 cm. long, tube green, one-third as long as the perigone; segments of a beautiful pink and reflexed; stamens about ½, the style almost ¾ as long as the perigone; stigmatic lobes undivided.

Habitat.—Chile; grows in the Andes in the so-called Cordillera De Popeta in the Province of O'Higgins.

35. A. TENUIFLORA (Phil.) Traub & Uphof in Herbertia 5: 131.1938; syn. *Hippeastrum (Habranthus) tenuiflorum* Phil. in Anal. Univ. Chile 1890.

Description.—Bulb and leaves unknown; scape about 20 cm. high; spathe valves two, grassy green, 6 mm. longer than the pedicels which reach a length of 3 to 5 cm. with maturity of fruits; umbel 5-6 flowered; the perigone is divided almost to its base, but has the appearance of a lengthened narrow tube, 48 mm. long and 6 mm. wide at the mouth; the regular, linear-lanceolate segments, 4 mm. wide, extend beyond this by 14 mm. and are slightly bent backward; stamens very unequal, the longer ones and the declinate style being shorter than the perigone; stigma trifid lobes recurved; capsule is almost globose, 11 mm. in diam.; seeds unknown.

Habitat.—Chile; collected by Frederico Philippi in the Province of Santiago.

Notes.—Philippi states that this species is easily recognized on account of the narrow tubular form of the perigone.

36. A. PHILLIPPIANA Traub & Uphof in Herbertia 5:130.1938; syn. *Hippeastrum (Phycella) angustifolium* Phil. non Pax in Anal. Univ. Chile 1890.

Description.—Bulb small, 21 mm. in diam.; leaves two, as long as the scape, narrow, 3 mm. wide; scape 312 mm. high; spathe valves 21½ to 23½ mm. long, obtuse and of irregular length, and sometimes as long as the pedicels and perigone combined; inside the spathe valves there are a number of narrow bracts, almost as long as the spathe valves; umbel 2-3 flowered; pedicels erect, shorter than the spathe valves; perigone scarlet, 34 mm. long, tubular, funnel-shaped, the diameter at the mouth being hardly 8 mm.; stamens much longer than the perigone, the style either much longer or much shorter than the stamens, and this variation may be found in one umbel; corona not detected. (Philippi is silent about the structure of the stigma.)

Habitat.—Chile; in the valley of Maipo near the mine Cristo; specimens were obtained by Mr. Benjamin Davila for the Museum (Santiago, Chile).

Notes.—Philippi, who examined 5 specimens, observes, "Our species differs from *Phycella Herbertiana Lindl.* which has narrow leaves of unequal length, but which have not been sufficiently observed."

37. A. LAETA (Phil.) Traub & Uphof in Herbertia 5;131.1938; syn. ***Hippeastrum (Habranthus) laetum*** Phil. in Anal. Univ. Chile 1890.

Description.—Bulb unknown; leaves unknown, except in a mutilated condition, 5 mm. long; scape 40 cm. long; umbel many-flowered; spathe of many bracts; pedicels 5 cm. long, and almost as long as the perigone which is scarlet in color, and funnel-shaped; the scales are minute and originate from the filaments; the shorter stamens half as long, the longer two-thirds as long, as the perigone; style not much longer than the longer stamens and shorter than the perigone; stigma trifid, lobes elongated and much reflexed.

Habitat.—Chile; collected near Tiltil, in the Province of Santiago, October 1879.

Notes.—According to Philippi this species differs from *Amaryllis phycelloides* and *Amaryllis fulgens* by its larger stigmatic lobes.

38. AMARYLLIS FULGENS (J. D. Hooker) Traub & Uphof, comb. nov.; syn. *Habranthus fulgens* J. D. Hooker in Curtis's Bot. Mag. 1866, t. 5563; A. Verschaffelt t. (?); *Hippeastrum (Habranthus) fulgens* (J. D. Hooker) Phil. in Anal. Univ. Chile 1890.

Description.—Bulb unknown; leaves glaucescent, 10-12 inches long, half to three-quarters of an inch broad, linear, recurved, obtuse, convex, and scarcely keeled at the beak; scape one to one and a half foot high, as thick as the little finger, glaucous green above, purple below; flowers seven in this specimen, four to five inches across, bright scarlet; tube yellow externally; lobes linear-oblong, acute, golden-yellow at the base, the yellow forming a defined triangular mark; scales at the base of the tube of corolla, six, forked; stamens with yellow filaments; stigma minutely three lobed; fruit and seeds unknown.

Habitat.—Chile; collected by Philippi in the Province of Santiago.

Notes.—Hooker's description was based on a plant sent him by Messrs. Backhouse, of York, with whom it flowered in April 1865. Philippi had only the plate by Verschaffelt, whom he compliments as representing the plant well. He points out that the yellow which forms the star in the interior of the perigone is too marked, and the spathe valves, the style and filaments are yellow that are first reddish, then clearly red in the plants in their mountain habitat. The leaves are 9 mm. wide, but the Verschaffelt plate shows them as 15 mm. wide, which Philippi claims may be due to the influence of culture in fertilized soil. Philippi states in his notes that the umbel is 2-7 flowered; perianth segments scarlet; corona of elongated bifid scales, 11 mm. long at the base of the stamens; stigma obscurely 3-lobed, practically undivided.

55. A. BLUMENAVIA (C. Koch et Bouche ex Carr.) Traub in Herbertia 5:131 1938 syn. *Griffinia Blumenavia* C. Koch et Bouche ex Carr. in Rev. Hort. 1867, p. 32, c. tab; Hook f. in Bot. Mag. t. 5666 (1867); Gard. Chron. 1871, p. 711; c. fig.; Gartenflora XXI. 52, c. fig. (1872); The Garden, XIX. 528, c. fig. (1872); Nicholson's Ill. Dict. Gard. II. 99. c. fig. (1885); Neubert's Deutsch. Gart. Mag. 1885, p. 12, c. fig.; W. W. (Watson) in The Garden, L. 208, c. tab. (1896); Bellair & St.-Leger. Pl. Serre, 873, c. fig. (1900); *Hippeastrum iguapense* R. Wagner in Wien. Ill. Gart. Zeit. XXVIII. 281, t. 3 (1903); *Hippeastrum Blumenavia* (C. Koch et Bouche ex Carr.) Sealy in Curtis's Bot. Mag. tab. 9504.1937; *Amaryllis iguapensis* (R. Wagner) Traub & Uphof in Herbertia 5:125-126.1938.

Description.—Bulb globose, about 4 cm. in diam.; bearing one or two leaves with the flowering stem, and later on up to 7 leaves; leaves petioled, blade narrow, oblong-obovate or broad oblong-oval, acute, cuneate at the base, 8-12 cm. long, 2-5.7 cm. wide; petiole 4-6 cm. long and about 5 mm. broad; scape up to about 20 cm. long; spathe-valves 2, more or less erect, narrow oblong-lanceolate and long acuminate, 5.5 cm. long, 1.1 cm. wide; flowers 4-5, patent, horizontal at first but soon somewhat cernuous; bracts 1-4.5 cm. long; pedicels 2.2-3 cm. long; perigone funnel-shaped, segments spreading and slightly recurved at the apex, 6.5 to 7.5 cm. across, white with mauve-crimson lines and bands running downwards into the tube; segments united for about 5 mm. at base; sub-equal in length, but unequal in width, 5.5 cm. to 6 cm. long, 1 cm. to 2.1 cm. wide; stamens declinate, filaments united to perigone for about 5 mm. at base, 3.4 cm to 4.8 cm. long; corona a finely lacinate

white membrane about 2 mm. long inserted between the perigone and the base of the filaments; style white, about 5 cm. long; stigma 3-fid, lobes about 2 mm. long; ovary 5 mm. long, 4 mm. in diam.; ovules about 12 in each loculus in superposed pairs; capsule globose, about 1 cm. in diam. crowned by the persistent, shrivelled perigone; seeds one or two developed in each loculus, rounded on back with flat surfaces, 6-7 mm. long and about 5 mm. broad, shining, translucent, the testa olive-brown at first but eventually black and produced at the top of the seed as a large flattish wrinkled crest which resembles a "walnut" cock's comb.

Habitat.—Southeast Brazil.

Notes.—The above description is abridged from the excellent detailed description of this species by Mr. J. R. Sealy which appeared in Curtis's Botanical Magazine in 1937.

69. AMARYLLIS PSITTACINA Gawl var. decorata (Lemaire) Traub & Uphof, comb. nov.; syn. *Hippeastrum decoratum* Lemaire in Jardin Fleur vol. 4, t. 338. 1854; Nat'l. Hort. Mag. 18:66-67.1939.

Notes.—We can find no specific difference between *Amaryllis psittacina* Gawl. and *Hippeastrum decoratum* Lemaire.

72. A. KROMERII WORSLEY in Herbertia 6:117-118.1939.

(For complete description of this new species see pages 117-118 of this issue of Herbertia).

74. A. FORGETII (Worsley) Traub & Uphof in Herbertia 5:131.1938; syn. *Hippeastrum Forgetii* Worsley in Gard. Chron. 1912, p. 108; Jour. Roy. Hort. Soc. July 1912, p. 73-75.

Type material.—None available; description was made from living plants by Arthington Worsley at Isleworth, England, in 1912.

Description.—Bulb rather small, neck 3 in. long; leaves 6, contemporaneous with the flowers, lanceolate-tipped, dull light green, ruddy on back, ultimately 2 ft. long by 1½ in max. width; scape 2-flowered, slender, about 2 ft. high; pedicels 3 in. long, equalling the spathe-valves; flowers stellate, dull crimson, distinctly keeled in the lower half with a green keel, base green, span 6 in. by 5½ in. horizontally; limb 4½ in. long, scentless, the 3 outer segments slightly incurved, 4 in. long by 1 in. max. width, the inner slightly narrower, the lowest 3½ in. long by ¾ in. max. width: tube under ¼ in. long, completely closed in by the incurved corona, the throat bearded by tufts of white hairs three-eighths in. long borne on the green corona; stamens contiguous, very little if at all excerted, pollen yellow, style excerted ½ in. beyond the lowest segment; stigma 3-lobed; fruit sub-triquetous, ovules normally seated, about 75 in all (25 in each row).

Habitat.—Peru; near Cuzco.

Notes.—Described by Mr. Worsley from bulbs gathered by Mr. Forget near Cuzco, Sept. 23, 1909, and imported into England. Mr. Worsley states that it differs in a few particulars from *Amaryllis pardina*, notably in the unspotted, subvittate coloration of the flowers and the narrower segments. In the same importation were found two variations ("A" and "B") that were similar to *Amaryllis Forgetii*, and also *Amaryllis pardina* var. *tricolor*, and a variation ("C") near to the latter. Variety "A": flower of an intense dark red, with narrower segments, and a very short star; Variety "B": irregularly blotched with white at the apices of all segments: Variety "C": inflorescence substantially like *Amaryllis pardina*, but unspotted.

REGISTRATION OF NEW VARIETIES

Descriptions of new varieties of hybrid amaryllids and alstroemerids for this section should reach the editor by June 1 if 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 the 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.

Hybrid Amaryllis Varieties

Introduced by Frank Vasku, Winter Park, Fla.

CHARMAINE (No. 90) A brilliant red with a cream colored throat 6 inches across. It probably belongs in group 219 of the Yearbook classification table.

ERNEST PYE (No. 166) A compact red flower suffused with white toward the center, about 8-inch size, group 221.

JOHN VASKU (No. 401) An 8-inch light compact red with white throat and keels. Group 219.

DARK RED BONNET (No. 206) A dark red flower of solid color 7 inches across. Group 223.

PRESIDENT BENES (No. 606) A 7-inch flower of rich warm stoplight shade of red. Group 220.

SONIA (No. 619) Group 205, 7 inches across with white keels, red veins and edges suffused with red.

JEAN SWOPE (No. 625) Group 215, a cerise red with a touch of yellow inside, 7-8 inch size.

DEETTA PYE (No. 616) An 8-inch flower of solid dark red with stamens yellow at the base. About same color as Dark Red Bonnet but larger and somewhat different shape. Also group 223.

Hybrid Daylily (Hemerocallis) Varieties

Introduced by Lakemont Gardens, Wyndham Hayward, Winter Park, Fla.

LENORE (HC-131); Seedling of *H. fulva* var. *rosea,* evergreen, with darkish coppery red flowers, rather full and compact type of bloom, even brownish rose coloring of petals, golden throat, slightly darker mid-zone marking, free flowering, 6 in. blooms, faint yellowish edging of sepals; 3 to 4 ft.

E. W. YANDRE (HD-12); Vigorous, large wide-petaled flowers, flaring open very widely, gold throat and base with fulvous bronze shading and darker eye-zone; gold bordered and striped; edges crepy; bold type of bloom, showy and full; six-in flower, plant 2-3 ft.; evergreen.

EMPEROR JONES (HD-9); deep mahogany red to purple black flowers with lighter golden stripe in mid-petal; free blooming, vigorous, clear golden throat; stands sun well; 6-in flower, plant 3-4 ft.; full, slightly recurved petals, flowers having a purple-black sheen when seen in morning light; evergreen. (See Plate 159.)

RAMONA (HC-216); Bright brick-red flower on light yellow-gold base; deciduous; seedling of Lemona X H. fulva var. rosea; neat and colorful; trimly shaped flower; pleasingly and symmetrically recurved petals and sepals; gives charming effect; 2 feet.

MINNIE (HC-111); A tiny flowered dark mahogany red type, the color of the petals blending with a real deep crimson tone; lighter orange center; wavy or fluted petals, darker midzone; many flowered and free flowering; semi-evergreen; flowers 3 in.; plant 2-3 ft. An interesting variety with high decorative value.

Introduced by Hamilton P. Traub, Mira Flores, Orlando, Fla.

ST. JOAN (No. 406); robust, petals Moroccan Red, 5-K-11, edges ruffled and lighted up with a golden halo; sepals similar in color but lighter, not ruffled; only a faint eye-zone; first blooms in early April; recurrent bloomer.

REBA COOPER (No. 427); semi-robust; flower color, Sunrise, 10-C-7, eye-zone Raspberry Red, 3-K-9; early April; recurrent.

ESTELLE FRIEND (No. 350); semi-robust, ideal plant and flowering habit, averages 15 flowers per scape; color, Burmese Gold, 3-C-11; faint reddish eye-zone; golden throat; flowers full; early April; recurrent bloomer.

CECIL HOUDYSHEL (No. 420); semi-dwarf, color Doge Red, 4-K-9, eye-zone scarcely perceptible, sepals of similar color but slightly lighter at edges; middle April; named in honor of Herbert Medalist, Cecil Houdyshel.

AUDREY BLASER (No. 423); robust, flowers large and segments recurved; color Sunkiss (orange), 9-K-9, suffused Rufous, eye-zone not prominent; middle April; recurrent bloomer.

MAYOR STARZYNSKI (No. 430); semi-robust; full flower, delightful shade of bronzy-rose; middle April; recurrent bloomer. Named in honor of the heroic defender of Warsaw.

LA TULIPE (No. 436); semi-robust, flowers few and held practically erect, reminiscent somewhat of a Cottage tulip; flower color, large sulfur yellow throat, upper part of petals near dark Cardinal. 6-L-8, sepals somewhat lighter; eye-zone scarcely perceptible; middle April; recurrent bloomer.

JOHN BLASER (No. 439); semi-robust, flowers numerous, near clear Apricot, 9-K-5, petals about ¾ inch, and sepals about ½ inch wide; early April. Named in honor of Mr. John Blaser of Sarasota, Fla., who first recognized its value as a cut flower.

FRED HOWARD (No. 440); semi-robust; flowers full with wide segments; petals near Ember, 5-K-10, sepals lighter; eye-zone scarcely perceptible; Chrome-lemon, 9-K-2, throat; late April; recurrent. Named in honor of Herbert Medalist, Fred H. Howard.

CORINNE ROBINSON (No. 462); semi-dwarf, very light pink, near to Etruscan, 4-G-11, early May.

PEONY RED (No. 464); semi-robust; similar to Fulva Rosea in growth habit, but flowers are Peony Red, 6-J-6, eye-zone darker; early May.

MILDRED ORPET (No. 468); semi-robust, a very delicately tinted bi-color; throat Sunflower, 9-L-4, petals gradually shading to a clear Peach Blush, 5-C-11; sepals suffused Peach Blush at upper end; early May.

CARNIVAL (No. 476); semi-robust; striking color combination; throat Aureolin Yellow, 10-L-2, tapering to one-eighth inch stripe through center of petals; relatively small portion of petals is Moro Red, 7-L-10; sepals somewhat lighter; middle of May.

RUSSELL WOLFE (No. 477); robust; petals near to Spanish Wine. 7-J-6; sepals slightly lighter golden yellow throat; full flower like Soudan; middle of May.

NEWLY NAMED DAYLILIES

A. B. Stout

This list is for the daylilies of which the writer has record that have been introduced between May 18, 1937[1] and April 1, 1939. The persons and firms involved in the origin and first distribution of these clones are arranged alphabetically and numbered and the appropriate numbers are given with the names of the clones. Only a few of these clones have been described in horticultural literature and for such cases the reference is given. Certain clones have, however, been described in catalogs of some of the firms mentioned. But a considerable number of the nursery firms which are offering daylilies have recently organized for business and are issuing only typed or mimeographed lists. Hence many of the daylilies here listed have not been described.

LIST OF PERSONS AND FIRMS

(1) Betscher, C., Dover, Ohio.
(2) Bristol Nurseries Inc., Bristol, Conn.
(3) Craemore Garden, Merrimac, Mass.
(4) Donahue, T. F., Newton Lower Falls, Mass.
(5) Dreer, Henry H., Inc., Riverton, N. J.
(6) Dunean Gardens, 32 Smythe Ave., Greenville, S. Carolina.
(7) Fairmount Gardens, Lowell, Mass.
(8) Farr Nursery Co., Weiser Park, Pa.
(9) Fisher, Wm. E., Seneca Falls, New York.
(10) Floravista Gardens, Olympia, Wash.
(11) Florida Agri. Exp. Sta., College of Agr., University of Florida. Gainesville, Florida.
(12) Hillside Gardens, Amesbury, Mass.
(13) Kelsey-Highlands Nursery, East Boxford, Mass.
(14) Lakemont Gardens, Wyndham Hayward, Winter Park, Florida.
(15) Lord, R. P. & E. L., P. O. Box 1948, Orlando, Florida.
(16) Mass. State College Agri. Exp. Sta., Field Station, Cedar Hill, Waltham, Mass.
(17) Midwest Gardens, Elkhorn, Nebraska.
(18) National Iris Gardens, Beaverton, Oregon.

[1] A list of New Clones of Daylilies, by A. B. Stout, Herbertia, 4: 144-160. 1937.

(19) Parker Nursery Co., Newark, New York.
(20) Perry's Hardy Plant Farm, Enfield, Middlesex, England.
(21) Port Rose Garden, 713 Young's Lane, Freeport, Ill.
(22) Quality Gardens, Freeport, Ill.
(23) Roadside Gardens, East Arlington, Vermont.
(24) Royal Hort. Society, Wisley, England.
(25) Russell, H. M., Route 6, Houston, Texas.
(26) Stout, A. B., New York Botanical Garden, New York City.
(27) Traub, H. P., Mira Flores, Orlando, Florida.
(28) Wallace, R., & Co. Ltd., The Old Gardens, Tunbridge Wells, England.
(29) Yeld, George (deceased).

It must be noted that many of the names and also the listing of them do not conform to the simplest common-sense rules or principles which horticultural organizations and conferences have frequently recognized and formulated.[2] Some of these which apply particularly in this connection may be mentioned.

1. *"A plant can bear but one valid name."* In several cases a single clone of daylily has been given two or more names or synonyms. At least two nurserymen have the habit of distributing divisions of a plant under a name but later deliberately listing the same clone under a different name. There are also cases in which a clone that has been fairly well known is given a new name.

2. *"The valid name is the earliest which conforms to the accepted rules of nomenclature."* In several cases two different clones are being sold under one name (a homonym) and in this there may also be the confusion of two differently named clones. For example, in 1929 the Bay State Nurseries introduced two rather distinctly different daylilies under the names *Gypsy* and *Cressida*. Later, plants of the clone *Cressida* have been sold as *Gypsy*. It is obvious that in this case the application of the names in the distributions of 1929 should be considered valid. The designation of the name *Sunbeam* to two different plants, as noted in the above list, is another case of a homonym.

3. The various horticultural daylilies are propagated as *clones* and most of them are complex hybrids. The clonal name should never be a Latin name. It is a "fancy" name that is capitalized; it has the rank of a proper noun for it is the name of an individual plant. It has been decided that, as far as possible, a single word should be used; that prefixes as "Mrs.," "Miss," and "Dr." should be avoided, and that the articles "a" and "the" should not be considered a part of the name. "In order to be valid, a name must be published." The name and a "recognizable description" should appear "in a recognized horticultural or botanical periodical, or in a monograph or other scientific publication, or in a dated horticultural catalogue."

A considerable number of the names listed above do not conform to the recommendations and rules noted above, but are reported here in the effort to make the record as complete as is possible.

[2]The Naming of Plants, in Journal Royal Horticultural Society. 63:40-41.

THE LIST OF CLONAL VARIETIES

ALGERIA; 14; Herbertia; 1938:
AMARILLO; 14:
ANTARES; 14; Herb. 1938:
AUGUST PIONEER; 8; 26; Jour. N. Y. Bot. Gard. Feb. 1939:
AURANTHE; mentioned in The Gardeners' Chronicle. Sept. 1, 1934
AURILLO; 14:
AZTEC GOLD; 7; 12:
BALSARA; mentioned in The Gardeners' Chronicle, July 24, 1937.
BARBARA LORD; 15; Herb. 1938:
BELOIT; 16; 18:
BOBETTE; 23:
BOUTONNIERE: 8:26; Horticulture; Oct. 1, 1938:
CANARY BIRD; Evidently a misnomer:
CARMEN; 14; Herb. 1938:
CERES: 28:
CHARLOTTE TRAUB; 27; Herb. 1938:
CHIPSEA=CHISCA; Herb. 1937:
CHLOE; 7:
CHRYSANTHA; 12:
CIMARRON; 15; Herb. 1938:
CLEO; 14; Herb. 1938:
COLUMBINE; 15; Herb. 1938:
COPPER LUSTRE; 15; Herb. 1938:
CORALIE; 15; Herb. 1938:
CRAEMORE RUBY; 3:
CREPE; 6:
CRINKLES; 14:
CROWN PRINCE; 14:
CRYSTAL PINK; 7:
CYPREA; 24; Possibly *H. fulva* clone Cypriana:
DAWN PLAY; 7:
DELOVELY; 14:
DOMESTICO; 11:
DOROTHY MCDADE; 17:
DR. HUGHES; 27; Herb. 1938:
DR. STOUT; 27; Herb. 1938:
DUSTY STARS; 25:
DUTCHESS OF WINDSOR; 14; [See also Plate 159, this issue of Herbertia, (1939)].
EARLIEST; 13:
ELAINE; 27; Herb. 1938:
ENCHANTRESS; 2:
FESTIVAL; 8; 26; Jour. N. Y. Bot. Garden Feb. 1939:
FISHER VARIEGATED; 9; 19;
FLAMANTE; 14:
FLAMULA; 23:
FLORIBUNDA; 23:

FLORIDA; 14: Herb. 1938; [See also Plate 159, this issue of **Herbertia**, (1939)]
FRANK RUSSELL; 25:
FULVALA; 1:
FULVOLA; 1:
GINGER; 14:
GITANA; 15: Herb. 1938:
GLORIOSA; 27; Herb. 1938:
GLOW; 28:
GOBLIN; Evidently this is Goldeni.
GOLDEN BYNG OF VIMY; 20; 22; 3:
GOLDEN DAWN; 7:
GOLDEN FLEECE; 7:
GOLDEN GLOW; 27; Herb. 1938:
GOLDEN MAMMY; 4:
GOLDEN MANTLE; 11:
GOLDEN SHADOWS; 25:
GRANADA; 27; Herb. 1938:
HANKOW; 8; 26; Jour. N. Y. Bot. Garden, Feb. 1939:
HAPPINESS; 27; Herb. 1938:
HARLEQUIN; 15; Herb. 1938:
HARVEY RUSSELL; 25:
HEATHER ROSE; 7:
HECTOR; 15; Herb. 1938:
HERMES; *syn.* MRS. HELEN CAMPBELL, which was listed in Herb. 1937:
HESPERUS; 17:
HOWARD RUSSELL; 25:
INDIAN CHIEF; 27: Herb. 1938; [See also Plate 159, this issue of HERBERTIA, (1939)].
JAPANESE FALL; 21:
JAPANESE SPRING; 21:
JAPANESE SUMMER; 22:
JENNIE LEE; 25:
KUBLAI KHAN; 15; Herb. 1938:
KWANSO VIRGINICA and VIRGINICA; Evidently the old semi-double clone of *H. fulva.*
LAMAR RUSSELL; 25:
LEMONE; 5:
LENA HUGHES; 27: Herb. 1938:
LILA WHITE; 11:
LOUISE; 14:
MALCOLM RUSSELL; 25:
MAUVE ROSE; 27; Herb. 1938:
MEDUSA; 23:
MISS ANNIS; 25:
MISSIANNI RUSSELL; 25:
MOONGLOW; 15: Herb. 1938:
MRS. C. L. SEITH; 1:

MRS. GARLOCK; 19:
MRS. HERBERT H. DEWEY; 14; Herb. 1938:
MULTIFLORA HYBRID; 25; Possibly this is one of the Summer Multiflora Hybrids:
MULTIFLORA PERRY; 20:
MYSTERY STAR; 16:
NEBRASKA; 17:
NUBIANA; 14: Herb. 1938:
OLD ROSE; 23:
OLIVE; 21:
OMPHALE; 3:
ORANGE QUEEN; 28:
ORB; 24:
OTHELLO; 14:
PASTEL ROSE; 3:
PERSIAN PRINCESS; 7:
PINK LASS; 7:
RALPH WHEELER; 14:
RAMONA; 23:
RED MAN; 23:
R. I. LEMON; listed in 1939 by Kenwood Iris Gardens.
RITA; 29:
ROMANY; 15; Herb. 1938:
ROSALIND; 8; 26; Horticulture, May 15, 1938.
ROSITA; 23:
RUSSELL, C-28; 25:
RUSSELL, J. T.; 25:
RUSSELL, U-29; 25:
SAMOSET; 7:
SAN JUAN; 27: Herb. 1938.
SASS NO. 10-33; 17:
SENATOR ANDREWS; 14:
SEQUOIA; 25:
SERENA (Forrestii); 20: Mr. Perry reports he has discarded this.
SPARTAN; 25:
SPECIOSA; 28:
STELLA ROSE; 15; Herb. 1938.
STORM CLOUD; 25:
SUNBEAM; 15: Herb. 1938—But this name already in use, see page 159 of Herb. 1937:
SUNRISE; 7:
SUNSHINE; 6:
SWEETBRIAR; 7:
THE MILLER'S DAUGHTER; 25:
TURY; 15; Herb. 1938:
VESUVIUS; 15; Herb. 1938:
VICTOR LORD; 15; Herb. 1938:
VICTORY TAIERHCHWANG; 27; Herb. 1938:
WEKIWA; 27; Herb. 1938:

AN AMARYLLID HERBARIUM

L. H. Bailey, *Ithaca, N. Y.*

Somewhere in the United States should be a standard herbarium collection of the cultivated Amaryllidaceae correctly determined, to serve as a record and as a basis of comparison and identification. Correspondence has developed the suggestion that the Bailey Hortorium of Cornell University might cooperate in such an enterprise. The Hortorium will be glad to be of service, in connection with its general study of cultivated plants. Such a collection is greatly needed for continued scientific study and for consultation alike by investigators and growers. Many questions could be answered from such a museum as time goes on.

