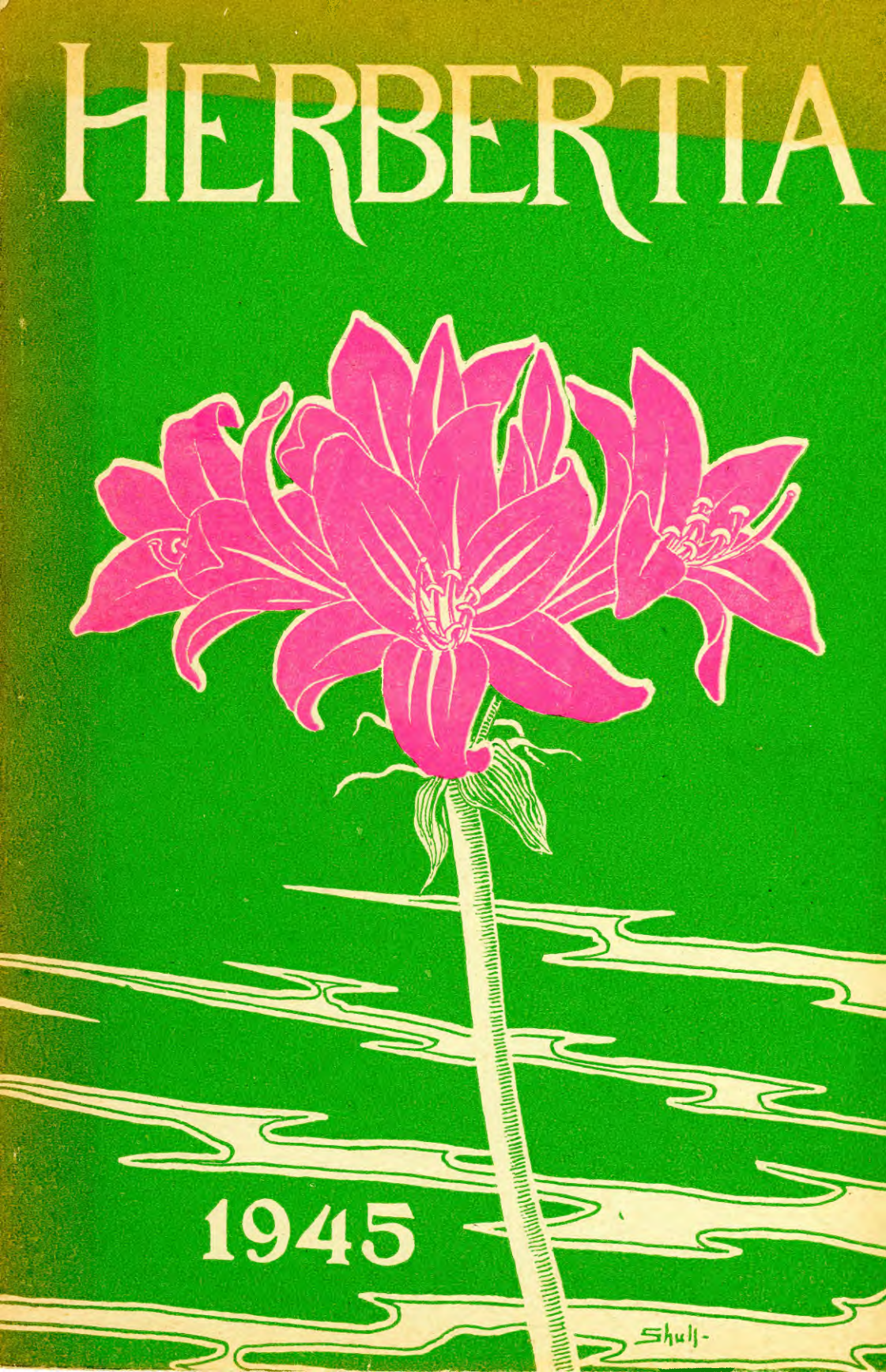
HERBERTIA



THE AMERICAN PLANT LIFE SOCIETY

THE AMERICAN PLANT LIFE SOCIETY is organized for the "increase and diffusion of knowledge concerning plant life," and to carry out its objectives the main emphasis is placed on the publication of PLANT LIFE, the periodical devoted to plant life in general, and HERBERTIA, the year book devoted to the amaryllids. All paid up members are privileged to receive the current issues of PLANT LIFE and HERBERTIA.

NOTE FOR PLANT LIFE AND HERBERTIA CONTRIBUTORS

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

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

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

Address correspondence and send membership dues to:

E. FREDERICK SMITH, Assistant Secretary-Treasurer,

The American Plant Life Society

Box 2398, Stanford University P. O., California

HERBERTIA

VOLUME 12

EDUCATIONAL EDITION

EDITED BY
HAMILTON P. TRAUB

THE AMERICAN PLANT LIFE SOCIETY
Box 2398, Stanford University P. O., Calif.
1945

Printed in the United States of America

Published March, 1947

Citations to this issue of HERBERTIA should read as follows: HERBERTIA 12(1945): ——-——. 1947

Address correspondence and send membership dues to:

Mr. E. Frederick Smith, Asst. Sec'y.-Treas.,

The American Plant Life Society,

Box 2398, Stanford University P. O., Calif.

PREFACE

The 1945 issue of HERBERTIA is dedicated to Supt. R. H. Huey, an outstanding American educator, who has had the imagination to see that the amaryllids offer one of the most excellent tools for the teaching of plant science in our public schools. In recognition of his outstanding contributions in this field, the WILLIAM HERBERT MEDAL for 1945 has been awarded to Supt. Huey. His pioneer work is being generally recognized, and his example is being followed in other parts of the country. Supt. Huey contributes to this issue of HERBERTIA a brief autobiography, an article on the use of amaryllids as an educational tool, and a brief history of the Paintsville, Kentucky, Public Schools.

The beautiful cover design, featuring *Brunsvigia rosea* (syn. *Callicore rosea* Link; *Amaryllis belladonna* Ait.) is the work of J. Marion Shull.

After the 1940 to 1945 Nazi blackout of the Netherlands, we are pleased to report that Ida Luyten (Mrs. Ida Olivier-Luyten) has been able to favor the members with two outstanding articles on the culture and optimum flowering of hybrid *Amaryllis.*

The articles on daylilies include preliminary reports from some of the regional trial gardens, a second announcement of the daylily check list, registration of daylily clones, articles on doubleness in daylilies by Dr. Stout, daylily breeding by Mr. and Mrs. Eugene A. Taylor, and J. Marion Shull, favorite daylilies by George Gilmer, daylilies in the Adirondacks by Prof. Stanley E. Saxton