The larger showy amaryllids are very difficult to preserve for herbarium use, and a new technique will need to be developed. The entire plant should be kept in one way or another. A representative plant should be photographed when in bloom, probably from more than one side or view, and the prints with negatives should be housed with the specimens. Whether the entire head or umbel should be pressed will depend on circumstances, but of course individual flowers may be prepared in such way as to show the botanical characters of all the parts, with useful notes on color. Leaves must be pressed. Seed-pods should be kept.

The plant should then be grown to maturity and the entire bulb be preserved and kept in as near its original condition as is possible with a dead and permanent object.

The pressed specimens may be mounted on the most durable heavy herbarium paper. The other material may be stored in boxes that fit into the herbarium pigeon-holes. We use these boxes extensively for cones, nuts, heavy palm materials and similar objects. They are manufactured for us to order. Therefore all the records of any species of plant may be kept together for easy reference.

The preparation of all such material for preservation requires much experience, time and perseverance. But the particular problem is to obtain fresh material for the work, and this requires cooperation of the growers. Mr. Hayward, secretary of the American Amaryllis Society, suggests that collectors and growers of amaryllids send a bulb of each species to me and that we grow the plants here under glass for the purpose of procuring preserved material. We shall be glad to cooperate in such an undertaking as far as possible, but we are not practiced amaryllis growers and we might fail with some of the difficult ones. Now and then a good head, just coming into bloom, might be sent us by mail as cut-flowers are shipped, and the specimens can be prepared here.

Mere horticultural varieties and color sports of standard species need not be added to an herbarium collection unless the differences are such as would show in the prepared specimens.

What is needed is a source herbarium of amaryllid material. The assembling of such a collection could not proceed rapidly, but a beginning could be made without great trouble. Considerable storage space would be required, which we would provide. The collection should be brought together where other cultivated groups are kept and studied, and where library facilities are available.

CRITICAL REVIEW OF SEALY'S "AMARYLLIS AND HIPPEASTRUM"

J. C. Th. Uphof, *Florida*

In the Kew Bulletin of Misc. Information No. 2, 1939, there appears an interesting article by J. R. Sealy[1] on the nomenclature of *Amaryllis* and *Hippeastrum* that is worth reading—not that it alters in any way the case that is discussed—for it is of interest as an example of a certain type of argumentation. Although Linnaeus in the first edition of Species Plantarum, 1753, a work that is universally recognized as the beginning of nomenclature of vascular plants, indicated clearly what he considered typical illustrations[2] of *Amaryllis belladonna*, it is attempted in Sealy's article of 19 long pages to make out after enveloping the subject in a web of circumstantial evidence not only that Linnaeus was a slip-shod worker but also that it remained for some one 185 years later to show the world what Linnaeus actually meant to illustrate.

In reading the article it is illuminating to analyze the type of argumentation employed. The reader will remember that a year or so back an attempt was made to erase one of the amaryllids, *Habranthus texanus*, native to the State of Texas on the alleged ground that the Texas amaryllid was similar to the Argentinian type and is the only *Habranthus* reported north of the Equator, and that Spanish missions were built in Texas prior to its discovery in that State.[3] That there are obvious flaws in the argument is indicated by the facts that the missionaries were not from the Argentine but came out of Mexico, and the amaryllid concerned covers an enormous area in the great State of Texas.[4] It is clear that all such arguments based on untenable suppositions, although *interesting* do not settle anything! This case is mentioned because it is a similar type of argumentation with which we are again confronted in the article that is the subject of this review.

In the British Museum there is a specimen in the Clifford herbarium that bears no name or identification, and Sealy confesses (p. 51) that "there is no ground for stating either that it is the basis of *Amaryllis belladonna*, or that it is the plant Linnaeus knew in the Clifford garden for the specimen may have been added to the herbarium after Linnaeus had left Holland." On page 58, this becomes merely "There is a specimen of the Cape Belladonna in the Clifford herbarium, but no specimen of *Hippeastrum equestre*." Finally, after he has woven his web of circumstantial evidence, on page 60, one is flabbergasted to read "the specimen may actually be the type, but unfortunately this cannot be proved. However, in the absence of evidence to the contrary this specimen may be accepted as the working type." We are sorry to interrupt this fanciful exercise but we must point out that it is generally recognized that "no argument can ever be drawn from silence." Alas, in this case history is silent!

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[1]Sealy, J. R. Amaryllis and Hippeastrum. Bul. Misc. Inf. Kew. No. 2, 49-68. 1939.
[2]Uphof, J. C. Th. The History of Nomenclature of Amaryllis Linn. and Hippeastrum Herb. Herbertia. 5:101-109. 1938.
[3]Sealy, J. R. Zephyranthes, Pyrolirion, Habranthus and Hippeastrum. Jour. Roy. Hort. Soc. 62:195-209. 1937.
[4]Flory, Walter S. Cytotaxonomic Notes on the Genus Habranthus. Herbertia. 5:151-153. 1938.

Since the point he wants to make cannot be proved as he confesses, why not omit it altogether out of due respect for science?

The reader should note the shocking transition from downright condemnation of the evidence to final bald acceptance. It should also be borne in mind that the "blank" specimen is one of the pillars on which his dubious structure is built.

In the article under review, he presents the above jewel, and also a number of other arguments that will be considered later. He summarizes with the statement, "Taken as a whole, the evidence indicates that Linnaeus knew the Cape Belladonna, that he almost certainly based his *Amaryllis belladonna* upon it but confused with it the literature relating to *Hippeastrum equestre.*" The reader should note the tell-tale word "almost." There apparently was a reasonable doubt in his mind for "almost certainly" means "very nearly," "all but," unless he used it in the sense of "approximately" which is a weasel word. In order to supercede Linnaeus something more substantial is needed than this.

He next sets down what he considers as four views concerning *Amaryllis belladonna* on the basis of the main points he has brought up, and the web of circumstantial evidence in general, and then he makes his choice. The main pillars of his structure are the suppositions that—(a) the Cape Belladonna was a well known garden plant and *Hippeastrum equestre* was rare, (b) Linnaeus refers to the Cape amaryllid as outstandingly beautiful, an attribute that is scarcely applicable to the American amaryllid, (c) Linnaeus' diagnosis fits the Cape amaryllid better, (d) there is a specimen of the Cape amaryllid in the Clifford herbarium, and (e) in the second edition of Species Plantarum Linnaeus made additions that indicated what he meant.

As a result of all this he comes to the conclusion that *Amaryllis belladonna* must be retained for the South African amaryllid, and the rest of the long paper is an attempt to typify the generic name *Amaryllis L.*, and to find a valid name for *Hippeastrum*, which even to his view is an *invalid* name that must yield to *Leopoldia*, but never-the-less, he ends up by proposing that the name *Hippeastrum* be conserved in order to save work!

Let us now consider the five pillars, and the general web suspended from nowhere that are supposed to support the flimsy structure he pictures:

(1) Sealy claims firstly, and naively of all things, that the American amaryllid was *rare*. There is a treatise by Dr. J. Hill. "Outlines of a System of Vegetable Generation," London, 1758, that has a bearing on this question. The evidence about to be presented is especially valuable since it is brought out incidentally, and this type of evidence is considered by research workers in history as impartial and unbiased. This evidence is devastating as far as some of Sealy's arguments are concerned.

As a plant to illustrate his theory, Dr. Hill used not the Cape Belladonna that Sealy claims to have been more plentiful at the time, but none other than the *allegedly* then rare American amaryllid that Linnaeus was allegedly supposed to be ignorant of. But let Dr. Hill speak.

Dr. Hill, on page 11, says,—"I am extremely obliged to Mr. Lee, nurseryman at Hammersmith,[5] who, for the space of six weeks, from the middle of February to the end of March, supplied me almost daily with fresh plants in flower for the experiments." The book was published in 1758, only five years after the first edition of Species Plantarum and the plant must have been plentiful for some time, long before 1753, for anyone to have had such a large stock of it in 1758. Thus perishes the fable that it was rare, and out goes Sealy's pillar number one for anyone who has grown the American amaryllid knows the large number of bulbs Mr. Lee must have had in order to deliver almost daily fresh flowers to Dr. Hill over a six weeks period. This shows the danger of jumping at conclusions on the basis of circumstantial and flimsy evidence.

(2) Comparisons of the objects of people's enthusiasms are odious. Plant species are representatives of particular lines of evolution and are in the main appreciated as such. What anyone may think as to the beauty of any particular flower is hardly of taxonomic value. It is true that the Cape amaryllid is outstandingly beautiful, and the same may be said of the American plant. An impartial appraisal will show that one is delicately tinted while the other is gorgeously or resplenlently beautiful, and both are outstanding. Who would ever dream of creating such an *invidious* distinction in this case and using it as a main point in deciding a case in nomenclature? Out goes pillar number two.

(3) If there are for any of us any uncertainties as to what is meant by the morphological description given by Linnaeus in 1753, we need only to rely on the *type illustration* cited by Linnaeus rather than any long-winded circumstantial evidence based on untenable suppositions that will never prove anything and that has come to plague us only after the 18th Century. That there was no confusion in 1758, we learn from Dr. Hill, who writes in the work previously cited, "I propose to trace these several parts in a plant, in which they are all large and conspicuous . . . . this plant is a species of Amaryllis, it is distinguished from the rest by the drooping position of the filaments, and it is native to the American Islands." In a foot-note to this sentence he quotes,—"Amaryllis spatha multiflora, corollis campanulatis equalibus, genetalibus declinatis. Linn. Sp. 293."

This statement is also devastating to Sealy's argument for it shows what a contemporary of Linnaeus who knew the plant intimately considered as the true type. This work of course contains a plate that shows a plant that is identical with the type illustration referred to by Linnaeus. The fact that the scape is two-flowered in this case proves that "spatha multiflora" means "more than one-flowered" as used in this connection, and that the real distinction is based on the declinate gynoecium as pointed out by Dr. Hill in 1758. There were illustrations of the Cape Belladonna available at the time, but Linnaeus did not choose any one of them, and that is the deciding factor.

It is of interest to note and *remember* what was said concerning the typification of Linnean species at the 6th. International Botanical Congress, Amsterdam, 1935. Dr. Mattfeld said that "the important thing

[5]On the way from London to Kew.

was to reach an unambiguous decision, but that it was better that this decision should be in harmony with established custom. In the special case of the treatment of Linnean species, the question was already decided by common usage: for the correct application of the Linnean species names was determined by means of the figures, etc., cited by him, and not be means of the specimens in his herbarium, which were sometimes wrongly determined. This procedure is in accordance with Art. B 54. Furthermore, if Art. A 54 were accepted, it would be necessary to declare as invalid all new combinations associated with wrong identifications . . . . " Dr. Sprague of Kew apparently approved this procedure for it is recorded that "Dr. Sprague referred to the case of *Oxalis corniculata* and *Oxalis stricta* in support of what Dr. Mattfeld had said as to the interpretation of Linnean species names by means of citations. Mr. A. J. Wilmott had shown (Jour. Bot. 1915, p. 172) that the names *O. corniculata* and *O. stricta* should be applied in accordance with the citations given by Linnaeus." The reader will be interested to know that Article B 54 was adopted by the overwhelming majority of 217 votes to 40 votes. One can imagine what the verdict would be if the procedure of "blank" specimens, and *unlimited* circumstantial evidence were presented to the vote of the systematic botanists! Such a suggestion would be especially appalling when it is known that in this case there are unmistakable type-illustrations cited by Linnaeus *himself*.

Here Sealyan pillar number three crashes.

(4) With reference to the "blank" specimen of the Cape amaryllid in the British Museum need anything further be said? Can anyone imagine that Linnaeus used this specimen in such a way that we could today recognize it as the type-specimen, or even a *working* type-specimen whatever that may be, when he used such a distinct type-illustration of the American amaryllid? Confusion is impossible for we must give others credit for at least a minimum of intelligence even after they are dead. Pillar number four collapses.

(5) Sealy claims that Linnaeus made additions in the second edition of Species Plantarum and he refers to the illustration of Miller[6], fig. 23, which also shows a genuine American Belladonna. It should be emphasized that *Linnaeus refers to the plate only.* It is clear that the Cape amaryllid is not considered by him. Pillar number five cannot support the Sealyan structure! C-r-a-s-h goes the entire structure.

* * * * * * * * * *

We are concerned here with a case involving nomenclature only which has been well regulated. We put our reliance on a clear statement by Linnaeus in his first edition of Species Plantarum, 1753, a work that is the foundation of our nomenclature of vascular plants, and when he assigned the name *Amaryllis belladonna* to an American plant he automatically fixed all the other related species under the same generic name. *Rules of Nomenclature have not been made in jest,* but to stop everlasting word-juggling, hair-splitting and fanciful argumentation. If the rules fail here, other similar problems of nomenclature will come to plague us *ad infinitum*, and chaos will be the result.

[6]Miller, Philip. Figures of the most important, useful and uncommon plants described in The Gardeners Dictionary. Vol. 1, London, 1760.

Mrs. A. N. Steward

Dr. Albert N. Steward

See page 168

Plate 156

HEMEROCALLIS IN EASTERN AND CENTRAL CHINA

ALBERT N. STEWARD[7]

Department of Botany, University of Nanking

During the past eight years botanical explorations have been carried on under the auspices of the University of Nanking in cooperation with the Arnold Arboretum and the Farlow Herbarium of Harvard University, as well as the New York Botanic Garden, reaching to several previously neglected areas in the eastern, central and middle western parts of China proper. In all of these regions *Hemerocallis* has been collected, but three of the localities merit special mention because of the unusual

Fig. 38. Daylilies and peanuts grown for food, Meng Shan, Shantung Province, China. Son Newton Steward, at age of 15 years, with book in hand.

interest of the forms discovered there, or on account of the manner in which the plants are cultivated.

Dr. A. B. Stout, Director of Laboratories at the New York Botanic Garden, has for some years been so enthusiastic in stimulating interest in *Hemerocallis* that he deserves credit for the collections which have been made, as well as for the breeding and other experimental work by which the material from China and elsewhere has been made to yield such striking and valuable ornamental forms.

[7]Through the kindness of Mrs. Steward we secured a photograph of Dr. Albert N. Steward, and it is reproduced in Plate 156.

Lai Chong Photo, Shanghai & Kuling

See page 171

Native home of Hemerocillas fulva rosea—Lushan, or Lion's Leap Mountain, Northern Kiangsi Province, China.

Plate 157

A. N. Steward, Nanking, China

See page 171

Native home of Hemerocallis multiflora—Scenes near Kikungshan on Honan-Hupeh border, China. A deserted "City of Refuge," 1925, lower right.

Plate 158

Lushan, the mountain reaching an elevation of 1500 m., (See Plate 157), which lies just south of the Yangtze River, between Poyang Lake and the city of Kiukiang in northern Kiangsi Province, is perhaps the most interesting of the localities which have yielded material of unusual value.

The summer resort town known as Kuling is situated on this mountain at an elevation of about 1200 m. Motor cars, buses and rickshas operate over the road from Kiukiang to the base of the mountain, a distance of about 25 li (8 miles). The remainder of the journey to Kuling, about 15 li (5 miles), must be made on foot or by sedan chairs. All baggage and freight, including food supplies, fuel and building materials is carried up on the backs and shoulders of men. However, pianos and stoves are not uncommon at Kuling.

Lushan is surrounded by rich and intensively cultivated rice land for the terraces of which water is taken from the streams which flow out in all directions at the base of the mountain. No extensive forests remain here because the demand for fuel, especially for charcoal, has been so great that the woody vegetation of most of the slopes has been reduced to a cover of brush and small trees which is cut over every few years. There do remain, however, a few restricted areas of fine trees surrounding some of the temples. Also the Kuling Estate, where the summer homes are located, has been protected from cutting, some parts of it for twenty-five to thirty years.

The Fan Memorial Institute of Biology, in cooperation with the Kiangsi Provincial Government, has recently established the Lushan Botanic Garden and Arboretum, and extensive plantings are being carried on over the mountain. For the purposes of an arboretum it is happily situated in a central location as to the climate of China, being cool enough for most of the northern species, and yet warm enough for many of the southern subtropical species. A little snow falls every winter, and it is never extremely hot near the mountain top.

In moist, brushy or grassy situations on this mountain *Hemerocallis fulva* var. *rosea* occurs. The flowers are gathered by the Chinese and dried for use as a vegetable, the flavor of which they enjoy in certain meat dishes.

Kikungshan is a mountain on the border between Hupeh and Honan, (See Plate 158), near the railway running northward from Hankow to Peiping, on which is located the summer resort of that name. This area suffers a somewhat drier, colder winter than Lushan, and the elevation is not so high, probably not reaching 1000 m. The woody vegetation is less abundant, and many of the hills are covered only with grasses and low shrubs.

The people in this region have not enjoyed so prosperous an agriculture as those around Lushan, for they do not have moisture enough for so plentiful a winter crop, and many of their fields produce only one crop a year. On the hilltops one sees occasionally cities of refuge, (See Plate 158), built by the people as strongholds to which they might retire when attacked by bandits, who are usually roving bands of farmers whose crops have failed and who have become desperate for lack of food.

Hemerocallis multiflora occurs on Kikungshan.

In the vicinity of Meng Shan, not far from Chufu in western Shantung Province, tufted rows of a yellow-flowered *Hemerocallis* are cultivated on the margins of fields, (See Fig. 38), used for the Chinese (sweet) potato, peanuts or other crops. It is grown for the flowers under the name Huang Hua Ts'ai (Yellow Flower Vegetable). No evidence has been observed of the cultivation of *Hemerocallis* as an ornamental, except very recently, and in gardens under Western influence.

DAYLILIES RATED FOR GARDEN VALUE, SEASON 1938

GEORGE DE WITT KELSO, *Rhode Island*

The results of the third season's attempt to rate daylilies for garden value have now been compiled, and a summary is presented chiefly in the form of tables. The primary aim has been to prepare a standard *Grade A* list of 10 varieties (Table 1); general lists of varieties receiving more than 5 votes (Table 2), and those receiving less than 5 votes (Table 3); and to take a step toward the elimination of inferior sorts on the basis of a discard list (Table 4) representing the opinions of the voters.

For the season 1938, twenty-five voters participated and the results show a great variation of opinion indicating that the work should be continued until greater unanimity has been attained. The varieties *Fulva Cypriana, Gaiety* and *Hippeastrum* are the only ones receiving an unmixed vote in the class receiving more than 5 votes. The discard list (Table 4) is probably of the greatest value.

There has been a slight mix-up with reference to the method of rating. In 1938 Herbertia, page 138, the values assigned by the Editor were as follows: *a*, 9-10; *b*, 8-9; *c*, 7-8; *d*, 6-7. Anything below 7 was to be regarded as a discard. However, in the forms sent out for ratings, the following values were indicated: *a*, first class garden variety; *b*, good but ordinary variety; *c*, recent introductions, reserved for further test; and *d*, for decidedly inferior sorts, or discards. Some of those who sent in ratings used the first and others the second scale of values. Apparently in another year the recent introductions should be included in a separate table, and rated according to the first scale of ratings. The results are presented in the following tables, and you should draw your own conclusions.

After this paper was written, the Editor suggested that the best varieties should be presented on the basis of flowering season since the grower is very much interested in the 10 best varieties for the early, mid-season and late blooming periods. This is an improvement that should perhaps be tried out next season. If this is carried through, it should be pointed out, that it may happen that some of the 10 in the late flowering class, for instance, might not have the high "a" rating. However the grower might wish to get along with these until the breeders produce better ones. The Editor points out that a variety

Wyndham Hayward

See pages 155, 159 and 160

Hybrid Daylily varieties—Indian Chief (Traub, 1938), upper left; Florida (Hayward, 1937), upper right; Emperor Jones (Hayward, 1939), lower left; Duchess of Windsor (Hayward, (1938), lower right.
Plate 159

like *Queen of May* (rating 8.7) which has a consistent record for very early flowering (February) in Florida would most likely be included for an early list for that State. Similarly, a variety like *Dorothy McDade* (rating 7.5) would probably appear on a late list in the North.

These are matters that should be given attention in future attempts to rate daylilies for garden value. They are mentioned here as food for thought.

TABLE 1. Rating of daylilies for garden value; comparison of ratings of the first ten for the past three years.

	Season 1936	Rating	Votes a	b	c	d
1	**Mikado* (Stout)	9.4	7a	1b		
2	**Hyperion* (F. B. Mead)	9.4	7a	1b		
3	**Ophir* (Farr)	9.3	6a	1b		
4	**Golden Dream* (Betscher)	9.3	6a	1b		
5	**George Yeld* (Perry)	9.1	5a	1b	1c	
6	*Goldeni* (Betscher)	9.0	4a	1b	1c	
7	**Wau-Bun* (Stout)	8.9	5a	3b	1c	
8	*Cressida* (Betscher)	8.9	4a	2b	1c	
9	*Radiant* (Yeld)	8.7	2a	2b	1c	
10	*Soudan* (Stout)	8.5	1a	4b	1c	

* * * * * *

	Season 1937					
1	*Bijou* (Stout)	9.5	4a			
2	**Mikado* (Stout)	9.3	6a	1b		
3	**Ophir* (Farr)	9.1	6a	1b	1c	
4	*Pale Moon* (Cleveland)	8.9	3a	1b	1c	
5	**George Yeld* (Perry)	8.8	5a	2b		1d
6	*Cressida* (Betscher)	8.7	4a	2b	2c	
7	**Wau-Bun* (Stout)	8.6	1a	5b		
8	**Hyperion* (Mead)	8.6	5a	2b		1d
9	**Golden Dream* (Betscher)	8.6	3a	2b	2c	
10	*Mrs. A. H. Austin* (Betscher)	8.6	4a	1b	3c	

* * * * * *

	Season 1938					
1	**Mikado* (Stout)	9.45	20a	1b		
2	*Patricia* (Stout)	9.37	15a		1c	
3	**Hyperion* (Mead)	9.33	20a	4b		
4	**Ophir* (Farr)	9.32	16a	6b		
5	*Anna Betscher* (Betscher)	9.21	15a	6b		
6	**Golden Dream* (Betscher)	9.13	12a	7b		
7	**Wau-Bun* (Stout)	9.13	12a	7b		
8	**George Yeld* (Perry)	9.13	14a	4b		
9	*Bagdad* (Stout)	9.10	10a	4b	1c	
10	*Sunny West* (Sass)	9.07	11a	1b	1c	1d

*Varieties starred in this table appear among the first 10 in all three years.

OTHER VARIETIES RECEIVING 10 OR MORE A VOTES IN 1938

Margaret Perry (Perry)	9.00	10a	7b	1c	
Cressida (Betscher)	8.93	12a	7b	1c	1d
Bijou (Stout)	8.92	11a	4b	1c	1d
Mrs. A. H. Austin (Betscher)	8.89	12a	3b	1c	2d
J. A. Crawford (Betscher)	8.86	13a	6b	1c	2d
Modesty (Betscher)	8.78	10a	5b	1c	2d
D. D. Wyman (Betscher)	8.76	10a	5b	3c	1d
Goldeni (Betscher)	8.64	10a	7b	1c	2d

TABLE 2. Record of 150 Varieties Receiving 5 or More Votes.

	Votes	a	b	c	d
A. E. Kunderd (Kunderd 1934)	6		1	2	3
Ajax (Mueller 1908)	13	4	6	1	2
Alba striata (Perry 1934)	5		1		4
Amaryllis (Betscher 1932)	17	8	8		1
Anna Betscher (Betscher 1929)	21	15	6		
Apricot (Yeld 1892)	15	7	7	1	
Aurantiaca 1890	15	1	10		4
Aurantiaca major	10	1	5	2	2
Aureole 1903	16	5	7	1	3
Bagdad (Stout 1935)	15	10	4	1	
Bardeley (Perry 1932)	13	2	4	4	3
Baroni (Mueller 1903)	13	1	1		11
Bay State (Betscher 1929)	18	7	9	2	
Beacon (Betscher 1939)	5	1	2	2	
Bijou (Stout 1935)	17	11	4	1	1
Burbank (Burbank 1924)	8	1	3	2	2
Byng of Vimy (Perry 1931)	6	4	2		
Calypso (Burbank 1929)	20	9	7	1	3
Chengtu (Stout 1932)	6	5	1		
Chrome Orange (Mead 1933)	5	2	2	1	
Cinnabar (Stout 1931)	17	8	9		
Circe (Stout 1937)	6	2	2	2	
Cissy Guiseppe (Perry 1931)	14	2	4	3	5
H. Citrina about 1897	15	1	5		9
Citronella (Farr 1926)	6			2	4
Cressida (Betscher 1929)	21	12	7	1	1
Crown of Gold (Nesmith 1933)	7	2	3	2	
Curlypate (Scheffy 1935)	10	4	3	3	
Dauntless (Stout 1935)	11	7	3	1	
Dawn (Perry 1932)	7	1	2	2	2
Dazzler (Dreer 1937)	6	1	2	2	1
D. D. Wyman (Betscher 1925)	19	10	5	3	1
Dover (Betscher 1932)	14	5	2	3	4
Dr. Regal 1904	17	4	5	3	5

	Votes	a	b	c	d
H. Dumortieri 1834	15	2	5	2	6
Dumortieri-Sieboldi	5	1	1	1	2
E. A. Bowles (Perry)	10	4	4	2	
Earliana (Betscher 1939)	8	6	2		
Estmere (Yeld 1906)	12	6	2	1	3
Flamid	9	1	4	1	3
H. Flava 1762	18	7	5	3	3
H. Flava var major 1908	13	3	4		6
Flavina (Fewkes 1934)	9	5	2		2
Flore pleno 1712	7	1	5		1
Florham (Harrington 1899)	14	1	4	2	7
H. Fulva Europa 1762	15	2	7	2	4
H. Fulva from Japan	5			2	3
H. Fulva from China	6	3	1		2
Fulva Cypriana (Sprenger 1907)	5				5
Fulva maculata	16	9	7		
H. Fulva rosea (Rosalind)	12	8	2	1	1
Gaiety (Betscher 1939)	6	6			
George Yeld (Perry 1926)	19	14	4		1
Gladys Perry (Perry 1931)	8	1	1		6
Gloaming (Cook 1936)	5	1	2	2	
Gloriana (Betscher 1940)	8	7		1	
Golconda (Farr 1924)	13		2	2	9
Gold Dust before 1906	19	5	9	2	3
Gold Imperial 1925	13	6	4	1	2
Gold Standard (Perry 1925)	12		3	2	7
Golden Bell (Wallace 1915)	13	3	6	3	1
Golden Dream (Betscher 1929)	19	12	7		
Golden Empress (Dennett 1936)	6	2	1	3	
Golden West (Sass 1932)	11	6	1	4	
Goldeni (Betscher 1929)	21	10	7	1	3
Gracilis	12	3	4	1	4
Gypsy (Betscher 1929)	17	8	5	1	3
Harvest Moon (Betscher 1929)	14	3	3	3	5
Highboy (Gray & Cole 1934)	9	3	2	2	2
Hippeastrum 1925	7				7
Hyperion (Mead 1925)	24	20	4		
Imperator (Perry 1931)	13	5	5	3	
Iris Perry (Perry 1925)	18	8	8	1	1
J. A. Crawford (Betscher 1929)	21	12	6	1	2
James R. Mann	17	7	4	2	4
J. S. Gaynor (Yeld 1928)	6	2	2		2
Kwanso var fol. 1864	11	3	3	3	2
Lady F. Hesketh (Perry 1924)	9	3	2	3	1
Lemona (Betscher 1928)	16	4	6	4	2
Lemon King (Betscher 1932)	13	4	4	1	4
Lemon Queen (Farr 1926)	5		1		4
Linda (Stout 1936)	8	7		1	

	Votes	a	b	c	d
Lovett Lemon (Van Fleet 1915)	12	2	6	2	2
Lovett Orange (Van Fleet 1915)	7		2	1	4
Luteola (Wallace 1900)	12	2	3	2	5
Luteola grandiflora (Lemoine '08)	5			1	4
Luteola major 1932	13	3	3	2	5
Luteola pallens (Lemoine 1907)	7		3		4
Mandarin (Farr 1924)	12	2	3	4	3
Marcys Perry (Perry 1932)	10	6	2	1	1
Margaret Perry (Perry 1925)	18	10	7	1	
Mary Florence (Betscher 1934)	8	4	2	2	
Mary Stoker (Perry 1932)	5	1	1	1	2
May Sadlier (Perry 1934)	6	3		1	2
Midas (Stout 1935)	15	5	4	2	4
Middendorfiana 1878	8		1	2	5
H. Middendorffii 1856	13	2	5	3	3
Mikado (Stout 1931)	21	20	1		
H. Minor 1768	16	5	7	3	1
Miranda (Yeld 1929)	5	2	1		2
Modesty (Betscher 1929)	18	10	5	1	2
Mrs. A. H. Austin (Betscher 1929)	20	12	3	3	2
Mrs. C. S. Leith (Betscher____)	5	3		2	
Mrs. J. R. Mann 1930	7	2	1		4
Mrs. Perry (Perry 1925)	8	2	2		4
Mrs. W. H. Wyman (Betscher 1929)	17	7	7	3	
H. Multiflora 1929	8	4	1	2	1
Nocerensis (Perry 1930)	7	1	2	2	2
Ochroleuca (Sprenger 1903)	12	1	2	1	8
Olif (Nesmith 1934)	12	2	2	2	6
Ophir (Farr 1924)	22	16	6		
Orangeman 1906	7	1	3	1	2
Pale Moon (Cleveland 1934)	10	4	1	3	2
Parthenope	8	1	1	2	4
Patricia (Stout 1937)	16	15		1	
Pollyanna (Nesmith____)	7	1	3	2	1
Queen Mary (Perry 1925)	6	3	2		1
Queen of May (Lemoine 1925)	16	8	5	1	2
Radiant (Yeld 1925)	18	9	5	2	2
Rajah (Stout 1937)	12	7	3	2	
Royal 1925	18	4	10	2	2
Semperflorens (Van Tubergen '25)	6		3	2	1
Seranade (Stout 1937)	7	4	2		1
Shirley 1926	8	2	3		3
H. Sieboldi	9	2	2	1	4
Sirius (Yeld 1930)	12	6	4	2	
Sir M. Foster (Mueller 1904)	20	5	10	2	3
Sonny (Stout 1935)	12	9	1	2	
Soudan (Stout 1931)	14	7	4	1	2
Sovereign (Yeld 1906)	16	4	5	4	3

	Votes	a	b	c	d
Stalwart (Cook 1935)	5	1	1	3	
Star of Gold (Sass 1934)	7	2	2	2	1
Summer Multiflora Hybrids	6	2	1	2	1
Sungold (Dreer 1937)	5		3	2	
Sunkist (Perry 1932)	7	1	1	2	3
Sunny West (Sass 1932)	14	11	1	1	1
Sunset (Perry 1932)	9	2	1	1	5
Tangerine (Yeld 1906)	11	4	5	2	
The Gem (Betscher 1929)	15	3	9	1	2
Thelma Perry (Perry 1925)	5		1	1	3
H. Thunbergii 1873	19	2	5	3	9
Vesta (Stout 1931)	17	6	9	2	
Viscountess Byng (Perry 1931)	11		5	2	4
Vulcan (Stout 1937)	8	6		2	
Wau-Bun (Stout 1929)	19	12	7		
Winsome (Yeld 1925)	14	5	7	1	1
Wolof (Stout 1936)	5	3	1	1	
Woodlot Gold (Cleveland 1934)	7	3	2	1	1
Yellow Hammer (Perry 1925)	7		3	1	3

TABLE 3. Record of 148 Varieties Receiving Less Than 5 Votes.

		Votes a	b	c	d
1	*Afterglow*	1a			
2	*Aloma*	1a	2b		
3	*Amos Perry*	1a			
4	*Araby*	3a			
5	*Aurelia*	1a			
6	*Aztec Gold*	2a		1c	
7	*Beauty*				1d
8	*Berenice*				1d
9	*Bernstein*			1c	
10	*B. Latham*		1b		2d
11	*Brownie*	1a			
12	*Burgundy*	2a			1d
13	*Burmah*	2a		1c	
14	*Buttercup*				1d
15	*Ceres*				1d
16	*Charmaine*	2a			
17	*Chisca*			2c	
18	*Chrysantha*			1c	1d
19	*Chrysolora*				3d
20	*Corona*			1c	1d
21	*Crown Prince*		2b		
22	*Dainty*		1b		
23	*Dawn Play*			1c	
24	*Dora Wyman*				1d
25	Dorothy McDade			2c	
26	*Dwarf Yellow*				1d
27	*Earliest Lemon*			2c	1d
28	*Eldorado*				1d
29	*Elemense*				1d
30	*Eliz. Pyke*		1b	1c	1d
31	*Emily Hume*	1a	1b	2c	
32	*Erika*				1d
33	*Everblooming*			1c	
34	*Flame*				2d
35	*Flamea*				1d
36	*Flavo-citrina*				1d
37	*H. Forestii*		2b		
38	*Framingham*			1c	1d
39	*Francis*				1d
40	*Fulcitrina*				1d
41	*Fulva longituba*			1c	1d
42	*Fulva speciosa*				1d
43	*Fulvax*				1d
44	*Fulvola*	2b			
45	*Garden Gold*	2b	1c		
46	*Gay Day*	3b			
47	*Giant Orange*	1a	2c		
48	*Giantess*		1b		
49	*Gigantea*		2b		
50	*Glow*				1d

		Votes			
		a	b	c	d
51	*Gold Ball*				1d
52	*Golden Fulva*	1a	1b		
53	*Graminea crocea*				1d
54	*Harriet Moore*				3d
55	*Helen Campbell*		1b	1c	
56	*Herbert Spencer*				1d
57	*Hermes*				2d
58	*Jubilee*	2a		1c	
59	*June Boissier*	2a	1b	1c	
60	*Keston*				1d
61	*Large Gold*		1b	2c	
62	*Lemonetta*				1d
63	*Louise*		1b		
64	*Low Growing*				1d
65	*Luteola pallida*	1a			
66	*Majestic*	2a		1c	
67	*Marigold*			1c	3d
68	*Mars*				2d
69	*May Morn*			1c	1d
70	*May Queen*	1a	1b	1c	1d
71	*Mehami*	1a			
72	*Middendorfii major*				1d
73	*Moidore*			1c	
74	*Moonlight*			1c	
75	*Moonstone*	1a		1c	1d
76	*Mrs. C. S. Leith*	1a			
77	*Mrs. Visseaux*			1c	
78	*H. Mullieri*		1b		1d
79	*Multiflora* Isis			1c	1d
80	*Multiflora* luna			1c	1d
81	*Nada*	2a			
82	*H. Nana*	1a		1c	
83	*Omphale*	1a			
84	*Orange*				4d
85	*Orange Glow*		1b	1c	
86	*Orange King*				3b
87	*Orange Vase*				1d
88	*Oriole*		2b		
89	*Pandora*			1c	
90	*Peachblow*	1a		1c	1d
91	*Pink Lustre*			1c	
92	*Pioneer*				1d
93	*H. plicata*			1c	1d
94	*Princess Eliz.*	1a			
95	*Ralph Schrieve*	2a			
96	*Rayon d'Or*		1b	1c	
97	*Reggie Perry*	1a	1c		
98	*Rhodos*			2c	
99	*Robin Redbr'st*	2a			
100	*Rosa Key*	1a		1c	
101	*Rose Queen*			1c	1d
102	*Rutilans*				2d
103	*Salem*		1b		3d
104	*The Saracen*	1a			1d
105	*Saturn*	2a			
106	*Semeramus*			1c	
107	*Serena*	1a			1d
108	*Sharon*		1b		
109	*Shekinah*	1a			1d
110	*Shippan*				1d
111	*Sir William*		1b	1c	1d
112	*Sprengeri*				2d
113	*Springtime*				2d
114	*Starlight*	1a	1b		1d
115	*Summer Eve*	1a			1d
116	*Sunbeam*				1d
117	*Taruga*	1a	1b		
118	*Theron*	2a			
119	*Todmorden*				1d
120	*Urmiensis*				1d
121	*Winnie Nightingale*	1a			
122	*Wm. Deam*				1d
123	*Wonder Gold*		2b		1d
124	*Yellow Wonder*				2d
125	**R 4-3*		1b		
126	**R 303*	1a			
127	**R 1 No. 1*	1a			
128	**Golden Orange*	1a			
129	*** ?*		1b		
130	**R 3 No. 2*	1a			
131	**R 5 No. 1*	1a			
132	**Sunshine*				1d
133	**Little Gem*				1d
134	**Golden Queen*		1b		
135	**Golden Dawn*		1b		
136	**Craemore Ruby*	1a			
137	**Fulva rosea*	1a			
138	**Beloit*			1c	
139	**Bouttoniere*	2a			
140	**Crepe*	1a			
141	**Fulva variegata*	1a			

		Votes a	b	c	d
142	*Kwanso virginia	1a			
143	*Fisher var.			1c	
144	*Golden Byng of Vimy			1c	
145	*Mrs. Garlock			1c	
146	*Mrs. Crawford	1a			
147	*Golden Mammy	1a			
148	*Large Yellow	1a			

*Varieties written in by voters.

TABLE 4. Record of varieties receiving 5 or more discard votes (Discard List); and varieties receiving 3 or 4 discard votes (Danger List).

DISCARD LIST

Baroni
Cissie Guisseppe
H. Citrina
Dr. Regel
H. Dumortieri
Flava major
Florham
H. Fulva cypriana
Gladys Perry
Golconda
Gold Standard
Harvest Moon
Hippeastrum
Luteola
Luteola major
Middendorfiana
Ochroleuca
Olif
Sunset
H. Thunbergii

DANGER LIST

A. E. Kunderd
Aureole
Bardeley
Calypso
Chrysolora
Estmere
Flamid
H. Flava
H. Fulva (from Japan)
Gold Dust

DANGER LIST (Continued)

Goldeni
Gypsy
Harriet Moore
*Mandarin
Middendorffii
Orange King
Salem Daylily
Shirley
Sir M. Foster
Sovereign
Sunkist
Thelma Perry
Yellow Hammer
Alba striata
Aurantiaca
Dover
H. Fulva Europa
*Citronella
Gracilis
James R. Mann
Lemon King
*Lemon Queen
Lovett Orange
Midas
Mrs. J. R. Mann
Mrs. Perry
Orange
Parthenope
H. Sieboldi
Viscountess Byng

*These varieties have been discarded by the Farr Nursery Co.

ON THE STATUS OF THE DAYLILY[1]

EDWARD STEICHEN, *Connecticut*

I would like to report to the Society the impressions obtained in considering the daylily situation at the present time. In this connection I must state in advance that I am definitely influenced by what I consider to be a changing condition in the American horticultural picture now under way. For a great many years, the horticultural world has been talking about the growing interest in flowers throughout the country, particularly as a result of the work of the various garden clubs and garden federations. In fact, some authorities have been repeating this with such regularity that they have apparently failed to notice that the prediction has been realized and that it is erroneous to refer to the garden club movement as a potential force, and that the thing to do instead is to take stock of the significance and value of their achievements. I have no accurate statistics as to the increase in the number of amateur gardeners during the last fifteen years, but it is quite evident by the growing importance of our gardening magazines and the increasing interest shown by most magazines and newspapers in the subject of popular gardening that the growth has been spectacular. Such an increase and the still increasing growth is bound to have an influence and bearing on questions of production and distribution of perennials. If a few thousand clonal propagations of a new perennial might have been sufficient for average national distribution fifteen years ago, today in order to give national distribution to a new perennial, with all of the incurrent expense of publicity required to reach and interest the gardening public, a stock of at least one hundred thousand plants would need to be propagated. In spite of the improvements and speeding up of propagation methods as published in HERBERTIA, the daylily is still relatively a very slow propagator. I doubt whether any wholesale grower could afford to tie up the necessary capital long enough to produce a hundred thousand daylilies of one named variety for national distribution. Experience with several perennials, notably Delphinum, would seem to indicate that if the new colors in daylilies are to get into general circulation within a reasonable length of time it will have to be through the medium of seed propagation rather than clonal propagation. It presents the relatively simple proposition of fixing the general type of color so that they will reproduce with reasonable fidelity from seed. This has been done successfully by several Delphinium breeders. Up to five years ago, it was considered impossible by most growers and even breeders to fix the colors of the garden hybrid Delphinium. By that time I had proven by my own experience that the fixing of color, type and stature of Delphinium was a result readily achieved by standard breeding practice; and within the last two years Frank Reinelt has placed over two hundred pounds of Delphinium seed on the market,

[1]Col. Edward Steichen is the Chairman of the Daylily Committee, and we are all very grateful to him for his stimulating report. His recommendations I am sure will have great weight with all who grow and appreciate daylilies, and the gardening fraternity in general.—Ed.

which seed produces plants that are as well fixed as to color as are some annual flowers that have been on the market as fixed colors for years and years. Dr. Leonian has been marketing seed of daylilies for the last three years that has produced a large proportion of red and dark colored types. This year he has offered seed in separate and differing colors, and I do not doubt but that a large percentage of these will come reasonably true to color description. I have heard a rumor that a Pacific Coast grower is inter-crossing the fulvous and dark colored daylilies and setting out plants by the hundred thousand with a view to marketing the seed. I am bringing up this item, not as a news bulletin, but as a matter for consideration in connection with the various projects of evaluating existing daylilies now under way and being considered.

Due to the magnificent breeding work of Dr. Stout, the daylily has come into the running of the garden picture as a perennial with a future. This is not due to the fact that the publicity naturally attending Dr. Stout's fine achievements has stirred up the knowledge of daylilies themselves, but it has stirred the interest of the public because they believe they are going to get something better than what they have heretofore known as daylilies. If the best daylilies that Dr. Stout has produced during the last ten years could by some miracle suddenly become available to every gardener in the country I haven't the slightest doubt but what all but a very few of the previously known varieties would be willingly junked by any discriminating gardener. At the rate these daylilies are being propagated and disseminated now it will take at least ten years before they can achieve anything like a general distribution and a popular valuation. In the meantime, more breeders are taking up the work, and the problem of evaluating named varieties becomes still more complicated. For one thing, I cannot see much sense in trying to evaluate varieties that have already obviously been superseded and consequently have no value, and I do not see how we can evaluate new varieties which are not yet out of the breeder's or the distributor's laboratories and nurseries. I find that a daylily has to be established in one spot for three years before it gives a normal performance. Therefore, we cannot vote on the value of a new variety until we have had the plant growing in a comparative plot, next to the varieties with which it is to be compared, for three years. If gardener "A" has a plant of *"Hyperion"* growing in his garden, he can only say that he likes *"Hyperion"* or does not like *"Hyperion."* If gardener "B" grows *"Hyperion"* and also grows *"Patricia,"* he is in a position to vote which of the two he likes best; but the usefulness of his vote is strictly limited to the fact that as between *"Hyperion"* and *"Patricia"* he likes one or the other better. His vote has absolutely no general rating value. There are a few private growers and institutions that have reasonably large collections of old and modern daylilies. If the varieties in these collections are all planted in like surroundings and conditions, any person having the interest and willingness to make a daily visit throughout the season to such a collection can give a truly comparative vote of personal opinion. If twenty-five individuals would make such

a study in various localities and then vote upon and rate all these very same varieties of daylilies, the average of such a rating would certainly be of tremendous value to retail and wholesale distributors, as well as to all gardeners. A rating produced by any less inclusive system than this would have more or less value depending upon how great would be the deviation. At the rate new varieties are being placed on the market, it is easy to foresee that within a few years they could easily run into hundreds each year. It would be entirely unreasonable to expect any institution or any amateur or grower to acquire and grow each and every variety that over enthusiastic growers may place on the market. I think it would be fairer to limit these ratings to such varieties as are listed for sale by at least three different dealers. This would place something of a damper on the appearance of entirely untried new varieties.

In the meantime, I hope that all members of the Amaryllis Society will give their active support and cooperation to the tests, trials and check-ups that are being conducted by the Massachusetts State College Field Station, Cedar Hill, Waltham; by George DeWitt Kelso, of Providence, Rhode Island; and by Elmer A. Claar, 1301 Chestnut Avenue, Wilmette, Illinois.

Anyone at all interested in the subject should visit Dr. Stout's daylily test plots at the New York Botanical Garden at any time during the spring, summer or fall. Here the range of new colors can be found in bloom throughout the season and comparison may readily be made between the new Stout hybrids and all of the older and some of the newer varieties by other breeders and growers.

Unfortunately, I cannot speak with first-hand knowledge of the work and achievement of the Florida breeders, particularly when they are to be considered outside of their own surroundings. It is quite likely that Florida and California with their advantageous growing conditions will in the future produce results more rapidly than can be achieved in the North. These will merely require testing in our more rigorous Northern climate.

I hope that all breeders and growers of new varieties of daylilies who are planning to distribute their clonal propagations will use all possible restraint in the release of new varieties. A plethora of new named daylilies that will turn out to be mediocre or too much alike will do great harm to the present "forward march" of the daylily. We can all continually bear in mind that novelty is outlived by true beauty.

DAFFODIL VARIETIES: WORK IN PROGRESS AND FOOD FOR THOUGHT

JAN DE GRAAFF, *Oregon*

I noticed some time ago that in order to prevent duplication of effort a book is being prepared reporting on the various scientific investigations in progress. It is interesting to note that as far as horticultural investigations are concerned, there is very little chance of unnecessary repetition. Experiments made abroad should be tried out here to discover whether, for instance, bulbs grown in the United States react the same way as Dutch or English bulbs. Especially in hybridizing there seems to be no possibility of duplication of effort. Over a period of years, crosses made at my farms using the same parents have shown the most delightful and interesting differences and the number of variations in color or form is without limit. Our program has been made up to cover several very definite experiments. One is to breed towards more perfect pink-cupped daffodils. Another is to bring hardiness and disease resistance—such as we find in *King Alfred*—to some of the other types of flowers. A third is to give several of the finest recent Dutch introductions such as *Scarlet Leader*, *Bertha Aten* and others, the length of stem they need to become popular in this country for outside plantings.

A great number of hand pollenized crosses are made by us annually and a most careful record is being kept. Of several of these, second generation flowers will be available next year and we can then embark upon the third generation crosses. Even with the best of care we cannot expect flowers in our climate before the fourth year and as a matter of fact it usually takes six years from seed to get really full-strength blooms. It takes us, therefore, some eighteen years to raise three generations of seedlings. Compare this with the fine work of Mr. David Burpee who has sometimes raised three generations of nasturtiums in one year and it is obvious that our progress must necessarily be slow. Yet we consider this breeding work of sufficient importance to devote a great deal of time and money to it. In spite of the fact that there are now some *eight thousand* named varieties of daffodils, there is still room for more. As a matter of fact, some of the latest seedlings raised in this country show so much progress and seem to be so much better adapted to our peculiar conditions of climate and temperature that we have great hopes that eventually we will no longer be dependent on foreign sources for our new daffodils. In this connection I might mention that, among others, Professor Sydney Mitchell of Berkeley, California, has already small stocks of several magnificent new hybrid daffodils which in the writer's opinion are as good as, if not better than, the latest English or Dutch introductions.

It might be worthwhile here to point to the great difference that exists in the life history of a daffodil hybrid as compared to, for instance, a new rose. Mr. Pyle assured me the other day that there are some twenty-four thousand named varieties of roses listed in a French publication of some twenty years ago. By breeding towards greater disease

resistance, greater hardiness and better flowers, the turnover in rose varieties is tremendous. Varieties hailed only five years ago as excellent novelties have fallen by the wayside and have been superseded by still better varieties. In the average garden we find that after several years the roses, due to neglect, insufficient pruning or other causes, deteriorate and that replacements are made with newer and, generally speaking, better varieties. The same thing does not at all hold true for daffodils. Varieties of fifty years ago—such as *Sir Watkin, Seagull, Emperor, Golden Spur*—are still being grown in large quantities and many of these old-timers are still very beautiful and useful for naturalizing purposes. The variations in size, form and coloring of the daffodil are infinite and they are all so pleasing to the eye that I venture to say that in its proper setting, any daffodil taken at random from the Classified List of the Royal Horticultural Society would give pleasure to the gardener. The popularity of certain varieties is, in my opinion, due not only to the beauty or perfection of the flower or to the number of awards it has gained at shows, but to a host of other reasons. A flower is liked because of the stamina of the plant, that will grow well under adverse conditions and will continue to flower freely even if undisturbed for years. If, when cut, it lends itself to pleasing arrangements and will last long in the dry, warm air of most living rooms, then it is indeed bound to be a success. From the growers' standpoint, of course, a natural selection will be made out of those varieties which propagate fastest and are least troubled with fungus diseases. The fact that some varieties produce a large percentage of well-shaped bulbs and that others split so badly that it is hard to select nice bulbs for store-trade also plays a role. The fact that some varieties can be forced into flower early in the season, has played an important part in the relative importance of certain varieties, although this is largely offset by the new discoveries about cold-storage treatment. We thus see that the mere excellence of a daffodil flower on the show table is not the only, or even the decisive, factor in its popularity and that the fact that a variety has been superseded as an exhibition flower does not by any means spell its doom.

Yet commercial growers are confronted with the necessity of limiting their production to a number of varieties which can be readily sold. This again is limited by the space the distributors can give to daffodils in their catalogs and since the public is interested in obtaining several varieties of each of the seventeen divisions and sub-divisions of the daffodil family, the choice has been narrowed to some hundred varieties. I might quote the experience we have gained here at the Oregon Bulb Farms. Starting in 1928 with over 1,200 varieties obtained from the best sources in Holland and England, we narrowed this down to approximately eight hundred in the course of four years. Out of these eight hundred we selected again about three hundred varieties as "most likely to succeed." At the present time we grow about 120 kinds in large quantities and have some three hundred other varieties which we grow in smaller lots mainly for the very limited demand from more advanced amateurs. While for hybridizing purposes we buy additional varieties

from year to year, we bring in only from one to three bulbs of each of these and only when by comparative study we find that one of these is very desirable from all points of view do we obtain additional stocks. Any new addition to our list of varieties produced in quantity means the elimination of one of the older varieties on this list. Such discards, together with the many second rate seedlings which are produced annually, are sold to the trade as mixtures for naturalizing.

As a strictly wholesale grower we have to introduce new varieties through the established distributing channels, which in our case generally means through the retail catalogs of our customers. Here several factors enter into play. To be economical and efficient, a catalog cannot be drastically changed from year to year. According to expert advice a variety has to be offered for several years before the public will turn to it and order it in any appreciable quantities. In order to encourage the sale of new varieties it has become more and more imperative to have good color plates made of them and to get publicity in the horticultural papers. The cost of all this is obviously very high and is often at least partially borne by the grower. Considering the extremely small margin of profit in daffodil production, neither the grower nor the retailer can afford to make a mistake. For both of them it is of the greatest importance to offer a list of varieties, that is as good and complete as can be made.

Since the reader may be interested in the final selection we have made after some ten years of testing in different climates and soil conditions, I shall cite it below. While this list has been made up most carefully, since obviously the success of our enterprise depends on it, I should be the first to concede that it is a highly personal selection and that my preferences, likes and dislikes have played a large role. Yet I feel that no one can take exception to the statement that considering limitations of price, quantity production and availability of the varieties concerned, this list is as good a *basic* one as can be made. I believe that it represents as fine an assortment and as inexpensive a one as can be made today and that starting with this group of varieties a magnificent collection can be built up. Each kind has been chosen for its peculiar merits, such as sturdiness, perfection of form, size, coloring, flowering time, etc., etc. Some six weeks of bloom can be had from the varieties mentioned, starting the season with some of the miniatures and with *February Gold,* that beautiful *N. cyclamineus* hybrid, and ending it with the graceful, fragrant flowers of *N. poeticus recurvus.*

THE CLASSIFICATION OF DAFFODILS

The Royal Horticultural Society's Classification of Daffodils to which is added a group of the most outstanding and typical varieties in each division: a collection of fine varieties for the advanced amateur.

Division 1. Trumpet Daffodils.

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

(a) Varieties with yellow or lemon-colored trumpets, and perianth of same shade or lighter (but not white).

Aerolite, Alaska, Alasnam, Ben Hur, Cleopatra, Diotima, Matamax, Tresserve, Warwick.

(b) Varieties with white trumpet and perianth.

Ada Finch, Beersheba, Eve, Jungfrau, La Vestale, Mrs. E. H. Krelage, President Carnot, W. P. Milner.

(c) Bicolor varieties, i. e., those having a white or whitish perianth and a trumpet colored yellow, lemon, or primrose, etc.

Jefta, Robert E. Lee, Silvanite, Spring Glory, Victoria.

Division 2. 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 coloring on the cup.

Abelard, Carlton, Croesus, Donatello, Helios, Lucinius, Micareme, Red Cross, Sir Watkin, Walter Hampden, Yellow Poppy.

(b) Bicolor varieties with white or whitish perianth, and self-yellow, red-stained, or red cup.

Bernardino, Dick Wellband, Francisca Drake, John Evelyn, Maude Adams, Milford-Haven, Red Shadow, Whitewell.

Division 3. 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 coloring on the cup.

Anna Croft, Barrii Conspicuus, Bath's Flame, Mrs. Barclay.

(b) Bicolor varieties with white or whitish perianth and self-yellow, red-stained, or red cup.

Alcida, Diana Kasner, Firetail, Fleur, Lady Moore, Mayflower, Niobe, Seagull, Shackleton, Sunstar.

Division 4. 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.

Betsy Penn, Daisy Schaffer, Gertie Millar, Louis Capet, Silver Star, Suda, Tunis.

(b) Cup or crown less than one-third the length of the perianth segments.

Hera, Mrs. Nette O'Melveny, Mystic, Queen of the North, Radio, Tullia.

Division 5. Triandrus Hybrids.

All varieties obviously derived from *N. triandrus.*

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

Moonshine, Pearly Queen, Queen of Spain.

(b) Cup or crown less than two-thirds the length of the perianth segments.

Agnes Harvey, Mrs. Alfred Pearson, Thalia.

Division 6. Cyclamineus Hybrids.

All varieties obviously derived from *N. cyclamineus.*

Beryl, February Gold, March Sunshine.

Division 7. Jonquil Hybrids.

All varieties obviously derived from Jonquils.

Campernelle Single, Campernelle Double, Chrysolite, General Pershing, Golden Sceptre, Lady Hillingdon, Lanarth, Orange Queen, Trevithian.

Division 8. Tazetta (Garden Forms and Hybrids).

To include the Poetaz varieties and the Dutch varieties of Polyanthus Narcissus.

Admiration, Cheerfulness, Frans Hals, Glorious, Golden Perfection, Klondyke, Orange Cup, Medusa.

Division 9. Poeticus Varieties.

Actaea, Comus, Edwina, Homer, Ornatus Maximus, Recurvus, Rupert Brooke, Snow King.

Division 10. Double Varieties.

Argent, Daphne, Dubloon, Indian Chief, Irene Copeland, Mary Copeland, Snowsprite, Texas, The Pearl, Twink.

Division 11. Various.

To include *N. Bulbocodium, N. cyclamineus, N. triandrus, N. juncifolius, N. Jonquilla, N. Tazetta* (wild forms such as *N. canaliculatus), etc.*

Note: The pink cupped varieties such as *Mrs. R. O. Backhouse, Lovenest, Rosabella, Sublime,* have purposely been eliminated from this list. They are all on the borderline of White Trumpet-Leedsii groups and it is the writer's opinion that they well might be classified separately, since they are a very distinct group.

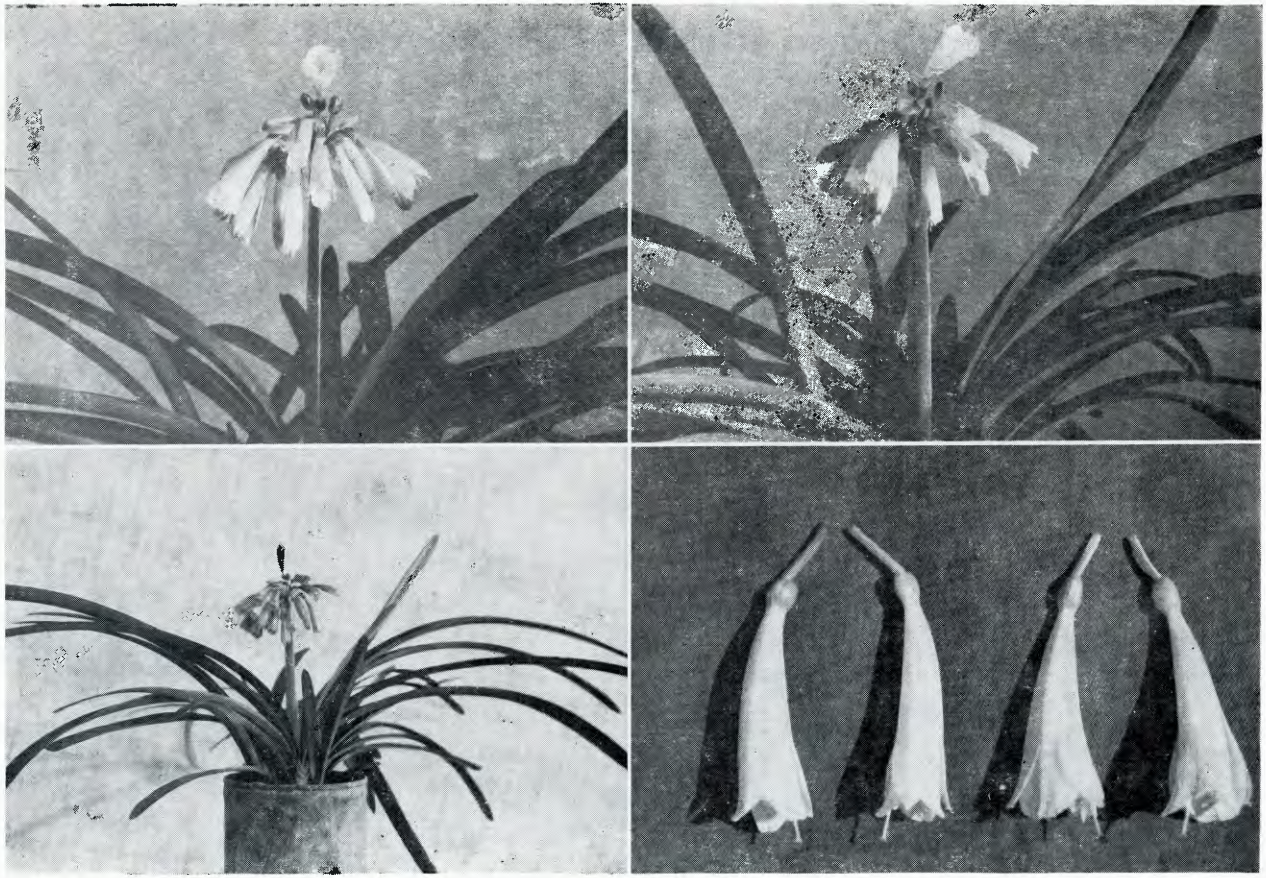
Any gardener growing a collection consisting of the varieties mentioned would have a most complete and distinct group of daffodils, well worth exhibiting at any daffodil show.

CLIVIA GARDENI HOOK

Through the kindness of Dr. R. A. Dyer of the Union Department of Agriculture and Forestry we present the very interesting illustration (Plate 161) of *Clivia Gardeni* Hook., which is native to the Transvaal. The specimen illustrated is cultivated by W. Terry in Johannesburg, and was photographed by Dr. Dyer in May 1939. The *Clivia* breeders in America will be particularly interested in it as a possible parent in hybridizing.

In the next issue of Herbertia will be articles detailing the results secured by American *Clivia* breeders. Some of this material has already been received.

—*Ed.*



Gladys I. Blackbeard, Grahamstown, South Africa

See page 191

Clivia breeding—C. nobilis, upper left; C. miniata var. flava, upper right; hybrid between the preceding lower left; flowers of C. nobilis (left) and C. miniata var. flava (right), lower left.

Plate 160

4. CYTOLOGY, GENETICS AND BREEDING

CLIVIA BREEDING

GLADYS I. BLACKBEARD

Scotts Farm, Grahamstown, Cape Province

Of the many interesting flowering plants of South Africa, the Genus *Clivia* is worthy of special mention. It consists of handsome plants with dark green leaves and strong erect stems which carry massive flower heads in brilliant shades of nasturtium red to copper and gold. Even in winter they are most attractive pot plants with evergreen leaves and brilliant red fruits.

My early interest in the genus *Clivia* was awakened by my mother, who was deeply interested in South African flowers and gardening generally—an art almost neglected by women folk at that time. Gardening brought her into contact with many flower lovers and gardeners of the old type. She was fortunate in making the acquaintance of an old English gardener, who came to South Africa. He soon saw the possibilities of exporting bulbs, etc. to England. He collected the very handsome *Red Clivia, C. miniata,* (see Plate 160) and presented my mother with one plant. As a child I well remember the joy of seeing it bloom each year. It increased and after many years has come to be considered almost as a family heirloom. I was fortunate in securing another plant from a friend, the origin of which she could not give. The flowers are of pale apricot tint, having broader and more widely spreading perianth lobes (see Plate 160).* This gave me an inspiration and soon I made a cross between these two. Some five and a half to six years later the progeny flowered. The cross had considerably enhanced colour and form, from the palest to deep shades, with larger flower heads and broad petals—truly a beautiful show. Year after year I made crosses from the best plants and today those early crosses have multiplied to a family of some 2000 plants, from flowering plants to year-old seedlings.

Branching out from this family and making a fresh cross, I took again as my pollen parent the pale apricot one, and as the seed parent, a species that is indigenous to this part, *Clivia nobilis,* (See Plate 160). The flowers of this species are tube like and hang down in a massive cluster, being supported by a strong peduncle. This is in nature a very hardy and robust species—growing under various conditions in shaded moist kloofs some thirty-six miles away from the sea, down to within a few hundred feet from the sea shore, on the slopes of the hillside, in part shade from the tall tree *Euphorbia* on the banks of Bushmans River in the eastern Cape Province. In this particular spot *Clivia nobilis* has survived the damaging effects of man. Whereas most of the undergrowth has faded out with the advance of civilization the *Clivia* has persisted.

*It is probable that this is **C. miniata** var **flava** Phillips, which was figured and described for the first tme in 1931 Flowering Plants of S. Afr. t. 411. It was discovered in North Natal about 1888 and a number of plants were distributed from the originals.

R. A. .Dyer, Pretoria See page 189

Clivia Gardeni Hook. native to Transvaal; cultivated in Johannesburg by W. Terry; flowered in May-June, 1939.

Plate 161

The flowers of *Clivia miniata* var flava are erect or sub-erect whereas those of *C. nobilis* droop or hang their flower bells. The hybrids in this cross are somewhat varied in shade and form. The shades vary from dark to light apricot pink. They flower out of season, that is to say my general collection flowers in the spring, late August to September, whereas the *C. miniata* var *flava-C. nobilis* hybrids flower in May and a few in July, the flowering period having completely changed. If this will continue season after season is yet to be proved. This may be of immense value for making crosses with other related plants that bloom at this time.

From the time the seeds start to form, the capsules or fruits gradually develop to the size of a large cherry, but pear shaped. As they ripen they turn to brilliant scarlet and have a handsome appearance. It takes from ten to twelve months for them to ripen and they would remain on the plant much longer, but I prefer to remove the seeds as soon as possible before other flower buds appear. The seed may be gathered as soon as the fruits show any red colouration. After removing the pods I leave them for about ten days to two weeks after which I peel them and remove the seeds. The fruit contains an average of 5 to 7 seeds. One should not leave the seeds in their fruit pods too long for they will probably start growing and the delicate shoots may be broken off when removing the seeds.

When planting the seeds I use flat pans or boxes with moss at the bottom as drainage and then fill up with a light mixture of one part each of sand and leaf mould to two of good light garden soil, well mixed. Place the seeds in rows one inch apart, cover them with soil and give the seed pans a tap down by lifting up a little and dropping on the bench. Tap down at least twice. This settles the seeds into position. The pans or boxes can be their home for some time up to eighteen months or two years. When transplanting never give the seedlings much pot room, and never transplant until the roots are pressing above and over the side of the pot. They will flower well in 9 inch pots. Never "overpot" *Clivia* plants as they will not flower, but only increase in leaf and root system. The secret of flowering them is rather to starve the plants than to over feed them. The general cry from most people is "my *Clivia* will not flower in spite of the fact that I keep potting it on." I always reply "Starve it." To enhance the bloom, when buds show, sprinkle round each plant a little well decayed mixture of horse and cow manure. This is all I have ever done for mine. For cultivation I have a "bush house" with flat roof, but before flowering it is advisable to put the plants under more shelter such as a glass house or verandah to protect the blooms from damage. Plants can be broken up and subdivided.

It must be remembered that all details given in this brief summary are purely the result of my own personal experiments, unaided in any way. Therefore my experiments have not advanced as rapidly as I should have wished. However many things have small beginnings, and the joy and keen interest shown in my collection has more than repaid me.

CYTOLOGICAL CONFIRMATION OF TAXONOMY IN COOPERIA*

WALTER S. FLORY

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Until 1936 there were only three species that could be authentically placed in Cooperia. These were the two North American forms *Cooperia Drummondii* Herbert (with its variant—variety *chlorosolen* Herb.) and *C. pedunculata* Herb., and the Peruvian species *C. albicans* (Herb.) Sprague (see Hume, 1938). In the past three years the number of described species of Cooperia, apparently so far accepted by taxonomists as authentic, has been doubled. The three new species described are: *C. Traubii* Hayward (1936) from the Texas Gulf Coast, *C. kansensis* (1938) from Kansas, and a sixth form *C. Smallii* Alexander (1939) from South Texas, which is a lemon-yellow in color—rather than the standard white of previously described Cooperias.

Since 1936 the writer has made occasional cytological observations, chiefly chromosomal, on the three white Cooperias found in Texas. No material of *albicans* or *Smallii* has been available and *kansensis* has not yet been studied in any detail.

So far as is known no previous reports have been made on chromosome numbers in this genus. Numbers that may be reported here are:

Cooperia Drummondii	2n=48
C. pedunculata	2n=48
C. Traubii	2n=24

In all three species the chromosomes are comparatively large. This, coupled with the relatively large number of somatic (2n) chromosomes in the first two listed species makes it no easy matter to determine the numbers in these forms definitely. But the technique finally arrived at gave numerous plates for both species in which there seemed to be no doubt that 48 was the usual number. An exception should be noted: a few root tips secured from germinated seeds of *C. pedunculata* contained around 70, probably 72, chromosomes in dividing cells, but this number has not yet been observed in root tips of successfully surviving plants. The smaller number of chromosomes present in *C. Traubii* makes for ease of counting, and 24 is clearly the somatic number in the material examined of this species (Fig. 39). Preliminary observations indicate the same number of chromosomes in *C. Drummondii* var. *chlorosolen* as in *C. Drummondii,* and also that *C. kansensis* has in the neighborhood of 48 chromosomes; more definite reports on these forms will be given later.

The cytological evidence would seem to support the correctness of the present taxonomic position of *C. Traubii.* The lower chromosome number of this form offers an additional (perhaps the controlling) morphological distinction from *C. Drummondii* and *C. pedunculata.* Furthermore the cytological picture of *C. Traubii* supports the contention

*Technical contribution No. 539, Texas Agricultural Experiment Station.

made in its original description, that this species is more closely related to *Drummondii* than to *pedunculata.* In *C. Traubii* the chromosome pairs fall into the following wide types: 1 long pair with median constrictions, 1 medium-long pair with submedian constrictions, 8 medium-short pairs with subterminal constrictions, and 2 short pairs with median to submedian constrictions. In *C. Drummondii* the chromosome types are: 2 long pairs with median constrictions, 2 medium-long pairs with submedian constrictions, 16 medium-short pairs with subterminal constrictions, and 4 short pairs with submedian to median constrictions. In other words the chromosome types of the two species are practically the same, there are apparently just about twice as many of each type in *C. Drummondii* as in *C. Traubii.* The types of chromosomes in *C. pedunculata,* based on size and constriction position seem to differ in being

Fig. 39. Root tip cell of Cooperia Traubii, at right, showing 24 chromosomes; x 1250. Note that 23 chromosomes are fully visible; that the 24th is under the one at the upper left in the cell and can be seen only in part.

more numerous and less easily classified into a few groups. On the basis of present data, which it is intended to expand, the types in *C. pedunculata,* ranging from longest to shortest pairs, approximate: 2 long pairs, submedian constrictions; 6 pairs, subterminal; 10 shorter pairs, subterminal; and, 6 short pairs, submedian. The size range within some of these groups is such as probably to necessitate a large number of groups for a definite classification of types. It will suffice here to point out that the chromosome types found in *C. pedunculata* seem to differ considerably from the types in *C. Traubii* and *C. Drummondii.*

The above discussion furnishes a simple and striking instance of the way in which cytological and taxonomic information supplement each other. Technique description, detailed data, and cytological figures will appear in a later report.

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PARTHENOGENESIS IN ZEPHYRANTHEAE

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A. & M. College of Texas

A quarter of a century ago Pace (1913) published a paper under the title "Apogamy in Atamosco" which should be of interest to any one attempting crosses with species of Zephyranthes, Habranthus, Cooperia and perhaps related genera in tribe Zephyrantheae. Since the paper seems to be but little known, and also rather inaccessible to many amaryllid breeders, the editor of Herbertia has suggested that a review of this paper, with comments on it and on related phenomena, be given here.

Miss Pace worked at Baylor University, Waco, Texas, with presumably native material of *Habranthus texanus* Stendel (*H. Andersonianus* var. *texana* Herbert; *Atamosco texana* Greene;—see Flory, 1938). The parts of her paper describing unusual steps in the initiation and production of seed will be summarized below.

We will first state the case briefly. There is a failure of chromosome reduction in the steps leading to egg formation. The resulting eggs then have the same number of chromosomes, 24, as are found in the body, or somatic, cells. These eggs with the unreduced chromosome number are not only capable of developing into diploid sporophytes (plants with the usual chromosome number) without fertilization but they actually *will not* unite with the male gamete, although the nuclei of the two gametes are frequently in contact—according to Pace's work. The male gamete disintegrates as the egg develops into a new sporophyte.

Drawings and diagrammatic sketches showing approximate location of most parts mentioned in this paper, together with their reported scheme of development, are presented in Figures 40-A; 40-B and 41. These are explained, for the most part, in the legends and labels of the figures. In place of any nuclear detail, the number of chromosomes present in each nucleus is given in the sketches. Where new terms are encountered in the text of this paper, reference to the sketches should usually clarify them.

Now in slightly more detail Miss Pace's findings were as follows: No chromosome or nuclear divisions of the Habranthus megaspore-mother cell (the body cell which gives rise to the embryo sac, and, hence, to the egg) were observed. The embryo sac development was interpreted as being of the Lilium type, so the megaspore-mother cell division would also be the first nuclear division of the sac. The second division in the em-

*Technical contribution No. 538, Texas Agricultural experiment Station.

bryo sac (giving four nuclei from two) was never observed. The third division in the sac, however, was observed in a number of ovules—usually in the chalazal end of the sac. "In all cases approximately 24 chromosomes could be counted . . . therefore the reduction division seems not to have taken place." Apparently there were only 3 divisions from the megaspore-mother cell to the complete 8-celled embryo sac. One of these 8 cells, of course, was the egg. Two of the remaining 7 cells were polar nuclei (nuclei which fuse with each other and with one of the sperm, or male gametes, to form the first endosperm nucleus) which followed the usual process of moving to the center of the cell prior to fusion. Late prophases, metaphases and anaphases of egg nuclei were seen, and figured, to have approximately 24 chromosomes.

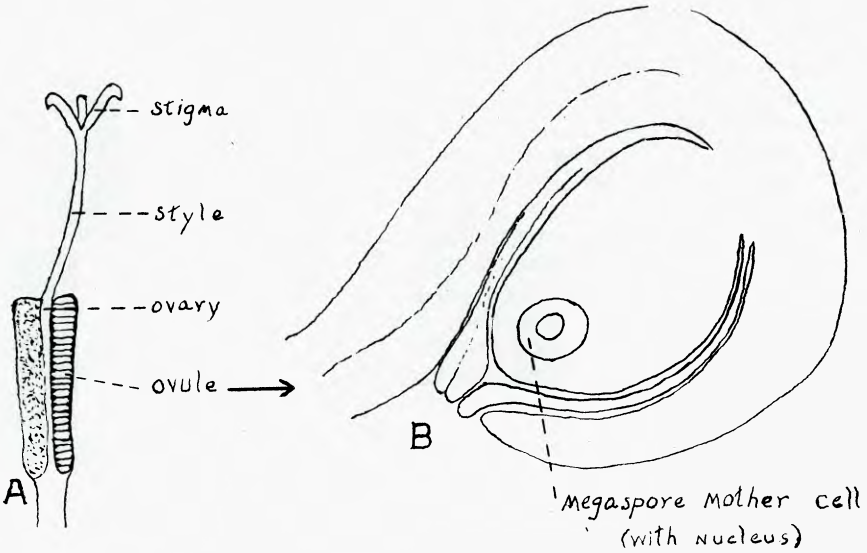

Fig. 40, A. Drawing of the pistil of an Habaranthus texanus flower at time of opening. A part of the ovary wall was removed to show one of the three columns of flattened ovules. The ovules are seen in side view here. Each column is composed of 25 or more ovules. 1.8 natural size.

Fig. 40, B. An enlarged, camera-lucida, drawing of a top view of one of the ovules—from the pistil drawn in Fig. 40, A. Note the megaspore mother cell. It is this cell that develops into the embryo sac (see Fig. 41), which contains the egg and later the young embryo. Sixty times natural size.

Pollen was observed to be normal in every way. Metaphase figures of the generative cell preparing for division showed 12, the reduced number of, chromosomes. Some of the male nuclei (sperm) present in egg cells (see below) were also seen to have "approximately 12 chromatic masses, apparently chromosomes."

More than 600 cases were seen of a sperm nucleus within an egg cell in which the egg nucleus was in a resting condition. In only a few cases was the sperm nucleus in contact with the egg nucleus; never were the two nuclei seen fused. About 300 sacs were observed to have a sperm

nucleus in an egg cell in which the nucleus was in process of division—usually in the spirem stage of prophase. But no fusion of these nuclei (gametes) was ever observed. In fact it was only in the egg nucleus that prophase was initiated and the implication is given that no nuclear activity was exhibited by the male gamete. The fate of the male gametes was that of "finally disintegrating during the first division in the egg," all signs of these being gone by the two-celled embryo stage.

The second male nucleus was seen in process of fusing with the two polar nuclei, and later stages showing the product of this triple fusion were noted. The triple fusion of these nuclei "seems the common condition in the material examined." A number of chromosomes could be counted following the triple fusion, in some cases. In several instances one could count 50 and know there were still others. In one case "more than 60 chromosomes (could) be counted in all three (consecutive) sections." Cut chromosomes might account for the apparent number being above 60. The number would be 60 if two polar nuclei with 24 chromosomes each fused with a sperm nucleus with 12.

There is apparently a question as to the correctness of Pace's use of the term "apogamy." For a part of the time while she was studying this problem she worked—during the summer of 1910—in the laboratory of the famous German botanist Strasburger, at Bonn. Strasburger's interpretations and definitions of apogamy (especially as given in his 1909 paper) were accepted by Pace, in preference to Winkler's terminology (1908). Strasburger (and Pace) considered parthenogenesis to be the development of a new organism from a reduced ("haploid") egg gamete. They considered other cases of new individuals arising from unreduced gametes without fertilization as being one type of apogamy. Winkler's considerations of parthenogenesis as involving the development of a new plant from an unfertilized gamete (reduced or unreduced in chromosome number) has been generally accepted outside of the Strasburger school. Among modern texts of a general scope Sharp's (1934) places the Habranthus (Atamosco) case, described above, as "unreduced parthenogenesis" and Darlington's (1937) borrows the term "diploid parthenogenesis" from Hartmann and Renner, to designate this and similar cases. In view of trends in terminology, then, we can probably speak more correctly of "parthenogenesis" than of "apogamy" in connection with the behavior described in Habranthus. Darlington (l.c.) states that the case described by Pace is "remarkable." Apparently no duplicate case (of one male generative nucleus fusing with the two polar nuclei of the embryo sac so that the endosperm is sexually produced, while the second male nucleus does not fuse with the egg) has ever been reported.

That Pace considered the embryo-sac development in *H. texanus* to be of the Lilium type is stated above. Details of embryo sac development in the lily were worked out by Sargant in 1896 and were generally accepted as correct in all details for a number of years. Briefly the development was said to be as follows: Following megaspore mother cell formation there were two divisions to give four megaspores. None of the megaspores disintegrated (as occurs for the three nearest the micro-

pyle in the ordinary type of sac development). A third division then gave an 8 nucleated, mature, sac. Presumably each of the 8 cells had 12 haploid chromosomes. However since 1928 (15 and more years following Pace's report) the work of Bambacioni and her colleagues (1928a,b; 1930; 1932), of Cooper (1935) and of others, has shown that there are other steps in this process. There are *four* divisions between the megaspore mother cell and the mature 8 nucleated sac. The first two give rise to 4 nuclei, each with the reduced number of chromosomes. As the third division occurs three of these nuclei are in one (the chalazal) end of the sac, and their chromosomes become arranged on a *single* spindle. When the third division is complete there are still only four

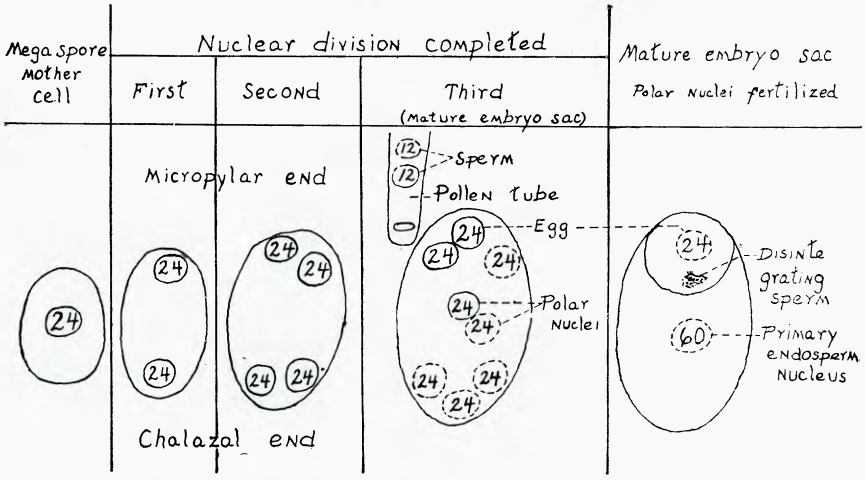

Fig. 41. Diagrammatic sketches of the steps in embryo sac formation in H. texanus (the Copper Rain Lily), based on Pace's report. Nuclei are shown as small circles. The number of chromosomes reported (in nuclei surrounded by broken lines) and presumed (in nuclei surrounded by solid lines) are given in each case. In most cases the reported numbers were "approximate" ones. The unreduced, diploid egg, denoted in the right hand sketch, develops into a new embryo, and plant, without fertilization—but probably in most cases only when the polar nuclei have been fertilized.

nuclei but two are large, with 36 chromosomes each, and the other two have the usual reduced number. Following the fourth division, of the eight nuclei four are large with 36 chromosomes, and four are small with 12 chromosomes. The egg nucleus is one of the latter. Of the two polar nuclei one is large, one small; after these fuse with the second male gamete, then, the triple fusion results in 60 chromosomes (the 5n number in the Lilium endosperm.)

In the light of her own observations Pace would scarcely have considered embryo sac origin in Habranthus as of the Lily type had she been aware of the situation revealed by later investigations. The chromosome numbers in the endosperm of Habranthus (more than 50,

about 60) would fit either with her observations, or with a Lilium type sac as known now. Also her observations on chromosome numbers, which showed more than the reduced number ("approximately 24") in the last division in the sac, were made almost entirely on divisions occurring in the chalazal end of the sac, because the majority of the divisions noted were found here. But while this latter fact, too, might be suggestive of the situation in Lily (and more especially of that in *Tulipa Gesneriana* —see Bambicioni and Giombini, 1930), there is the apparently incontrovertible fact of the unreduced number of chromosomes in the unfertilized and dividing egg, which would seem to decisively place the type of sac development here in a category of its own. This paragraph together with the preceding one, somewhat skirt the main issue, but are inserted because of the suggestiveness which the summarized facts might have in directing a reinvestigation of embryo sac development in Habranthus.

There is a small amount of genetical evidence available on this problem. In 1937 the present author pollinated, under control, 12 emasculated flowers of *Habranthus texanus* with *Cooperia pedunculata* pollen. Three weak sets gave a total of 8 seeds from which 6 plants were secured. All have leaves like the mother. Four have flowered and produced typical *H. texanus* flowers. The three plants in which the root-tip chromosome numbers have been studied each have 24. In the parents *H. texanus* had 24, *C. pedunculata* approximately 48 chromosomes. In other words the 6 plants from the carefully controlled cross do not appear to be hybrids at all, but are apparently pure *H. texanus,* parthenogenetically produced. Nine pollinations of the same cross in 1938 resulted in neither sets nor seeds. Twenty-four pollinations of the reciprocal cross—about half in 1937, half in 1938—gave neither sets nor seeds. In 1938 five flowers of *H. texanus* were emasculated and bagged, unpollinated. All five set pods, each of which contained about 6 seed, mostly abortive, with a total of 12 viable appearing seeds. The two plants secured from these have not flowered but will doubtless prove to be identical with their parent. Pollen is known to be comparatively very high in plant hormone content. It is possible that emasculation removes the source of hormones necessary for high percentage of seed set. With this in mind a technique to prevent self-pollination without anther removal is being planned both for a cross-pollinating, and for a bagged, unpollinated, series.

Mr. Wyndham Hayward, Secretary of the American Amaryllis Society, has informed me that he has made controlled pollinations on *Habranthus robustus* and *Cooperia pedunculata* using pollen of *Zephyranthes carinata* and of other Zephyranthes species. Good pods of seed were secured but all the progeny were good types of the maternal parent species with no hybrid or intermediate characters. This would sound very much as if parthenogenesis, perhaps similar in type to that described by Pace, has occurred in this material.

The present writer has made numerous pollinations on *H. robustus* using pollen of *H. texanus* with neither sets nor seeds resulting. A similar lack of positive results was the case when the same species was pollinated, under control, by *Z. carinata* and by *C. drummondii.* However,

only a very few flowers were used in the last two pollinations. From the crosses: *Z. simpsonii* x *Z. treatiae; Z. atamosco* x *Z. treatiae;* and, *Z. simpsonii* x *C. pedunculata* a number of seed and seedlings have been secured but these will not flower before 1940.

Mr. Percy-Lancaster (1936) has succeeded in securing a number of actual recombinations from his numerous crosses of Cooperia and Zephyranthes species. The name Cooperanthes has been given these bigeneric hybrids. However, from his descriptions one is led to believe that in some cases he, too, actually has parthenogenetic offspring and not true hybrids. He notes having secured, in the first generation, some plants of a parental type and some that were intermediates. As nearly as can be gotten from his paper it seems that usually where the offspring are of a parental type it is the maternal parent that is closely resembled. From the results of other workers, one would be tempted to think that some of these offsprings may be "maternals," while only the intermediate forms are true hybrids.

The results with unpollinated *H. texanus,* considered in the light of Pace's work, strongly suggests that where pollination occurs the subsequent fertilization of the endosperm supplies the factor and stimulus, needed for embryo and seed development; and, that usually, without pollination—and hence without endosperm fertilization—no seeds result. It is possible, and perhaps probable, that where *H. texanus,* or a similarly behaving species, is pollinated by a different species that the same phenomenon may occur—that is that the endosperm of the mother species may be fertilized by a different species and hence allow development of a seed, and perhaps eventually of a new plant; but if there has been no egg fertilization the new individual will be like the mother. On the other hand, of course, where conditions are such that egg fertilization will occur, true hybrids could be secured.

Summary and conclusions: The available genetic evidence seems to indicate that some form of apomixis (development of new individuals without fertilization), presumably parthenogenesis, occurs in several species of Habranthus, Cooperia, and Zephyranthes of the tribe Zephyrantheae. Pace has presented, in detail, the cytological evidence for this phenomenon in *H. texanus.* The combined genetic and cytological information suggest that pollination and endorsperm fertilization are necessary before parthenogenetic development of the egg can proceed. Much more data is needed to present anything like a clear picture of what actually happens—of how extensive the situation is; of the various environments and physiological conditions under which it does or does not occur; if apomixis in different species is all of the same, or of different types; etc. It is to be hoped that others working with species of this tribe will present regular reports of their findings so that all may benefit from these individual experiences.

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ADVENTURES IN BREEDING RED HEMEROCALLIS

LEON H. LEONIAN, *West Virginia*

Before they became available to the general public the varieties of red hemerocallis developed by Dr. Stout found their way into the gardens of the members of the board of directors of New York Botanical Garden. Some six or seven years ago I was fortunate in securing four unnamed plants of red hemerocallis from one of these gardens. The flowers varied from orange red to brownish red in color, and while judged by the present day standard they were nothing unusual, at the time they seemed startlingly beautiful to me. These unnamed seedlings constituted one line of parentage in my breeding program, while some of Perry's varieties formed the other. The first generation crosses yielded some very promising seedlings; maroon, deep rose, clearer red and old rose colored sorts were observed and separated for further breeding among themselves. The progenies of these came with much finer colors and added ruby red and purplish red colors to the increasing number of shades. However it remained for the third generation crosses (season of 1939) to bring forth the real "breaks."

Based entirely on my own seedlings, the red varieties may be divided into two primary groups: those possessing purple pigment, and those without such a pigment. The following colors come under the first group: blackish and lighter maroons, purplish red, old rose, and lavender pink. The second groups contains a larger number of representatives such as blackish reds with no trace of maroon, deep blood red, brownish red, ruby red, scarlet, deep rose, salmon pink, and flesh. In addition to the foregoing two primary color groups there are many bicolors and blends, such as splashes of red on yellow, salt and pepper effect, glowing and perfectly even blends of salmon and yellow that cannot be classified under either color, tan and brown combinations, brown and magenta effects, coffee and burnt orange, and many borderline colors impossible to define. Some of these are mere curiosities, but others possess an infinite charm.

According to their resistance to the sun the red shades may be divided into two groups: first, those that largely retain their original colors; second, those that fade very badly and become very unattractive, and third, those that become even more attractive after fading.

The sepals and petals show a great variation. Some are very long and narrow, others are broad. Some open funnel shape, others are flat. Some curl back like Martagon lily, others resemble amaryllis.

The height varies from five feet down to six inches. The dwarfs form a mound of narrow leaves. and the scapes may be taller or shorter than the leaves. The 4-5 inch flowers may be borne in clusters, in reduced clusters, or singly, and their colors vary from flesh pink or yellow to salmon, deep rose, lavender pink and deep red.

Undoubtedly some of the readers will think that in describing the colors of my seedlings I am indulging a bit too freely in what is known as poetic license. I can readily enough understand their reaction because before this year even I was somewhat skeptical concerning pink hemerocallis. I have had visitors who after seeing my seedlings admitted that previously they took all claims about red hemerocallis with a considerable degree of mental reservation. As red varieties become generally available this skepticism on the part of general public is going to give way to a healthy enthusiasm. We may not be able to develop a snow white hemerocallis, but pure purple and even blue varieties are not at all impossible, as the maroons, the purplish reds, and the lavender pinks are eloquent precursors of such varieties. After all, the breeders of hemerocallis are just beginning to flirt with the fascinating possibilities of colors that are so alluringly beckoning to us.

AMARYLLIS BREEDING

Hermon Brown, *California*

My horticultural experience began on a Kansas farm where I was born and reared. At the age of eighteen, I began work in a small nursery, where I stayed four years, during which I learned the nursery business pretty thoroughly. After that I did a little farming and fruit raising, and then came to California to take charge of a large fruit ranch in the Santa Clara Valley. Two years later, I left for Salisbury, Rhodesia, South Africa where I remained for twelve years as Curator of the Public Gardens—a fifty-two acre park and ornamental grounds. With this I ran a nursery and was the City's only florist. The work was largely experimental since the country was new, the plants strange, and we were a thousand miles from any established nursery. In 1913 I returned to the Santa Clara Valley in California where I have remained ever since on the prune ranch which I own and operate.

I started my amaryllis work about twenty years ago when a friend gave me one bulb—hybrid amaryllis—which he had obtained from Luther Burbank. It had light-colored blossoms with red lines, good open flowers from six to seven inches, of good substance, and was a good multiplier. The next year I bought a dozen mixed bulbs from Mr. Burbank. The friend who had given me the original bulb had in the meantime acquired a nice little collection of selected bulbs from Howard & Smith, Tait, and Burbank. These were hand-pollinated with a collection belonging to still another friend, and the resulting seed was given to me to raise on shares.

From this seed I obtained my start of some seven hundred and fifty plants. I had a good range of color from almost white to very dark red, and from this excellent stock I have selected the best, stressing clear colors, good substance and erect carriage. By this careful selection and hand-pollination, I have made improvements particularly in substance of blooms and clearness of colors.

I have a good white with faint lines of red in the upper petals, others with stripes or feathered with red on white. One type that I particularly admire, from the Burbank stock, is white with heavy markings of deep red with a clear white border. There are flowers with fine red lines and spots; one of the best with the spots showing on the backs

Fig. 42. Hermon Brown and his hybrid amaryllis.

of the petals. There are reds with white throats. I have not had a really satisfactory light red until this year when several very good ones appeared. Only about four years ago I learned that the dark reds with green in the throat were objectionable. But I had a few all red and am now breeding from them. Recently I have added a pure white, an orange red and a near orange to my collection. I have plain petaled and ruffled, and some fragrant blooms.

I have not stressed size but have had blooms nine inches in diameter, which is not bad considering I have no artificial heat. I have a little green-house and light an oil heater to keep the plants from actually freezing during a few of the coldest nights.

I start my seeds in the house in flats or in beds, generally leave them for a year, and then plant them out of doors in beds six feet wide with twelve inch boards for sides. I plant them thickly, about four inches apart each way mixing in sandy loam and use barn yard manure as fertilizer. I leave them in these beds for two or three years until after some of them have bloomed, then I dig them, sell some of the blooming sized bulbs, and replant others in rows fifteen inches apart in the open garden to bloom and increase in size. The choice ones I pot and put in the house for my own pleasure, and for breeding stock. The bulbs planted out of doors I cover completely with soil to prevent freezing, for sometimes the temperature drops to as low as twenty degrees F. here.

I have not had the opportunity to see many other amaryllis collections. Since the formation of the Amaryllis Society in 1934 I have taken renewed interest. By comparing my amaryllis with the judging standards I can determine in what respects mine fall short and also those points in which mine excel. I have gotten in touch with other members of the Society, found out their ideals and have gradually been getting some of their seeds and a few bulbs. Soon now I will have these seedlings blooming and from these I hope to add new colors and shades to my collection. I have some seedlings of the variety *A. aulica* crossed with the *hybrids*, also my first crosses of the dark reds and pure white, which I am watching with interest.

ADDITIONAL NOTES ON AMARYLLIS RETICULATA-STYLOSA HYBRIDS

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Years ago I crossed an out of season *Amaryllis stylosa* with *A. reticulata, Mrs. Garfield.* Among the seedlings there have been several slight variations in shade but two flowering in August this year are so distinct that I have dared to name them provisionally *Mrs. Lancaster,* and *Alipur Beauty.* A preliminary report on Amaryllis reticulata-stylosa crosses was presented in Herbertia 3:97. 1936.

The descriptions of the two named varieties follow:

MRS. LANCASTER: (*A. stylosa* x *A. reticulata striatifolia, Mrs. Garfield*); foliage dark green with a narrow greenish white stripe down the centre, length 16″, width 2″, the base of the under-surface flushed dull red, flower spike 24″ long, four-flowered, individual flower diameter 4″, petals reflexed and each slightly incurved, colour deep rose red with darker veinings, a white stripe running down the centre of each petal, pistil and stamens deep rose pink, pollen yellow.

The flowers are slightly larger than *A. stylosa,* and whereas the pollen of *Mrs. Garfield* is creamy white that of *Mrs. Lancaster* is deep yellow.

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5. PHYSIOLOGY OF REPRODUCTION

TREATMENT OF AMARYLLID AND OTHER SEEDS WITH HORMONE POWDER

W. M. JAMES, *California*

Early in 1938 a powder called Rootone was put on the market. It is a mixture of naphthaleneacetic acid and talc. This mixture can be prepared by wetting talc with the proper solution of naphthaleneacetic acid and then drying it thoroughly, or by grinding the acid crystals into a very fine powder—even fine enough to go through a 320 mesh sieve—and then mixing it with the talc. Either method requires a certain amount of skill and some equipment to get a thorough, uniform mixture.

Seeds of *Sprekelia, Haemanthus Katherinae,* several forms of *Callicore rosea* (*Amaryllis belladonna* Herbert) and several selections of Callicore-Brunsvigia Hybrids, several kinds of *Iridaceae* and two kinds of annuals were treated with the Rootone powder before being sown.

The annuals were snapdragons and Bismarck stocks in various colors. All kinds showed a decided reaction almost from germination. The seedlings from treated seed had a better color and were ready to transplant into flats before the check seedlings were. This difference was maintained as long as observations were made—until nearly blooming time.

In the amaryllids included there were two distinctly different types of seeds. The *Sprekelia* has relatively small ones which are comparatively dry and which will stay viable for some time. They germinate in the open ground in from 4 to 8 weeks. All the other kinds have soft, fleshy seeds from 3/16 to ½ inch in diameter and under ordinary conditions they remain viable only 3 or 4 months. They generally germinate in the open ground in from 2 to 4 weeks. Seedlings from treated *Sprekelia* seeds were no different from plants from untreated seeds. Seedlings from treated seeds of all other kinds showed a definite advantage over the seedlings from untreated seeds. The leaves appeared quicker, and six months after planting were a third larger than those of the controls. Both treated and untreated seeds (controls) were planted in short rows in the open ground. Neither the seeds nor the seedlings were counted. However, it is quite noticeable that there was a better germination from the treated seeds.

The *Iridaceae* (*Gladiolus spp., Moraea spp., Streptanthera, Tritonia,* etc.) seeds which were treated showed no noticeable reaction. They were also planted in the open ground and require from 1 to 6 months to germinate.

The Rootone was applied by placing the seeds and a small amount of powder in a jar which was closed tightly and then shaking until the seeds were thoroughly coated. The excess powder was screened out before planting and used over again.

(Continued on page 239)

6. AMARYLLID CULTURE

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

THE DISTRIBUTION OF SOUTH AFRICAN AMARYLLIDS IN RELATION TO RAINFALL

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The Union of South Africa lies between latitude 22°S and 35°S and consequently is, for the greater part, situated within the warm temperate belt but it extends into the tropics in the Northern Transvaal. The temperature is lower than might be expected since the elevation of the land is considerable and along the west coast it is lowered still further by the cold Benguela current. Due to its latitudinal position the seasons are well differentiated. The country is divisible into a coastal region with a small temperature range and the interior region which has a large temperature range. In the former, frosts are almost unknown but in the latter they are of frequent occurrence.

In regard to its water relations the country is essentially arid or semi-arid, with for the most part, a seasonal distribution of rainfall, a small number of rainy days (especially in Summer) and an excess rate of evaporation over precipitation. Nearly two-thirds of the country has a rainfall of less than 20 inches per annum and a great deal of it has less than 10 inches. High rainfall (60 inches and more) occurs only in small regions such as the higher mountain ranges and the escarpment in the northeastern Transvaal. The rainfall in general, decreases towards the west from a maximum on the east coast. Apart from the small rainfall, there is considerable irregularity in different years—bad droughts occurring fairly often. In consequence of the water economy the relative humidity is low, and clear, cloudless skies are characteristic of all seasons of the year. Over the greater part of the country most of the rain falls in summer but in the South-western parts 60 per cent or more of the total rainfall is in winter resulting in a Mediterranean type of climate. Winds are a much more prominent feature of the coastal region than of the interior.

In the accompanying map (Plate 162) it will be seen that the country has been divided into six regions on the basis of percentage rainfall in summer. I have attempted to correlate the rainfall with the distribution of the amaryllids but the figures given for numbers of species and genera occurring in these regions must be regarded as approximate since the field records are still incomplete and many records are as yet unpublished. More exact figures could only be obtained as a result of considerable work in all the South African herbaria.

The number of amaryllid genera and species occurring in each region has been ascertained as far as possible, and the chief characteristics and habits of the dominant genera have been considered for each

of the rainfall regions delimited below and shown on the map (Plate 162).

Region A.

Average annual rainfall: 0-10 inches.
Summer rainfall: 0-25 per cent of total.
Amaryllid genera: 10
species: 42

The genus with the greatest number of species occurring in this region is *Gethyllis* which has 13 species. *Gethyllis* could not, from the point of view of the field observer be said to be a prominent feature of the region since the plants are rather rare and scattered. The life history exhibits the most extreme characteristics of the ephemeral bulbs. The flowers appear after rain in mid or late summer and last for one or two days. In early winter the fruits are forced above the ground and subsequently the leaves emerge and remain green until early summer when they wither and die. These features are characteristics of all the other genera in this region with the difference that the fruit is produced immediately after the flowers and not after a lapse of about 3 months as in *Gethyllis.*

Region B.

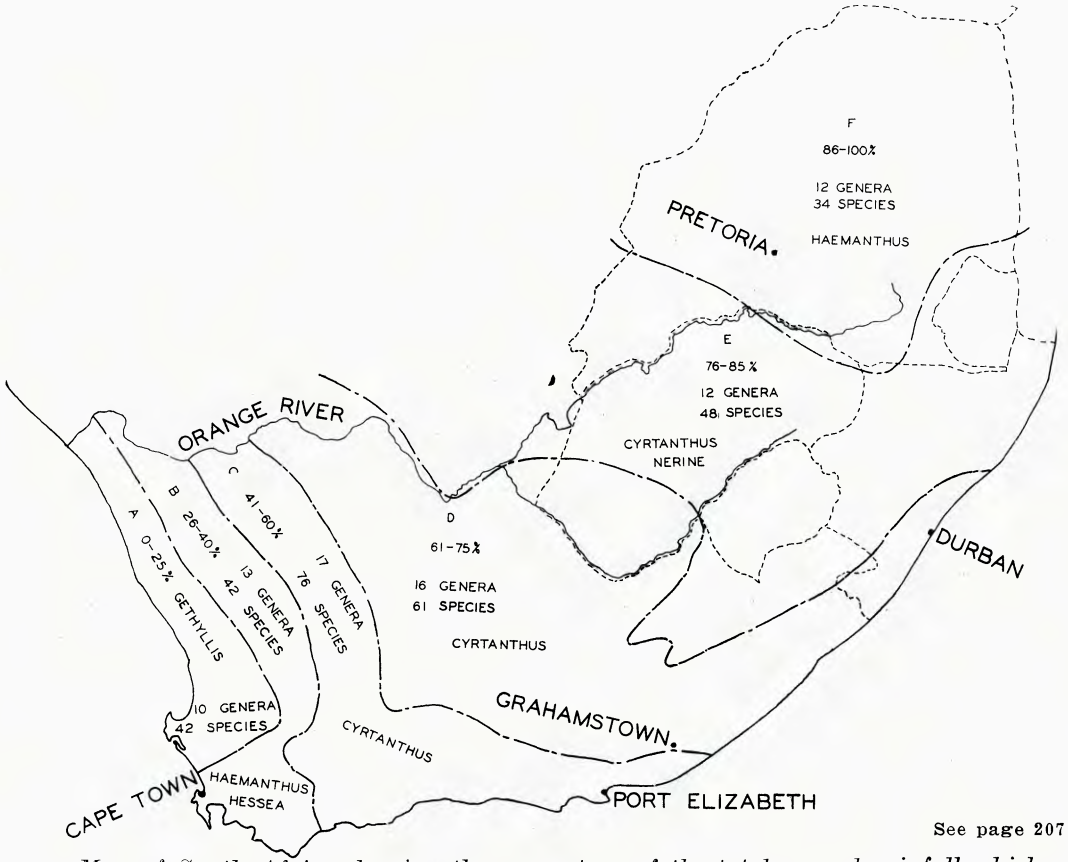
Average annual rainfall: 0-10 inches in the Northern part, 10-40 inches in the South.
Summer rainfall: 26-40 per cent of total.
Amaryllid genera: 13
species: 42

The most prominent genera are *Haemanthus* and *Hessea* with 8 species each and *Nerine* with 7.

Nerine and *Haemanthus* are widely distributed throughout South Africa. All the species of these genera and other such widely distributed Amaryllidaceous genera which occur in the Western and Southwestern Cape region, lose their leaves in summer while the majority of the species of the same genera which are endemic to the eastern parts of the country retain their leaves throughout the year. Notable exceptions to this rule are *Agapanthus* and *Tulbaghia* which retain their leaves in the south western parts. In the case of *Agapanthus* several species which are found in the summer rainfall areas are deciduous. There are other genera such as *Nerine,* which have deciduous species some of which are confined to the eastern parts of the country, whereas the deciduous habit obtains for all the species occurring in the western winter rainfall areas.

Region C.

Average annual rainfall: 0-10 inches in the North, 10-30 inches in the South-east with small regions of 30-40 inches in the South.
Summer rainfall: 41-60 per cent of the total.
Amaryllid genera: 17
species: 76



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Map of South Africa showing the percentage of the total annual rainfall which falls in summer; within each division the percentage rain in summer, dominant amaryllid genus or genera and number of genera and species are indicated for each division. Based on R. S. Adamson—"The Vegetation of South Africa" p. 27. (After Cox).

Plate 162

In this region the dominant amaryllid genus is *Cyrtanthus* with 17 species. *Haemanthus* and *Nerine* are each represented by 11 species. The majority of the *Cyrtanthus* species are found in the South-eastern corner of the region where the rainfall is from 20-30 inches per annum.

In the drier parts the species are deciduous but in the areas with more rainfall in summer, i.e., towards the east, there are many species which retain their leaves.

Region D.

Average annual rainfall: Ranging from 0-10 inches in the west through 10-20 inches to a belt of more than 40 inches in the east.
Summer rainfall: 61-75 per cent of the total.
Amaryllid genera: 16
species: 61

Cyrtanthus has the greatest number of species in this region—namely 16. With the exception of about 4 species these are confined to the southern and eastern parts.

There are 10 species of *Haemanthus* and 9 of *Nerine*.

The species of the genera represented in this region are predominantly evergreen in habit.

Region E.

Average annual rainfall: Ranging from 20-30 inches in the western part through 30-40 inches to a belt with more than 40 inches in the east.
Summer rainfall: 76-85 percent of the total.
Amaryllid genera: 12
species: 48

In this region the genera *Cyrtanthus* and *Nerine* are of equal significance—each being represented by 13 species. The species of *Cyrtanthus* are distributed chiefly along the eastern coastal region. There are several species of *Nerine* which inhabit the central and inland parts. These exhibit the same characteristics as the amaryllids described for regions A and B, namely the leaves die away before the flower is produced.

Region F.

Average annual rainfall: For the most part 20-30 inches increasing to 40 inches and over in the eastern part of the region.
Summer rainfall: 86-100 percent of the total.
Amaryllid genera: 12
species: 34

The records to which I have had access for this region were far from complete. *Haemanthus* is represented by 4 species, *Nerine* and *Cyrtanthus* with 3 species.

From this analysis of the climatic conditions prevailing in South Africa in relation to the distribution of the amaryllids the following generalisations emerge:

1. The amaryllids prefer those parts of the country where the rainfall is more or less evenly distributed between the summer and winter seasons.

2. The plants are much more plentiful both in numbers of genera and of species in the moister parts of the country although they grow also in the most arid regions.

3. In the regions where the summer is very dry the plants lose their leaves before flowering.

4. In the summer rainfall regions leaves and flowers are usually present at the same time.

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AMARYLLIDACEAE IN A CAPE NURSERY

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With a view to writing some notes on amaryllids for the American Amaryllis Society Year Book, I took a tour round my garden, where only plants indigenous to South Africa are cultivated. I was surprised to find how many members of the Amaryllidaceae are at home there. Then, following up this idea, I took down all the publications to hand on this subject, and my spirits fell for I realised that botanists are right away ahead of the horticulturists. I found many, many species described and sometimes whole genera, of which I knew nothing at all.

I will only write of those that I am actually growing, hoping that the hints given may be of use to those growing them under different conditions.

Just now it is late autumn, *Amaryllis Belladonna,* Herbert which must now be called *Callicore rosea,* is over and its juicy seeds are mostly lying on the ground and the leaves are big and green after the rain; *Nerine filifolia* is just coming into flower, and a great treasure it is. It seems the easiest of all nerines to grow provided that it is never allowed to dry right out. The hair-line leaves are evergreen, it has no dormant season and when it is not flowering it is busy producing new bulbs so that you plant your bulbs one year in a single row and the next year each one is the centre of a group. It makes an excellent cut flower, being a very attractive shade of pink and the stems are delicate.

Nerine filifolia and *N. lucida* (Plate 163) are the only nerines that can be said to flourish in my garden, the latter bloomed marvelously for weeks and the blooms are so large that they suggest *Brunsvigia* rather than *Nerine.* I received it from a collector who found it in quantity near the banks of the Orange River and it has a very wide range. I put it on a raised bed containing plenty of sharp broken up sandstone and good black soil. It was watered occasionally during the summer and the treatment seems to have suited it and it did not even object to our winter rainfall of 50 inches.

Nerine Bowdeni will not flower here; *N. appendiculata* flourishes in a swamp in the National Botanic Gardens, Kirstenbosch, but has at present done nothing for me; *N. flexuosa,* which I raised from seed three and a half years ago, has not flowered yet, and *N. sarniensis,* the gem of all which I planted in a special bed, about 200 bulbs, has also been disappointing. One bulb flowered last year and two this, but a few bulbs left under a bush of Lemon Verbena for six years or so, flower every year. To spite them I have bought *Lycoris* bulbs from America.

Vallota speciosa (*V. purpurea*) is just over now. It may always be relied upon to make a good show, doing best in shade in a well-drained place where it will get water in summer. Grown in a pot it should be left undisturbed until thoroughly potbound.

To understand the cultivation of the different species of *Haemanthus* one must know something of the peculiarities of the climate of South Africa. It is necessary to realize that the species from the Cape can stand any amount of water in winter but must be allowed to dry off in summer. This applies to *H. coccineus* and *H. pubescens,* but species from the northern Cape, Transvaal, Orange Free State and Natal must be kept quite dry in winter, when they are normally dormant. These species include the beautiful *H. Katharinae, H. filiformis* and *H. multiflorus* all of which are well worth growing; *H. Katharinae* being one of the showiest of pot plants and, unlike most members of the genus, it blooms while the leaves are in perfect condition. I think that all species of *Haemanthus* prefer a sandy soil and *H. Katharinae* definitely appreciates a mixture of sand and leaf mould and well enriched loam.

Climatic conditions have a similar effect on *Crinums,* though they are mostly very adaptable. *C. longifolium* likes plenty of rain in winter but can well do with water in summer too. *C. Moorei* is definitely dormant in winter and if kept dry then will give its beautiful pink campanulate blooms in midsummer, and *C. Kirkii* and *C. variabile,* both smaller and daintier than either of these, prefer to be drier in winter. *C. campanulatum* is a very charming species with deep pink pendulous blooms growing in water but it is much happier if the water dries up in winter.

Ammocharis falcata (Hort. in part) is found on the flats a few miles from here but it has never done well in my garden, probably because it insists on a sandy gritty soil, but *A. coranica* blooms well and is very attractive with its sweetly scented ruby-coloured flowers. These two lead us on to *Brunsvigia. B. gigantea* makes a grand show every year when it pushes its sturdy candelabrum through the hard soil at the end of summer. Later the large flat leaves appear with the winter rains and they remain until the spring sunshine dries them up and they roll off and no one would guess the presence of the huge bulbs well beneath the surface so well-equipped to stand the baking summer sun.

Tulbaghias should be cultivated more than they are; they ask for very little care and bloom the year round; the bright lavender colour of the flowers is very conspicuous. *Tulbaghia violacea* would be a first-rate cut flower but . . . . there is no getting away from the all-pervading

K. C. Stanford, Stellenbosch, South Africa

See page 211

Nerine lucida Herb.

Plate 163

Allium (garlic) scent. However, *T. fragrans* goes one better, its flowers are deliciously fragrant and very nearly as pretty. Every garden should have a good planting of it, particularly as it blooms throughout the winter.

Flowers of the *Cyrtanthus* too are always with us. All winter we have *C. Mackenii* making a sheet of creamy white blossom in a swamp. It grows about a foot high and the flowers have a delicious scent. In early spring *C. O'Brienii* follows with brilliant scarlet blooms and at the same season in sandy soil there is the taller *C. angustifolius.* In midsummer *C. obliquus* sends up its big umbels of pendulous blooms from some very dry spot on the top of the rock-garden, that is if someone has remembered to give it water in summer. Best of all is the rare form of *C. sanguineus,* known to us as Inanda Lily, from the name of one of its haunts in Natal. It likes hard gritty soil and water in summer.

Hypoxis, which until recently was classified in the *Amaryllidaceae,* includes some of the best-loved of our early spring flowers. Large yellow ones with brown centres are commonly called "Golden Stars," but the most beautiful one is known as *Hypoxis stellata* var. *elegans,* whose flowers are white or a soft pink with a big peacock "eye;" the stems are about 6 inches tall and they like to grow in moist sand. After the rough weather and drenching storms of winter at the Cape, there comes a day when the sun lights the *Leucadendron* bushes on the hillsides and we take a tour of the garden to see what is happening, and there, in a boggy bit by the stream, the first *Hypoxis* have opened their glistening stars and we know that the pageant of spring has started for us.

CALLICORE ROSEA IN ITS NATIVE HABITAT

L. B. Creasey

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The interesting and valuable research of Professor Uphof, the results of which were published in the 1938 number of Herbertia, concern a plant whose charms have annually delighted gardeners for well over 200 years.

Callicore rosea, Link, (See Plate 164), for so long grown in gardens under the names of *Amaryllis belladonna* Herbert and "Belladonna Lily," received the Royal Horticultural Society's Award of Garden Merit on April 16th, 1934. No South African plant is more worthy of that distinction. The appreciation of its value as a subject for garden culture has taken it to every quarter of the globe. Although many readers are familiar with the appearance of the species, the following brief description is given for the benefit of those who have not yet made its acquaintance.

The bulb of *C. rosea* may attain to the size of a cricket ball, but is often smaller at flowering size. It is a hard bulb, its papery outer tunic not being so copious and so loose as in many other South African bulbs. Each bulb may bear from five to twelve dark green leaves, each from

L. B. Creasey, Cape Town

See page 214

Callicore rosea Link, growing naturally on steep slope, spur of Table Mountain, Cape Province, South Africa.

Plate 164

a foot to eighteen inches in length and from half an inch to an inch or more in width. These leaves are thrown up after the flowering season. Having served their purpose they die, after which there is a distinct rest period before flowering.

The flowers number from three to ten (sometimes more), carried in an umbel and on pedicels of from an inch to about two inches long (lengthening to five or six inches in the seed stage), and which arise from the apex of a stout stem of up to two feet or a little more in height. This main stem is oval in section and may be either dull or pale green, while it is frequently tinged dark red or purple. At its junction with the pedicels there are two large, withered spathe-leaves.

The six perianth-segments of each flower are three to four inches in length, about an inch broad, oblong and acute, collectively forming a funnel-shaped bloom, the segments reflexing at their tips. The ground-color of the flower is white, with a hint of yellow at the base of the tube, and streaked pink towards the apices of the perianth-segments. The quantity of this pink stain varies considerably and leads to variation of general flower-color between almost pure white and deep pink. Using the R. H. S. Horticultural Colour Chart, Vol. 1, I find the pink to be generally that of Phlox Pink 625/1.

To complete our description of the flower, the six stamens have white, pink-tipped filaments and the versatile anthers are also white, tinged pink when young, while the style is white at the base and pink toward its tiny dark purple stigma. The globose and membraneous capsule splits when ripe to discharge the round, pearl-like seeds, each about a quarter of an inch in diameter.

In the past, several forms of *C. rosea* have been given distinctive names where there have been variations of growth, and of size, color and season of flower. Time of flowering may or may not be a constant character, and color-variations may be partly due to different soils. It would be interesting to check whether color-forms of *C. rosea* are more numerous "in the wild" in any given area than are types of soil and situation. The variations under natural conditions are numerous and the differences are often too slight for taxonomic distinction. Nevertheless, where known varieties have been used for hybridizing, their names and characters are important for the purpose of records.

I can find no information as to the date upon which *Callicore rosea* first reached Europe. It was introduced to England in 1712 from Portugal, where it may have been growing for some years previously.

It is a coincidence and of interest to note that the Portugese were the first Europeans to land in South Africa. After many unsuccessful expeditions covering a period of seventy years by navigators from Portugal, in 1486 or 1487 Bartholomew Diaz landed at the present position of Luderitz, to be followed by Vasco da Gama, who landed at St. Helena Bay (much nearer to the Cape Peninsula) ten years later. The first Englishman to land at the Cape was James Lancaster, in 1591, and he was followed by the first Dutchman in 1595. Thus, although Drake had sighted the Cape of Good Hope in 1580, Table Bay did not provide anchorage for ships until 1591, but I doubt whether any of the South-

western Cape plants could have been introduced to Europe before the colonization of the Cape by Johan van Riebeeck in 1651 for the main purpose of revictualling vessels of the Dutch East India Company.

Callicore rosea has certainly been grown in Europe and America for sufficiently long to become fully established in the milder localities. As an indication of the extent to which it has settled down to the seasonal differences of the northern hemisphere as compared with those of its natural habitat, there is the fact that home-grown bulbs are today available for those who desire to grow this plant.

By no means entirely confined to Table Mountain, *Callicore rosea* is, nevertheless, essentially a plant of the winter rainfall area of the extreme south-western Cape. This is probably one reason why it has proved amendable to culture in the northern hemisphere. Flowers are borne in February, March or April, according to the locality, altitude and season, and the onset of the winter rains see the commencement of leaf-growth—generally in April or May. The dormant season is high summer. Primarily a plant of the mountains, it is as often to be seen in partially shaded kloofs and along river banks as on the more open stretches of the hillsides. Where the ground is very rocky it grows in deep pockets of soil and, although it may be found where the root-run is more shallow, it grows better in a deep soil.

One of the most important facts which we can glean from observation of the natural conditions under which *Callicore rosea* grows, is that, whether in sun or in shade, there is almost invariably a ground-covering of other plants. Thus the base of the stem and the surface soil are usually protected from the full heat of the sun. It is natural that the greater percentage of self-sown seeds germinate and *continue* to flourish in the moister and cooler places where the ground-cover is sufficient to afford protection. The same thing is noticeable in *Agapanthus*. Seeds may germinate anywhere, but the seedlings often die out on bare ground during the hot weather, leaving those in the moister and often more shaded situations to survive and grow.

While flourishing normally amid the cooler surroundings of vegetation and in situations that are not too dry, *C. rosea* will *tolerate* quite arid conditions in South Africa, with the qualification that its season of leaf-growth coincides with that of our winter rains. Last summer I had occasion to visit a very old and neglected garden attached to a building of historic interest in the heart of Cape Town. Above the dry and stony soil several examples of *C. rosea* were flowering on short stems. Elsewhere, I have seen similar instances of this amaryllid growing and flowering (even if not flourishing) in fairly inhospitable places.

Another interesting fact about *C. rosea* is that under natural conditions the bulbs are frequently unharmed by bush and forest fires. There have been many times when bulbs have flowered from ground which had been swept bare by fire only a few weeks or months before, the bulbs usually being sufficiently low in the soil to escape damage. In fact, Rudolph Marloth held that, not only do the bulbs remain barren for many years when thickly overgrown by bushes and trees, but that they flower profusely after a bush fire. Yet, before accepting this as

being due to the removal of surface vegetation, I should want proof that the heating of the soil by fire had not had some physiological effect on the bulbs.

Although *Callicore rosea* grows wild in the Kirstenbosch Nature Reserve which extends up the eastern slopes of Table Mountain (Plate 164), within the garden proper there are both natural and planted areas of this bulb. So much at home is it that in many places one cannot tell which are the bulbs that have been planted. For the seeds do not lend themselves to storage, and may even germinate on the plant. For this reason, only a minimum quantity of seed is collected at Kirstenbosch for immediate disposal. And the species sets seeds so freely that a large proportion fall to the ground and germinate readily in the undergrowth. This, coupled with natural vegetative propagation, has helped the plant to become "naturalized" from former planted bulbs.

I have in mind the Cycad Amphitheatre—a huge semi-circular slope like the inside of a bowl, extending above and around the Fern Dell. In due season the lower portion of this steep declivity is dotted with the flowers of *Callicore rosea*—both as single individuals and as small groups—irregularly littered above the ground, and in all shades from almost pure white to deep pink.

In this area, apart from the Cycads, species of *Podocarpus, Virgilia capensis,* and tall tree-like shrubs such as *Kigilaria africana* and *Royene spp.,* there is a light ground-cover of smaller shrubs, ferns, *Asparagus* and, in many parts, tussocky grass that helps to retain the soil during the rainy season. The soil is a deep loam, probably the best in the planted portion of Kirstenbosch and, where grassed, it contains a certain amount of surface fibre. The steepness of the slope results in only about a third of the total natural rainfall (average 57 inches per annum) reaching the bulbs; even so, this is considerably more than the soil would retain were the ground free from vegetation.

Any planting or replanting of *Callicore* that has to be done is carried out after the foliage has died down in November, and they usually miss flowering in the first season, but flower in the second season after planting and can be left undisturbed for several years.

In 1936 the foliage died down later than usual. But, of 150 bulbs lifted from the nursery and planted at about six inches deep on December 18th, some 18 flowered on short stems during the following February. It would have been better for the bulbs had they not made this effort.

Under nursery conditions in full sun the bulbs do quite well, but are happier in a situation where there is a light ground-cover when planted out permanently at Kirstenbosch. The best "stand" of *Callicore* at Kirstenbosch is in a position on which the sun does not shine directly during the heat of the day, but it is possible that the excellent results in this spot may be due to a more generous planting of bulbs many years ago, in addition to the fact that some of the best pink forms are to be seen in that area. *Moderate* shade certainly results in longer stems, while the flowers remain in good condition for a longer period.

A soil where the natural drainage is good should always be selected for *Callicore rosea*. It need not be a rich soil. A good fibrous loam would be ideal, but if the existing soil is poor it can be suitably improved by incorporating half-decayed leaves. A dressing of bone meal at planting time will be found beneficial and is to be preferred to the use of farmyard manure.

Overseas, *C. rosea* is generally planted in a position fully exposed to the sun. While this may be applicable to countries and localities where the summer sun is feeble, in a warm garden subject to mild winters and hot sun in summer I would rather plant the bulbs on the edge of thin woodland, not too heavily shaded and on a slope where the drainage is good. What a plant will tolerate and what it prefers are two different things. I go so far as to say that while *C. rosea* can be planted effectively in a shrub-border, in a deep pocket on the rock-garden, it is essentially a plant for a position where it can have surroundings such as we describe by the term "wild garden." To mass it in a formal bed or border loses half the beauty of effect which the plant can give in the right situation. Copy wherever possible the careless wisdom of Nature, choosing a sloping piece of ground which already has a light covering of small plants and shrubs, and plant your bulbs in hap-hazard fashion—a few clusters or drifts here and there, with numerous single individuals which look as if they had grown there from self-sown seeds.

I cannot write from experience of the culture of *Callicore rosea* in America, but understand that its seasons of growth and flower approximate to those in England. September and October are the months when it usually flowers in England, the exact time being partly dependent upon the amount of summer rain. One of the most interesting facts regarding the culture of *C. rosea* in England is that there have been occasions (i. e., after wet summers) when the bulbs have not flowered until April. But, even with the normal late summer and autumn flowering, leaf-production occurs at about the most unfortunate time of the year—i. e., January. The foliage, which is so important to the plant in fattening up the bulb for the next season of flowering, may be damaged by frost or by cold winds. Although the bulbs may be planted deeply in order to escape frost, this possibility of damage to the leaves still exists and may account for many failures with the plant. No remedy can be suggested, except the selection if possible of a warm position in the garden. For this reason, some people who do not have a well-drained slope with a southerly aspect, plant *C. rosea* at the base of a wall facing south. We cannot ignore the fact that such positions, however unnatural they may be, are often unavoidable and are justified by the results obtained.

About half-way through the year the leaves may be expected to die down, after which the main period of dormancy occurs for about three months until September. Although bulbs of *Callicore rosea* in the open ground should not be disturbed until they become overcrowded, when lifting *is* necessary it should be done as soon as possible after the leaves have died down, and re-planting completed immediately or within a few weeks of lifting. If the lifting and re-planting can be finished before the end of July, so much the better.

There are experienced growers of *C. rosea* who maintain that the ground should be soaked twice before the bulbs flower, with an interval of one month between the two applications of water. At the Cape, November, December, January and February are hot and dry. The rains may commence any time between the end of February and the middle of May. While an occasional February rain may occur through thunderstorms or unsettled weather at the stage of transition between summer and winter, as a general rule a soaking *prior* to flowering is rare, except when the flowering season is late. Nevertheless, the object of the grower is to try to improve on Nature's provision for his plants, and under natural conditions there are both good and bad seasons for *C. rosea*. One thing which the bulbs always receive is a thorough ripening, and this is probably the main reason why good results, coupled with a normal season of flowering, are secured overseas after hot and sunny summers.

It is not necessary to set down here a history of hybridizing in which *Callicore rosea* has been a parent. This has already been done by more able hands, and the records are scattered in many publications throughout the world. Suffice to say that *Brunsvigia* and *Crinum* have been the main genera used, and it is of interest to note that all three belong to the tribe *Callicoreae* in the Key given by Dr. Traub in the 1938 Herbertia.

While it is noteworthy that *Callicore rosea* has not yet been crossed with any non-African amaryllid, the fact that the plants with which it has been hybridized by man do not grow within its own geographical area of natural distribution is also a matter of interest. The brunsvigias and crinums are natives of the eastern and north-eastern localities of summer rainfall. Further, those who would believe that *C. rosea* could form natural hybrids with plants growing in close association and flowering at the same season are faced with another peculiarity. For we have *Nerine sarniensis* growing actually *with Callicore rosea* and flowering at the same time of the year. Yet I have neither heard of nor seen a natural hybrid between these two plants. Exactly the same applies to *Haemanthus coccinea,* whose flowering season and locality also coincide with those of *C. rosea.*

Further Notes on Callicore rosea (March 17, 1939). The illustrations, (Plate 164), are from photographs taken by Mr. Creasey on March 12, 1939, and they illustrate the natural conditions under which this plant thrives. Mr. Creasey writes that—

"The bulbs were growing at the edge of the municipal fire-belt which borders a path round Lions Head, which is a spur of Table Mountain. They were on a steep slope facing south and west, at the edge of the belt nearest to the thick scrub of natural vegetation, and even penetrating this in one or two instances. The fire-belt itself has been cleared of all trees except the Silver Tree (Leucodendron argenteum), but it is *not* bare ground. As the photographs show, there is a ground-cover consisting mainly of grass. Although most of the flowers are in full

daylight, the plants are screened at the base of their stems. An interesting fact is that *all* the flowers turned away from the direct rays of the morning sun and faced the scrub—and beyond, the sea far below. Not until about 3 p. m. would the flowers have the sinking sun directly on their open faces.

"In this one patch the flowers were of all colors from almost pure white to deep pink. One specimen had not even the usual pink tinge at the apices of the segments. It was definitely white, with the faintest possible suffusion of pink over the petal surface, on the upper portion of the filaments and at the apex of the style. The pink only became prominent in the dying flower. The base of the flower was lemon, distinctly so when young. In some of the pink forms, the pink gradually spread down the whole of the petals with age, but this does not seem to be a constant feature. Although all color-forms—or at least *many* color-forms—are growing in that one area, this does not remove the possibility of the soil and situation of individual bulbs being partly responsible for color-variation, since natural increase is mainly by seeds and time can to some extent fix a variation and carry it from its source in the form of seeds.

"For the past fortnight large quantities of *C. rosea* have been sold as cut-flowers by the coloured flower-sellers in Cape Town. Sometimes these are from flower farms near Cape Town, but annually the bulk is still collected "in the wild" in defiance of Government restrictions on flower picking. On March 4th, I saw huge quantities on sale. These would be from the lower elevations because at that time there were few, if any, on the mountains this year. The paler pink forms were one dozen stems for sixpence (12 cents). Very deep pink forms were four stems for ninepence (18 cents). One form was pure white except for a touch of pink at the tip of each segment. Another was so deep a pink as to show very little white, the pink suffusion spreading right down the flower into the yellow base."

CALLICORE ROSEA AND BRUNSDONNAS

E. O. Orpet, *California*

The Belladonna Lily, *Callicore rosea, (syn. Amaryllis belladonna* Herbert) is one of the commonest bulbs seen in its season and always in the pink form, and must have been introduced here long ago (Plate 165). We are told by Miss Kate Stanford of South Africa that with them this same species is rarely seen in the pink form but is usually white or pale pink; so there must be variation within the species. When the first white-flowering *Brunsdonna multiflora alba*, a hybrid between *Callicore* and *Brunsvigia,* was brought into California, at least twenty-five years ago, it was highly valued and was used considerably for cross-pollination. The resulting bulbs have been lost sight of since the death of Mrs. Bullard, and we have been unable to trace these, but I saw them in her garden before they were old enough to flower. When after gaining possession of one of these original bulbs imported from Australia—the

one they list there as Amaryllis multiflora alba— *(=Brunsdonna multiflora alba)*—and seeing it flower, with tall stout stems bearing twenty to thirty pure white flowers with a golden base to the throat, the urge came to get more. This was done, and we also added *Brunsdonna Hathor,* the one shown in the foreground of the illustration (Plate 165); also *Brunsdonna Harbord* which with several other white ones we have not yet flowered. The one named *Amaryllis belladonna rosea (=Callicore rosea)* is a great beauty, equally tall and free flowering and greatly surpassing the old type in color and vigor but still rose-pink. All of the bulbs were in flower during August and September; the flowering of each bulb lasting several weeks.

It was always a mystery how the Australians got the breaks to produce such fine variants until we read the detailed story by G. H. Cowlishaw of Sydney, Australia, in Herbertia, Vol. 2, pp. 43-51, 1934. In this article is given a detailed list of the hybridizers back to 1870, and an account of their free use of *Brunsvigia* with the *Callicore rosea* (syn. *Amaryllis belladonna* Herbert). This was most enlightening and shows what was being done so long ago in far-off Australia. Mr. Cowlishaw states that these white hybrids do not come true when selfed, but vary to one or the other of the parents used. We see this here in that many of their offspring are dwarfer in growth than others, but none has flowered here yet.

There is a little difficulty with imported bulbs owing to the change of seasons which has to be adjusted as the two rest periods come together. The difficulty is overcome by giving little water to the rootless bulbs until growth begins.

The culture of the Brunsdonnas is of the easiest here—open ground, hot dry, rest period in the summer with little water, until the rains begin in autumn. The natural increase amounts to about doubling in number, each bulb producing an offset when well established. We have tried cutting at base of the bulbs, but these are different from most, having a fibrous coat between each layer, and we have failed to get increase by this method. Seeds are produced freely by self-pollination and these germinate well, but I am not sure at present how long they take to reach flowering age.

To those interested in breeding amaryllis, I would urge the rereading of the article by Mr. Cowlishaw just referred to, as many genera are mentioned and the work of many experimenters is chronicled. I have had occasion to refer to it many times. Results secured by the breeder of *Callicore rosea* are not as rapid as in the case of Amaryllis (syn. *Hippeastrum* Herbert) and perhaps the field is limited for their outdoor culture, but where severe frost does not occur for extended periods, success may be expected, although the common species should be tried first before the beautiful white varieties of *Brunsdonna* are planted. With established bulbs, one can see and estimate the possibility of increase by offshoots. It is best to lift and separate when signs of growth are still visible, preferably after the flowering period.

E. O. Orpet

See page 222

Callicore rosea hybrids, upper; Brunsdonna, Hathor in foreground, Multiflora Alba in background, lower.

Plate 165

CALLICORE ROSEA FOR THE MIDDLE ATLANTIC STATES AND THE SOUTH

THOMAS FINLEY MARTIN, *North Carolina*

Why *Callicore rosea* Link should be so ignored is one of the interesting sidelights on the mind of the discriminating bulb conscious amateur. That this interesting and beautiful amaryllid is ignored by amateur and professional alike here in the East is a fact is evidenced by the rarity with which one ever sees it grown or offered in the trade.

There are reports of growing this bulb with success outside in New England. It should be comparatively easy therefore in any of the Middle Atlantic States, and a matter of "daffodil ease" in the South. The secret of growing and flowering it over a period of years outside seems to be in a very simple cultural requirement. One should plant the bulbs fairly deep in a moderately rich sandy loam in a position on a south side of a wall or other protection. Then leave the bulb alone until there are so many offsets as to make moving imperative. If the soil about the bulbs can be kept fairly dry during the winter this will be an added help. Those who are more venturesome in their gardening might try variations of this to add to the general knowledge of amaryllid culture. *Callicore rosea* comes from the Cape Country of South Africa and for that reason many persons have probably gotten the notion that it is a plant requiring a long dry resting stage.

In California one finds this beautiful plant flowering in great numbers. It is so common there in fact that the excess bulbs are passed on from one garden to another very much as the usual gardener trades superfluous iris rhizomes. During September and October while driving along the streets it is not uncommon to see masses of this amaryllid in full bloom. The date for flowering would probably be a bit earlier in the east.

For years the writer had read of *Callicore rosea* Link (syn. *Amaryllis belladonna* Herb.) and had wondered about it. Circumstances had made it impractical to attempt to grow any of the bulbs. Then on a recent trip to the West Coast the sight of large quantities of it growing and blooming in great masses created a fitting climax to all the years of waiting to see it. The flowers are very similar in general appearance to the ever popular *Lycoris squamigera*. The color is a clear pink, in contrast to the bluish lavender of the *Lycoris*. There are numerous horticultural forms that vary in color from white to red. The normal form, pink, is the one most commonly found. The rapidity with which the bulbs multiply in California would seem to indicate that the price will not continue to be prohibitive for the average gardener.

I would like to say that I believe the criterion of a real gardener is his willingness to dare make an investment in a plant, upon no other recommendation than its Latin name and description, regardless of the fact that he might entertain considerable doubt as to his ultimate success with it. The sheer adventure of embarking upon a gamble with an unknown plant in the hope of winning the abundant reward of flower-

ing something new is in itself a thrill, that should preface and augment the joy of achievement that comes to the person who has the diligence and persistence of the dyed-in-the-wool horticulturist. One could name offhand a score of good bets in such a gamble of which *Callicore rosea* is only one.

AMMOCHARIS FALCATA

JOHN MARTLEY

Banhoek, Stellenbosch, South Africa

Although *Ammocharis falcata* is not such a showy flower as *Callicore rosea,* the Belladonna Lily, it has sufficient merits of its own to attract attention. It is widely distributed in South Africa but my personal encounters with it in the veld are limited to about half a dozen localities, all flat low-lying ground, within forty miles of Cape Town.

Like many other native bulbs they are never to be found in the veld unless you happen to stumble on them when in flower. A good illustration of this fact is my discovery of a charming little pink *Ixia* (a new species which has been named *Ixia cochlearis).* During the last ten years I have tramped backwards and forwards over the veld close to my place and I fondly imagined that I knew every plant there but to my surprise one day last December a patch of ground about 20 by 40 yards and only 50 yards from my gate was just one mass of a new little pink *Ixia* with the habit of a *Tritonia.* A thing like this recalls to one's mind that old and obsolete theory of spontaneous generation!

Ammocharis falcata is not particular in its requirements. You find it growing in the most unpromising soils; its favourite appears to be that hard gravelly clay sort much favoured by road contractors for surfacing our country roads. The illustration (Fig. 43) shows it growing in such a soil in the rough of the Stellenbosch golf course. In this case the over-all height is hardly 9 inches but in the very light sandy soil of the Cape Flats I have found it up to 2 feet in height with the inflorescence approaching 3 feet in diameter with some 40 or more flowers. There is no doubt that it is a tough sort of customer that can take the rough with the smooth of life. I know of a country road which had been graded over a patch of ground in which a colony of these bulbs lived, and year after year you would see them pushing their way up through the surface of the road. Not so many years ago an energetic divisional council decided to "tar-mac" many of its country roads including this particular one. Was our *Ammocharis* defeated or down-hearted? Not a bit of it, for to my surprise last autumn what should I see but its distinctive double-ranked sickle-shaped leaves pushing up through the thick coating of tarred-chips. In time no doubt these bulbs will give up the unequal struggle against tar-mac and hurrying motor wheels but in the meantime they are still holding out.

My first contact with *Ammocharis falcata* was meeting with a strange porcupine-like ball of spikes some two foot in diameter bowling along before the wind over the Cape Flats one windy day in autumn.

When the seeds are ripe the peduncle breaks off and as the wind blows the dried-up inflorescence about the seed capsules get broken and sow their contents broadcast over the veld. The seeds are rather large but somewhat variable in size and like *Nerine* seeds they start to germinate very soon after they are ripe.

Fig 43. Ammocharis falcata.

I do not know how long seedlings take to reach maturity as much of course depends on the sort of ground the seeds happen on, but from the rate of growth of the young bulbs which I raised from the seeds of that wandering inflorescence described above I should think that one could hardly expect a flower under eight or ten years. Mature bulbs are about fifteen inches in girth and approximately spherical in shape. In the ground the base of the bulbs is about six inches below the surface of the soil. Although this is not deep it is a surprisingly difficult job to dig out a mature bulb without damage owing to the hardness of the ground and the tough hold of the strong root system.

The time of flowering is in the autumn and the flowering stem appears before the leaves. As the seeds ripen the leaves appear with their characteristic double-ranked arrangement and more or less closely adpressed to the ground. They reach their full development during the winter season which is the period of vegetative growth. As the summer

Mrs. J. W. Archbell, Umkomaas, Natal See page 228

Tulbaghia violacea

Plate 166

comes on the leaves die away and the bulb enters a resting period lasting till the following autumn. There is nothing outstanding in the colouring of the flower which consists of a pinkish shading on a more or less white background. On the reverse side there is a dark brownish-pink mid-rib to each segment and the anthers are yellow. The flowers are scented but more pleasantly so than *Callicore rosea* since for me the scent of the latter is a bit too overpowering.

As all my own bulbs are small I am not able to say if *Ammocharis falcata* is a free-flowerer. Judging however from the number of inflorescences in the groups in the veld I doubt if mature bulbs flower every year in the wild state. Under the more opulent conditions of garden life there would be more likelihood of them blossoming forth every year.

Yes, in spite of possessing no very outstanding qualifications *Ammocharis falcata* is quite capable of establishing itself in horticultural society on the merits of its own self.

TULBAGHIA CULTURE

Mrs. J. W. Archbell

Natal, Union of South Africa

The fascinating member of the *Amaryllidaceae, Tulbaghia*, is indigenous in the Cape Province, but grows well in many parts of Africa. I have read of it growing and flowering almost continuously throughout the year as far north as Kenya, and no doubt it would flourish as well in the United States of America. There are two species under cultivation and these will be briefly described—

Tulbaghia violacea is charming (Plate 166); it has narrow strap-shaped leaves, and produces an umbel of eight to twenty clear mauve flowers on a thin strong upright stem that reaches from nine to twelve inches in height or it may be even taller. The only defect is the strong garlic smell. It is extremely hardy and does well in moist low positions in my garden, but also grows on a dry stony hillside among my aloes and succulents. It seems to be free from insect pests that are so numerous and destructive to most South African amaryllids. Possibly the strong onion flavor and smell give the protection.

Tulbaghia fragrans (syn. *T. alba)* has dainty, creamy white flowers, and blooms in spring only. It has a very sweet perfume. Possibly the recurrent blooming habit of *T. violacea* could be secured in combination with the sweet perfume of *T. fragrans* (minus the garlic smell) by making appropriate crosses. This should surely be worth a trial.

AMARYLLIS PROCERA AND GARFIELDII HYBRIDS

Frank Vasku, *Florida*

Amaryllis procera has not been happy so far in Florida probably due to errors in culture. They were placed in soil strong with rotted manure and limestone and wood ashes. In this medium the bulbs began to retrograde. One put out a bloom stalk but it blasted before it opened.

Gradually they were changed to muck with some sand mixed in and they are beginning to respond. From appearances it will be some time before we can hope for bloom.

In July 1937 I received a small bulb of *Garfieldii* hybrid *Amaryllis.* If there was a number on it it got lost. It was put into a 6′ pot and began growing like a weed. In a year's time it had filled the pot with offsets so that it was transferred into an 8′ pot and by this spring this pot too was as full as it could be with the bulb and offsets. Last March the bulb had attained about 3′ size and sent up a two foot spike with four large bells. The flowers were somewhat drooping, of red color with an orange cast to it and a yellowish throat. Before this spike was finished another one was coming up which proved every bit as good as the first. The flowers were almost 8′ across. When it got through blooming 60 offsets were taken from the original bulb. *Truly a wonderful plant.*

At this writing, May 31st, another *Garfieldii* hybrid is open, No. 56. It came during the summer of 1938. It has only six offsets, measures about 2 inches or less; has 15′ stalk with 3 bells, the first of which has just opened today. The flower has an upturned face; orange red in color with a yellow throat (reginae type)—a pretty flower but not in the same class with the one described above.

HEMEROCALLIS IN CALIFORNIA

Frank A. Leach, *California*

Although admirably suited to the existing conditions of most California gardens, *Hemorcallis* are rarely seen in our representative gardens. It undoubtedly suffers from the public's aversion to such technical names and also from the implied slander in its unfortunate popular name "Daylily." Although it has been standby in many gardens since the early days in California, I do not remember having seen it offered for sale until quite recently, and then only by a few nurseries. I regret to say that in these, the blocks of plants offered for sale did not seem to have diminished during the past selling season in spite of the fact that standard varieties were offered at reasonable prices.

The California State Federation of Garden Clubs has featured daylilies in its magazine recently, and other publications are now giving much attention to the new introductions so that it may not be long before daylilies in variety will find their way into our gardens.

A planting of some twenty standard varieties blooming for the first time in my garden this year has attracted much attention and caused much favorable comment. All of which has disclosed woeful ignorance on the part of the public concerning this fine garden perennial. One large clump of *Fulva Europa* growing under the edge of my old apple tree was a glory of sunset hues for a full month. What more could be asked? *Apricot* opened the '38 season with the first bloom on April 20th, followed by *Gold Dust* and a dwarf form of *H. flava* before May Day. *Orangeman* bloomed on the first and *Winsome* on the 24th of May. During June *Amaryllis, Mikado, J. R. Mann, Cressida, Hyperion, Ophir,*

Margaret Perry, Fulva Maculata, and *Anna Betscher* made a fine display. In July, *George Yeld* and *Golden Dream* held the stage while the June bloomers still produced many flowers. The old double *Kwanso* finished the procession for 1938 since several that should have bloomed later did not produce flowers for the first season after planting.

In Central California, especially inland from the Ocean, most varieties are practically deciduous. In Southern California and near the Ocean in the warmer locations, it is advantageous to choose many of the evergreen varieties for their foliage is a distinct asset in the winter garden. In the great central valleys there are times when plants must stand 10 to 15 degrees of frost in the full sunlight, without snow covering, alternating with mild, damp growing weather. These are very trying conditions for any perennial, but daylilies thrive with us.

Burbank worked with daylilies in his earlier days at Santa Rosa. Although seedlings were sold from his nursery, Carl Purdy is authority for the statement that *Calypso* was the only clone introduced commercially from Burbank's endeavors. Although Purdy has sold a variety under the name *Burbank* that he obtained from this grower, the variety does not now exist in commercial quantity. There is in my planting a dwarf growing form of the Lemon Lily which is attributed to Burbank. His greatness lay in his ability to observe such variations and to recognize their value. However, all the romance of his name has not served to popularize daylilies in California.

MILLA BIFLORA

W. M. James, *California*

Since discussing *Milla biflora* in the 1936 Herbertia, I have had reports of it growing nicely in many sections of the United States (Fig. 44). This indicates that the methods of culture and propagation suggested were approximately correct. Seed germinates readily in two to four weeks when planted one-fourth to one-half inch deep in the open ground after danger of frost is over. A few corms may bloom the second year. Most of them do not bloom until the third year, and I have found that they do very well if left in the ground until then. Although the growing plants are tender, dormant plants will probably stand several degrees of frost, especially if the ground is well mulched.

It is absolutely essential to store the corms in shallow trays in a dry place. That cannot be emphasized too strongly because they are especially susceptible to *Penicillium* (lemon mold) and *Rhizopus* (bread mold). The corms should be dried as soon as possible after digging. I have found no better method than that described in the 1936 Herbertia. Small cormlets should not be removed from the mother corm unless they break off very easily. Neither should the old dry corm be removed from the bottom of the new corm unless it comes off very easily. These watery scars and any bruises or scratches made while handling the corms make an ideal place for the mold spores to germinate. I have tried several fungicides, but none proved very satisfactory.

Milla biflora is proving a very easy plant to grow and I enjoy the flowers now just as much as when my first corms bloomed about eight years ago.

Fig 44. Milla biflora

HOUSE CULTURE OF AMARYLLIS

JOHN F. RUCKMAN, *Pennsylvania*

No house plant will give greater returns for the initial cost and subsequent care than hybrid amaryllis. Yet they are not very commonly grown and there is considerable complaint about their failure to flower. They do not thrive on neglect nor do they take the fussing that such forcing bulbs as tulips, hyacinths, freesias and most narcissus do. There are several easily avoided causes for most failures with them—improper potting, careless watering, neglect after blooming and general impatience.

Dormant bulbs should be bought and potted up in November or December though fair success is possible with bulbs potted as late as March. For the beginner perhaps it is just as well to start with the thirty-five or fifty cent bulbs offered in mixture by most seed houses. Once you get the knack of growing them by all means get the higher priced specified colors or if you can find and afford them, named varieties.

For potting soil use two parts of good loam, one scant part of dry pulverized poultry or sheep manure, one part sharp sand and a little bone meal or horn shavings. If cow manure is more convenient it may be used in a little larger proportion. Some discretion is also necessary in the amount of sand used according to the nature of the loam. There should be just enough sand to make the soil loose and friable. As a general rule the diameter of the pot should be one inch greater than the diameter of the bulb. Most of my amaryllis have flourished and bloomed freely for a number of years in four to six inch pots; a few very large old bulbs are in seven inch pots but I have found it best to keep the pot size at an absolute minimum. There are two reasons for this, small pots are much more convenient to handle and place in the average house and no house-grown amaryllis blooms its best until it is thoroughly pot bound. It is the usual practice to put an inch of sand or broken crocks in the bottom of each pot for drainage. I do not do this preferring to use that space for soil and thus keep down the pot size. However this entails much greater care in watering.

The bulb should be set so it is from half to two thirds above the soil in the pot with the level of the soil a half inch or so below the rim of the pot to allow for watering; potted deeper than this damage from over watering is much more apt to occur. It should be given one good watering and set in a warm, light though not necessarily sunny place and watered very cautiously until leaves or a bud appears. After that water every day but still cautiously and never under any circumstances so heavily that water will stand in the saucer under the pot for more than an hour after watering.

After blooming as vigorous a growth as possible should be encouraged and as soon as danger of frost is past the pots should be plunged to their rims in the soil out doors in a spot where they will get at least half a day of sun light and are sheltered from high winds. It is well to put a small flat stone or piece of tin under the drainage hole of each pot to prevent the roots from striking down into the soil. Before frost in the fall they should be brought inside, preferably to a window sill in an unheated but frost proof outbuilding or cellar where they may remain, watered just enough to keep from wilting, until freezing weather sets in. Many amaryllis will have a second crop of bloom during the summer and a few may bloom three or even four times a year. As a general thing when buds appear in summer it is just as well to bring the plant inside while it is in bloom to prevent storm and insect damage. Some hybrid amaryllis are naturally deciduous and some naturally evergreen. I think it is best to let each bulb follow its own inclination in this. Those bulbs whose foliage turns yel-

low and dries off after lifting in the fall should be put in a warm cellar and watered hardly at all until signs of renewed growth appear, usually some time in December. Those that retain their foliage should be kept in a warm, light place and watered just enough to prevent wilting until buds or new leaves appear. At the first sign of renewed growth they should be set in the warmest, sunniest window available where they should remain until they go outside for the summer.

Amaryllis resent having their roots disturbed and should not be repotted any oftener than absolutely necessary. Late in the fall when they are dormant or most nearly so I knock them from their pots and crumble off as much of the old surface soil as possible without disturbing the roots. In a healthy bulb the lower part of the ball of roots will be so dense that no soil can be crumbled off. Put half an inch of new soil in the bottom of the pot and return each bulb to the same pot it was in before, tamping fresh soil between the root ball and the sides of the pot and lightly covering any roots that may be exposed on the surface. Thus the bulbs are raised a little in the pots each year but the roots are not disturbed and the pot size is not increased until after three or four years or even more it is impossible to get them back into the same pot and a slightly larger one must be used. Some bulbs are eventually literally sitting on top of the soil with only their roots buried but continue to bloom as freely as ever. More drastic treatment or disurbance of the main ball of roots is only advisable when there seem to be a large number of old dead roots which need removing, which should not be oftener than once in four or five years. It is just as well to remove the old dry outer scales from the upper part of the bulb from time to time. They are untidy looking and make a harbor for thrips, the only really serious amaryllis pest I have encountered. Thrips flourish indoors and can pretty thoroughly ruin an amaryllis if not promptly discouraged. They can be eliminated by weekly sprayings with Black Leaf 40, one half teaspoonful to a quart of soapy water as hot as you can hold your hand in. It usually takes a course of about eight very thorough sprayings to do it however.

Amaryllis are heavy feeders and although a newly potted bulb needs no extra feeding for the first six months or so established bulbs, especially when grown in small pots, do much better for constant rather heavy feeding. As soon as the buds appear I give weekly waterings with manure water diluted to the color of weak tea until the buds show color; from then until the blossoms fade it is withheld. When the blossoms have faded I resume the weekly feedings, usually with manure water but occasionally with commercial general purpose fertilizer until the bulbs are set out for the summer, then every ten days or so through the summer. No feeding is necessary or advisable from the time the bulbs are lifted in the fall until new growth starts again.

When amaryllis are grown in the house it is necessary to turn the pots halfway around every week or ten days so that first one side then the other of the plant will get the sun. Otherwise the foliage gets to leaning toward the light and is apt to get so lopsided it is no longer able to support itself and flops about in an untidy manner. From the time

the buds are about four inches high until the bloom is faded the plants should be turned every day. Amaryllis buds have a very strong heliotropism and develop so rapidly that a bud will grow so crooked if left unturned two or three days in bright weather that it has to be staked to be straightened. Turned daily, the buds grow straight up and never need staking.

Amaryllis almost always bloom the year they are planted but very often fail to bloom the following year. They have put so much strength into forcing that first season's bloom without roots then into growing an entire new root system that only a very vigorous bulb or one growing under the most favorable conditions can also form buds for the next season's bloom. A great many people not realizing this lose patience and give up trying to grow amaryllis. This is a great pity for they almost invariably bloom the third year and there is no comparison between the forced bloom on an unrooted bulb and the bloom on the same bulb when rooted. As an example, two years ago I bought a bulb of a highly recommended named variety. It bloomed promptly enough but the quality of the bloom was rather disappointing. The blossoms which were supposed to be extra large were smaller than those on most of my run-of-the-mill bulbs and the color was fady. Last year, as is so often the case, it did not bloom but this year it even surpassed its originator's description—the blossoms were half an inch larger than specified and the color was superb.

These methods, of course are entirely for handling a few bulbs for household use in the north. Greenhouse culture or culture in pots farther south where the outdoor growing season is longer would doubtless be quite different. Probably most bulbs would do well enough with less feeding but I have found that extra feeding is more than paid for in quantity and quality of bloom; such drastic root crowding may not be necessary, however I have seen more amaryllis that have failed to bloom because they were over potted than for any one other cause. That all but two of my twenty-four hybrid amaryllis have bloomed so far (February 10) this winter with two to eight blooms to a bulb and many of them also had bloomed last summer makes me feel that this method cannot be far wrong.

AMARYLLIS CULTURE IN MANITOBA

R. W. Kenney, *Manitoba, Canada*

Is there any basis for this statement,—"If the plant is not pot bound, the bloom will be at the expense of the bulb?" (Heaton, 1st Vol. of Herbertia). Does rest or ripening or these other terms used commonly to excuse the abuse of the amaryllis for the commercial convenience of the grower under glass, really mean what they say?

One is used to the expression ripening of wood in relation to shrubs. One thins out the growth to the main stems and as a result the following crop either of blossom or fruit or both is increased. We are told by com-

mercial growers that this thinning out allows the air and sun to ripen the wood. What really happens is we have decreased the load on the same amount of root growth so we increase the crop.

Now the drying off of the amaryllis bulb gets it under the bench, and so allows room for another crop to be grown under the same glass and thus overhead is cut down, the turnover is increased.

But what happens to our bulb. We have bloomed it, and we have a shrinkage in the bulb of one half to one third in bulk. How will this be replaced? If not replaced no bloom will result the next season. Mr. Diener says that his bulbs do not require drying off, they may bloom at any time, that is more than once a year. Have these two statements any relation? I am inclined to think they have.

We find that the iris rhizome that makes side rootlets from the main roots will bloom the following Spring and the one that fails to do this does not bloom. Those who have sunken potted amaryllis bulbs will have seen roots growing over the rim of the sunken pot and that these escaped roots have lateral rootlets and a mass of them. The plants that do this are invariably in splendid health and are sure bloomers the following Spring.

So again one is forced to the simple conclusion that the better the root growth the better will be the resulting bloom crop. The bulb may stand the abuse of ripening, drying off and under potting, but instead of these being cultural beatitudes they are abuses of a very fine tolerant bulb.

The Bureau of Plant Industry at Washington has advocated seven and eight inch pots. Their results speak for themselves. Barrs in London say that with moist bottom heat they get a good growth of green straps with their bloom. After the growth is well started the bottom heat is discontinued. My own experience is that if moderate watering is continued instead of drying off there is usually a leaf growth that keeps pace with the growth of the bloom scape.

One other thing should be done to attain a lusty bulb. Repotting after the bloom scapes have withered. It is at this time replacement of the loss of substance will take place and hence the renewed food supply. This is becoming general practice as the amaryllis is better understood. It is however not new, as an old bulb book by Fish strongly advocates this.

The Bureau of Plant Industry at Washington in its bulletin on offsets says that the offset should be separated by disentangling the roots from the bulb roots. This is done each year as a healthy bulb usually makes one or two offsets. This would mean repotting of the old bulb each year. But in the bulletin on culture of the bulb, repotting is advocated at intervals of five years only.

DAFFODIL NOTES: VARIETIES, MECHANIZATION OF BULB INDUSTRY, AND BORON IN BULB NUTRITION

JAN DE GRAAFF, *Oregon*

It is almost impossible to attempt to give a coherent report on activities in the daffodil world during 1938 and 1939. Both in this country

as well as abroad, the number of shows is still increasing. So many new varieties are being shown that my correspondents in England and Holland say it is impossible to make a critical appraisal of them. The special show reporters for such trade papers as the Dutch "Bulb Growers Weekly" and the English "Horticultural Advertiser" also mention in their reviews that the number of novelties shown is such that it confuses even the expert. Obviously the task of selecting good varieties for the American gardening public devolves on the American growers and they have not taken this responsibility lightly.

A visit to the major bulb fields on the Pacific Coast during flowering time convinced me that the growers here are well aware of the opportunities that they can find in the selection and propagation of new varieties. It must be remembered that in most gardens the daffodils are neglected for the largest part of the season. They often have to compete with a rank growth of weeds or with annuals planted over them. Obviously only the strongest and more prolific varieties will survive this treatment. Another consideration for growers in this country is that as yet the demand for high priced novelties is very limited. Distributors prefer to keep varieties listed over a period of years and are not apt to make many changes. With this in mind, it is quite understandable that a variety like *King Alfred,* now in its fortieth year, is still by far the most popular flower at all shows in this country. *Fortune,* some twenty years old, is beginning to gain recognition with others than the few advanced amateurs who have already grown it for several years. *Beersheba* and *Aerolite,* both some fifteen years old, are now listed in most catalogs and have gained recognition at all shows. It is plain that many years must elapse before we know if a variety has sufficient stamina to be universally popular. It should be sturdy, a rapid grower, and plant and flower should both have good proportions. For the varieties with colored cups it is very important that they retain their color even in the full sun. All daffodil breeders have put great emphasis on perfect form, yet the public reaction to some of the more informally shaped flowers has been very favorable. I believe that in this direction some very good work could be done. Hybridizers should remember that while a perfect saucer-shaped and flat perianth may to them be a sign of great refinement, the public like flowers of more loose conformation which can be used to better advantage in flower arrangements. The great popularity of *Triandrus* hybrid *Thalia* and of Incomparabilis *John Evelyn* prove my contention. Other flowers that have a pleasing informality are *Delaware,* a new Leedsii type brought out by our firm, and *Florida,* a giant Incomparabilis of very good coloring and huge size.

The mechanization of the daffodil industry on the Pacific Coast is progressing. New machines to harvest the bulbs are being perfected and already we have on our farms one which harvests three acres of daffodils during a day of nine hours and puts them free from soil into trays. Other machines are now available which will plant the bulbs at a rate of one and a half acres per day, and together with the motorized cultivators these machines make mass production of bulbs possible at very low cost. I do not doubt that the same methods could be used for the

Harry L. Stinson

See page 238

Bomarea caldasiana

Plate 167

mass production of amaryllids and will be an essential factor in the popularization of these plants.

Workers at the North Carolina Experiment Station and the Federal Department of Agriculture have recently reported on the result of two years' work with boron. They have found that three pounds of the material mixed with commercial fertilizer and applied at the rate of 1000 pounds per acre increased the blooming of daffodils from 10 to 25%. Experiments conducted during the first year showed that an acre of bulbs that averaged 56,000 blooms without boron, gave 65,000 blossoms when the three pounds of boron were added to the soil. The same bulbs were replanted the second year and gave 70,000 blooms on boron-treated soil and only 56,000 on untreated soil.

BOMAREA CALDASIANA

Harry L. Stinson, *Washington*

Bomarea caldasiana (Plate 167) has been under cultivation so short a time that very little is known about its requirements. Some three years ago five plants were brought up from San Jose, California and placed in a cool greenhouse. At first they were placed in full sun, but they quickly showed that they did not like their location. After some puzzling over them for a while it dawned upon me that their climbing and trailing tendency gave a hint as to their culture. So the pots (6 inch) were placed so that they were in constant shade and cool, and the vines were allowed to climb up over the other plants or were tied up nearer the glass. The vines seem to stand considerable direct sun without injury.

During the winter months, October to February, they are given less water and they enter a semi-dormant stage, no growth is made and they stay evergreen. With the coming of spring they start into more active growth and during May and June they burst into bloom. The flowers are borne in terminal clusters of eight to ten tubular flowers. On the outside they are orange-red, and yellow on the inside of the petals, dotted with maroon dots. They stand up quite well as a cut flower. Ordinary rich soil was used in potting.

To date the writer has eight species of *Bomarea* as seedlings under observation.

(Amaryllis Hybrids—Lancaster; continued from page 205)

ALIPUR BEAUTY: (*A. stylosa* x *A. reticulata striatifolia, Mrs. Garfield*); foliage dark green, stripe down centre of leaf narrow and white, length 15 inches, width 2 inches; flower spike 15 inches high, four-flowered, individual flower four inches in diameter, petals 1¼ inches wide, colour deep carmine pink slightly lined, the base of the tube pale green, each petal with a distinct white band, those of the central and two outer petals extending to the tips but the inner two reaching half way, filaments pink and pollen cream. The back of the petals very much darker pink, and the tube short.

7. HARVESTING, STORAGE AND FORCING

DAFFODIL FORCING DEMONSTRATIONS IN HOLLAND

JAN DE GRAAFF, *Oregon*

An interesting demonstration of the effect of special treatment of daffodils was made by Dr. Volkersz, who is in charge of the Government Horticultural School at Lisse, Holland. On November 28th, (1938), he showed a group of pots of *Narcissus incomparabilis Helios*. The bulbs had been lifted on July 23rd. On arrival at the school (July 26th) the bulbs were divided into three lots. The first of these was first stored for six days at a temperature of 95 degrees and then at 48 degrees. By the middle of September the foliage was up about two inches and the bulbs were planted in the greenhouse which was kept at from 63 to 68 degrees. The second lot was also given the six days of 93 degrees, but after that the bulbs were immediately potted and kept in storage until the foliage was up some three inches after which the pots were brought into the greenhouse which was kept at 68 degrees. The third lot was given a storage temperature of 48 degrees and kept at this temperature until the bulbs were brought into the greenhouse which also was kept at 68 degrees. On November 28th the first lot was in full flower, the second lot was beginning to flower and apparently a few days later, the third lot hardly showed its buds.

It was therefore clearly demonstrated that a high temperature immediately following the lifting of the bulbs can be very beneficial. This test was made with the variety *Helios*. Other varieties react differently and further tests are being made. Members of the American Amaryllis Society when traveling abroad should not miss the opportunity of calling at the school and seeing the very interesting work that is being carried on there.

(Propagation—James; continued from page 206)

Results from these trials are definite enough to warrant further experiments. Experience has proven that cuttings of various kinds of plants require treatment with different strengths of the hormone solution to get best results. Therefore it is very probable that seeds of various kinds of plants will require treatment with different strengths of the hormone in powder form.

At the time of writing this I note that Merck is advertising "Hormodin" powder in three strengths. I am also finding out that watering newly rooted cuttings of certain woody plants and young seedlings of certain plants with a 1 to 1 million solution of Vitamin B-1 promotes faster root action. Science is progressing so fast that it is hard to keep up with it.

8. THE SOCIETY'S PROGRESS*

SECRETARY'S MAIL BAG

Mr. Cecil Houdyshel of Laverne, Calif., reports that the 1939 Fall Amaryllis Show of the Society, held in conjunction with the Los Angeles County Fair at Pomona, Calif., was a real success, bigger and better than before. Mr. Houdyshel is the Society's representative in managing and advising for this event. The heat and humidity were unusually high during the show, he reports, truly "unusual," even for California

Special mention is made of the plans now being laid for the 1940 National Amaryllis Show, which is scheduled for Southern California, in charge of a committee headed by Fred H. Howard, Herbert Medallist, and pioneer amaryllis breeder.

Mr. E. J. Anderson of Palm Beach, Florida, a recent addition to the Society's rolls, has become a real supporter of the Society's ideal of introducing new and rare amaryllids into cultivation. He imported a large collection of the rare "Blue Amaryllis," *Amaryllis procera,* from Brazil, and reports considerable success in getting them to grow, although he has had no flowers at the last account. He presented two of the long-necked bulbs to the Society.

Mr. Anderson sent a letter to the Secretary's office from his collector, Harry Blossfeld, in Brazil, who states that *Amaryllis procera* is cultivated "very well in the open" by him at Sao Paulo, "except during and after the flowering season, when they suffer from the rains." Mr. Blossfeld states that he protects the bulbs with hotbed sash during this period to avoid rotting of the bulbs. He takes care to give the bulbs plenty of air circulation.

Dr. A. B. Stout, the daylily specialist, spent the summer in Europe, and was scheduled to give a lecture for the Royal Horticultural Society on Daylilies, his specialty, early in September, when War intervened, and the writer has not heard, but presumes the engagement was cancelled.

Dr. A. B. Stout writes that the late Mr. T. L. Mead's daylily, "Chrome Orange," blooms in New York from May 29 to June 17, according to observations at the New York Botanical Garden. On another subject, he adds that he does not consider *Hemerocallis fulva* var. *rosea* the "best of the rosy-pink daylilies."

In the passing of Major George Churcher at Beckworth, Lindfield, England, in December, 1938, the Society lost one of its most loyal Eng-

*The material in this section was prepared by the wide awake Secretary of the Society, Mr. Wyndham Hayward. The Society has been most fortunate in being guided through its infancy and now to a robust coming of age by the brilliant and unselfish Secretary whose interest and enthusiasm never lag. We all owe him a very great debt of gratitude for a very difficult task exceedingly well done.—*Hamilton P. Traub.*

lish members and supporters, who will be not easily replaced in British horticulture.

Lt. Col. C. H. Grey in his book, "Hardy Bulbs," a remarkable three volume work of which the second volume includes the amaryllids, mentions *Hippeastrum equestre* (*Amaryllis belladonna*) as having been found in Burma, without definite citation or reference. In connection with this Mr. A. Worsley writes that he has bloomed bulbs of this amaryllid, a native to America, which came to him from West Africa, gathered there by a noted botanist. He presumes they were borne there by the sea or birds.

The Society is very much interested in new contacts with South American botanists and horticulturists, or persons living in the countries of Latin America having an interest in the growing and collecting of new and rare amaryllid bulbs and seeds. Let us hear from you.

Mr. J. R. Sealy advises that as the result of Mr. Milne-Redhead's researches, it has been determined that *Amaryllis longifolia L.*, is the same as *Ammocharis falcata* (Jacq.) Herb., but that the plant is not an *Ammocharis*, actually, and hence must be put in a new genus. The new name is to be published in the Journal of the Linnean Society of London. However, Mr. Sealy advises that the plant we know as *Crinum longifolium* is not the true *Amaryllis longifolia* of Linnaeus. *Crinum longifolium*, the familiar garden subject, now becomes *C. bulbispermum*, we understand from Kew.

Mr. Sealy also writes the important news that he now considers *Crinum amabile* and *Crinum augustum* synonymous, the prior name having the best standing. This is, he writes, "a plant whose origin remains a mystery, and which may well be a hybrid as Herbert suggested." This is of interest to the Southern gardener, who often grows huge clumps of the C. amabile as the "Big Milk and Wine Lily."

Mr. A. Worsley mentions in letters his difficulties with an arid gale lasting 3 days at his home on the Isle of Wight, which in the winter of 1938-39 brought 11 degrees of frost and damaged or destroyed many tender and tropical plants, this having been the worst spell of winter weather in 40 years at Ventnor.

According to Mr. Worsley, the late W. Watson, director of Kew, originally proposed establishing a new genus or sub-genus for *Amaryllis procera*, in Mr. Worsley's honor, because he first made the bulb to thrive in cultivation in England. Mr. Worsley made a special visit to Brazil more than 30 years ago to study this plant in its native habitat, near Petropolis. Mr. Worsley published a note on *Amaryllis procera in* 1929 in the Gardeners Chronicle, with detail drawings of seeds, etc., based on his observations.

Mrs. Charles E. Wait of Coconut Grove, Florida, reports in March, 1939 the first blooming of a bulb of the Garfieldii hybrid amaryllis distributed to her and others by the Society some years earlier. These are

a specially well adapted strain for garden and pot culture, characterized by ease of handling and good colors and vigor. Mrs. Wait writes she is much pleased with her bulb, "after two years of nursing it, during which time it reached a diameter of 3 inches, and put out seven offsets. Very gorgeous it is, indeed."

Mr. Julian A. Steyermark, Assistant Curator of the Herbarium at the Field Museum of Natural History, Chicago, writes some interesting experiences about collecting bulbs of *Hymenocallis occidentalis* as far west as Missouri, where he states it is "fairly common in the southeastern Missouri lowlands." This species is also known from Tennessee and Georgia.

The annual Narcissus Show of the Westbury Horticultural Society, under the auspices of the Holticultural Society of New York, will be held at 598 Madison Avenue, April 25 and 26th, 1940. Further information may be obtained from the Secretary of the H. S. of N. Y., at that address.

Messrs. R. Wallace & Co., Ltd., of Tunbridge Wells, England, is one of firms taking a leading interest in the newer and finer daylilies in England. They write that their firm was the introducers or originators of the varieties *Aureole, Luteola, Golden Bell,* also *H. aurantiaca* and *H. aurantiaca* var. *Major.* They report growing many newer American varieties, including Dr. A. B. Stout creations from the New York Botanical Garden, and express the belief that interest in these forms will be increasing steadily in Great Britain from now on.

This note will serve to announce to the world the baptism of a new horticultural variety of Crinum, namely "Crinum X Wormley Bury," which has an interesting history. It was hybridized on a plant in the private collection of Major Albert Pam, in England, and is named after his famous country estate. The seed was sent to the American Amaryllis Society in Winter Park, Florida and there grown on the blooming size in 1939, when it was found to be a superior type to the common White *C. Powelli album* in some particulars, and much better than the less known *C. Powelli* var. *Haarlemense,* which it most nearly resembles. It is white with a faint pinkish blush.

Mr. O. Mohr, florist grower of Glostrup, Denmark, writes some interesting statistics regarding his venture in the greenhouse growing of amaryllis in ground beds. He has four greenhouses, with 15,000 white amaryllis seedlings, and 200,000 bulbs of other hybrid amaryllis. He states that he is selecting 100 of the best types for propagation into a wholesale stock of some 100,000 or more, eventually after some years.

Mr. S. Percy-Lancaster, leading Indian horticulturist, who receives the Herbert Medal this year for his work with *Cooperia-Zephyranthes* hybrids and his interest and research with amaryllis and crinums, reports that his original Cooperanthes crosses were made "both ways," "*Cooperia* on *Zephyranthes* and *Zephyranthes* on *Cooperia*," using *C.*

pedunculata and *C. Drummondii*, and various *Zephyranthes* species. The seedlings were then fertilized with pollen from *Zephyranthes*, he adds, so that the present race has more *Zephyranthes* blood than before.

Dr. G. Steiner, Principal Nematologist of the Division of Nematology of the U. S. D. A., sends an interesting leaflet on "Nematodes infesting Red Spider Lilies (*Lycoris radiata*)." This is the plant commonly grown in the Southern states as *Nerine sarniensis* (Guernsey Lily). Such pests of amaryllids are not very common.

Mr. L. B. Creasey, of the Parks and Gardens Department of Cape Town, Union of S. A., advises that the three types or species of *Hemerocallis* commonly found in Capetown gardens are the familiar *H. flava, H. citrina* and *H. fulva Kwanso* (double). *H. fulva*, the tawny old-time favorite, is also known, but very little is observed of the modern hybrid forms.

From the Right Hon. J. C. Smuts, Prime Minister of the Union of South Africa, distinguished World War General and notable amateur botanist, the Society has received the information that the General "has read your 1938 Year Book with much pleasure, and compliments you on the very high standard of Herbertia. Gen. Smuts is a warm admirer and personal friend of Dr. J. Hutchinson, of Kew Gardens, 1939 Herbert Medalist. Gen. Smuts' letter adds that he "has a very high opinion of Dr. Hutchinson and his work," and "very much appreciates the action of your Society in awarding its William Herbert Medal to Dr. Hutchinson, and thinks this action is most amply justified." "The systematic work of Dr. Hutchinson," the letter continues, "is of the highest order, and is probably the most important contribution made to phylogenetic systematics in our time."

SECRETARY'S MESSAGE

The publication of the significant 1939 Herbertia marks the close of another successful year in the history of the American Amaryllis Society, in spite of the obstacles of financial stress, wars abroad, and general economic difficulties so prevailing in the world of today.

The officers of the Society feel that in the compilation of this remarkable yearbook, with its main theme concerned with the South African amaryllids, this organization has produced another work worthy to rank with its predecessors. Only those who have attempted to guide the ship of plant society progress through the troubled seas of recent years, know the exhaustless inspiration, the diligent and tireless application, the long hours of midnight toil, and the persistent search for the right article and the best illustrations that have been required of the Society's veteran editor, Dr. Hamilton P. Traub. His zeal for scientific and general information and the spreading of the truth to others in the Society's chosen field, has never flagged in the long seasons since our organization came into being more than six years ago. Sometimes

when most amazed and confounded by his insuperable will and energy, the other officers of the Society feel like paraphrasing the ancient Roman gladiator's cry, "We who are about to collapse, salute thee!"

Besides the distinguished contributions to the 1939 Herbertia, offered in this issue, the Society can point to a steady increase in interest in the field of the amaryllids. However, it is indeed regrettable that the present War in Europe has brought a cessation of activities and cooperation at leading horticultural and botanical centers by necessity. We all hope for a speedy return to more normal conditions as soon as this is humanly possible. Such international military stringencies are the greatest handicaps to progress in gardening and general horticulture, especially as affecting the more specialized fields such as our Society's.

In 1939 the Society can look back to a highly successful National Amaryllis Show in Jacksonville, Florida, held in cooperation with the Jacksonville Circles of the Garden Club, an organization which has long taken a real interest in the promotion of amaryllids, daylilies and alstroemerias as decorative plants for Southern gardens.

The Society regrets the resignation of Mr. R. H. Gore of Fort Lauderdale, Florida, late in 1938, as Executive Secretary, since which time all secretarial work has been handled through the writer's Winter Park office. Mr. Gore served the Society efficiently and well during a difficult period of its history and has been voted the thanks of the directors. His many business interests made it impossible for him to give the work his undivided attention.

The Society has lost two of its directors by death in the last year, Richard Diener of California and Al. G. Ulrich of Missouri. Their families and friends are extended the sincere sympathy of the officers and members of the Society, to which they rendered valuable service in the years past. Mr. John T. Scheepers, who served on committee posts of the Society and was outstanding in his work as importer of commercial strains of fancy hybrid amaryllis, daffodils, etc., was another member lost to the Society through death in 1938.

With a sincerity undimmed by years of repetition, the secretary sends out his annual plea for continued support and cooperation of the members and friends of the Society in the coming season, especially as regards the prompt payment of dues and other help. The secretary hopes that all the members will continue to think of the Society as their very own, to send in reports of their adventures with amaryllids.

WYNDHAM HAYWARD,
Secretary.

Lakemont Gardens,
Winter Park, Florida,

October 1, 1939.

NOTICE OF 1940 NOMINATIONS

To the members of the American Amaryllis Society:

As provided by Article 5, Section 1, of the By-Laws of the American Amaryllis Society, which specifies that the secretary shall send to all voting members, not less than 90 days before the date of the annual election, a list of the offices to be filled and the names of those whose terms expire, this information is hereby incorporated in the data below, and same will take the place of a mailed notice to the members to this effect for the 1940 election:—

President	Mr. E. G. Duckworth
Vice-Presidents	Mr. T. H. Everett.
	Mr. E. A. McIlhenny
	Mr. Fred H. Howard
Secretary	Mr. Wyndham Hayward
Treasurer	Mr. R. W. Wheeler
Director-at-large for 3 years	

Article 7, Section 1 of the Constitution, provides that any voting member may submit to the Secretary, not less than sixty days before the annual meeting, nominations for officers and directors. These shall be submitted to a nominating committee, who shall select the candidates for the final ballot.

The Annual Meeting of the Society in 1940 will be held on the second Wednesday in April, as provided by Article 10, Section 1, of the Constitution, this being April 10, 1940. Therefore the names of nominees must be submitted by the voting members to the Secretary before February 11, 1940.

WYNDHAM HAYWARD,
Secretary.

October 1, 1939,
Winter Park, Florida.

The Secretary would like to take this opportunity of calling to the attention of members again the desirability of adding new members and enlarging the field of the Society by bringing it to the attention of horticulturists and garden lovers everywhere. The 1939 Year Book, we hope, will be considered a notable example of the Society's constant efforts to bring together the latest research, the newest accurate and useful information and interesting illustrations concerning the important amaryllis family. The income of your Society is used solely for the publishing of its Year Book, the holding of Amaryllis exhibitions, and generally supporting the other worthy aims of the organization.

REPORT OF TRIAL COLLECTIONS COMMITTEE

The Trial Collections Committee reports the following accessions to the Society's collection of plants and bulbs since the 1938 yearbook report was published. A number of members of the committee having greenhouse facilities for the growth of tender plants and bulbs, and the United States Department of Agriculture are cooperating with the Society in this work at present.

Members are urged to remember the Society with trial lots of rare bulbs or seeds in its field when this may be possible.

A-256—Seed pod of *Pamianthe peruviana*, from Maj. A. Pam, Wormley Bury, Broxbourne, Herts., England.

A-257—Seeds of unknown amaryllid collected in San Luis, mountain country, by J. R. Baez, February, 1938, received from Alberto Castellanos, Buenos Aires, Argentina; received in May, 1938.

A-258—Bulbs of yellow-flowered amaryllid collected near Santa Rosa Prov. of San Luis, received in May 1938 from Jose F. Molfino, Buenos Aires, Argentina.

A-259—Seeds of amaryllid, identity unknown, collected in dry state near Gobernacion del Neugue, received from Jose F. Molfino, Buenos Aires, Argentina.

A-260—Bulblets of *Amaryllis reticulata* var. *striatifolia*, from Mrs. J. Norman Henry, Gladwyn, Penna.

A-261—Bulbs of a yellow *Zephyranthes* (?) species received from E. N. Blake, Laredo, Texas.

A-262—Bulbs of two *Leucojum* species, or varieties of same, probably near *L. vernum*. Received from Cecil Houdyshel, LaVerne, Calif.

A-263—Bulbs of *Amaryllis ambigua* (possibly near *Amaryllis solandriflora* var. *conspicua*) from Cecil Houdyshel, LaVerne, Calif.

A-264—Bulbs of *Hymenocallis* species, from Cecil Houdyshel, La Verne, Calif.

A-265—Tubers of *Alstroemeria chilensis*, received from H. L. Stinson, Seattle, Wash.

A-266—Bulbs of *Leucocoryne ixioides odorata*, from W. M. James, Santa Barbara, Calif.

A-267—Bulbs of *Hymenocallis* species, probably *H. occidentalis*, collected near Cordele, Ga., from Mrs. J. H. Churchwell, Jacksonville, Florida.

A-268—Bulbs of *Ammocharis coccinea* from the United States Department of Agriculture.

A-269—Bulbs of *Nerine falcata, N. lucida, N. flexuosa, Crinum crispum*, received from R. A. Dyer, Pretoria, Union of South Africa.

A-270—Bulb of the yellow-flowered *Cooperia Smallii*, from Mrs. W. D. Diddell, Jacksonville, Florida.

A-271—Two crinum bulbs, possibly Burbank hybrids, from Cecil Houdyshel, LaVerne, Calif.

A-272—Seeds of *Callicore* hybrids, including *multiflora rubra*, *X Hathor*, and *multiflora alba*. Received from E. O. Orpent, Santa Barbara, Calif.

A-273—Tubers of *Alstroemeria* species, from H. L. Stinson, Seattle, Wash. (including the rare *A. ligtu*).

A-274—Seeds of *Crinum Knightii*, received from Major A. Pam, England.

A-275—Seeds of fancy exhibition types of hybrid *Amaryllis*, from private collection of Baron Bruno Schroeder, England, received from Maj. A. Pam, England.

A-276—Seeds of *Habranthus texanus*, from Mrs. Rufus McIlhenny, Avery Island, La.

A-277—Seeds of *Pamianthe peruviana*, received from Maj. A. Pam, England. (Donated to Division of Plant Introduction and Exploration, U. S. D. A., Washington, D. C.)

A-278—Bulbs of *Amaryllis procera*, from E. J. Anderson, Palm Beach, Florida.

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1939-40

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*This committee makes recommendations to the Board of Directors for the annual award of the *George Yeld Memorial Medal.*

PUBLICATIONS OF THE AMERICAN AMARYLLIS SOCIETY

A complete file of HERBERTIA, the year book of the American Amaryllis Society, is indispensable to all who are interested in Amaryllids. A limited number of copies of the following are still available:—

Volume 1 (1934). Containing the biography of Henry Nehrling, and many valuable articles on amaryllids; with a portrait of Henry Nehrling and 16 other illustrations; a total of 101 pages.

Volume 2 (1935). Containing the autobiography of Theodore L. Mead, and many excellent articles on varieties, breeding, propagation, and culture of amaryllids; with portraits of Theodore L. Mead and David Griffith and 18 other illustrations; a total of 151 pages.

Volume 3 (1936). Containing the autobiography of Arthington Worsley, and important articles on description, genetics and breeding, physiology of reproduction, and amaryllid culture; with 3 portraits of Arthington Worsley, one color plate and 30 other illustrations; a total of 151 pages.

Volume 4 (1937). Containing the biography of William Herbert; the reprint of Herbert's essay, on Crosses and Hybrid Intermixtures in Vegetables; Dr. Darlington's essay, The Early Hybridizers and the Origins of Genetics, and many important articles on description; cytology, genetics and breeding; physiology of reproduction, and amaryllid culture; with two portraits, forty-four other plates and three figures; a total of 280 pages.

Volume 5 (1938). Containing the autobiography of Ernst H. Krelage; the history of amaryllid culture in Holland by Ernst H. Krelage, Dr. Uphoff's important article in which the name *Hippeastrum* is rejected; a revision of the tribes of the Amaryllidaceae; and the species of Amaryllis; outstanding articles on forcing amaryllids by Dr. Grainger and Prof. Dr. van Slogteren; and many other articles on description, cytology, genetics and breeding; physiology of reproduction, and amaryllid culture; with 33 plates and 2 figures; a total of 218 pages.

Volume 6 (1939). Dedicated to the Union of South Africa, and containing articles on South African amaryllids, including the history of botanical exploration for amaryllids in South Africa, the distribution of South African amaryllids in relation to rainfall, and a review of the Genus *Agapanthus* by Frances M. Leighton; a review of the Genus *Cyrtanthus*, with many excellent line drawings, by Dr. R. A. Dyer; other articles—*Zephyranthes* of the West Indies by Dr. Hume; the Tribe *Gilliesieae* by Dr. Hutchinson; rating of daylilies for garden value by Mr. Kelso; daffodil articles by Jan de Graaff, and many other items on description, cytology, breeding, propagation, and amaryllid culture; with 44 plates and 10 figures; a total of 258 pages.

The prices of the above described volumes are based on the available supply:

Volume 1, 1934, very scarce, $3.75 each, postpaid.
Volume 2, 1935, very scarce, $3.75 each, postpaid.
Volume 3, 1936, $3.75 each, postpaid.
Volume 4, 1937, (double number), $4.25 each, postpaid.
Volume 5, 1938, $3.25 each, postpaid.
Volume 6, 1939, $3.25 each, postpaid.

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Vols. 1, 2 & 3	—$10.00
Vols. 1, 2, 3 & 4	—$13.00
Vols. 1, 2, 3, 4 & 5	—$16.00
Vols. 1, 2, 3, 4, 5 & 6	—$18.50

Make checks payable to the American Amaryllis Society, and send orders to the Secretary,

Mr. Wyndham Hayward,
Winter Park, Florida.

THE BUYERS' GUIDE

From the number of advertisements in the "Buyers' Guide," I feel sure that many growers of amaryllids and producers of garden supplies and accessories are overlooking a wonderful opportunity to place their wares before an appreciative group of reader growers.

My experience as an advertiser in this section of HERBERTIA has been most satisfactory. It has brought inquiries from every quarter of the globe and an especially heavy response from readers in our own country. Through it I have made many most interesting and valuable contacts.

As a patron of the advertisers in HERBERTIA I have found all that I have dealt with, and that is a majority of them, thoroughly reliable and most generous with advice as to the culture of their specialties, apparently more interested in the flowers they grow than in the profit to be made from them.

For the fancier of amaryllis and related plants there is a world of information to be had from the catalogues and circulars of the advertisers in the Buyers' Guide. Catalogues and price lists from these advertisers will advise one of practically all of the amaryllids available in this country, also much information as to their culture, hardiness to cold and adaptability to different conditions. I know of no other way to get as much information for the price of a few postal cards and a few minutes time.

St. Augustine, Fla. —*John R. Heist.*
Nov. 1, 1939.

Agapanthus umbellatus
Amarcrinum Howardii
Chlidanthus fragrans
Clivia miniata
Cooperia Drummondii
pedunculata
Crinum Cecil Houdyshel
Ellen Bosanquet
Louis Bosanquet
Mrs. Henry Nehrling
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Peachblow
Powelii alba
Powelii rosea
Cyrtanthus lutescens
Eucharis amazonica
Haemanthus coccineus
multiflorus
Hippeastrum equestre
equestre var. Alberti
Johnsonii
Hybridum
advenum, red
advenum, pink
Hymenocallis calathina
caribaea
Su'phur Queen
Leucojum vernum
Lycoris aurea
radiata
squamigera
Nerine filifolia
Pancratium illyricum
maritimum
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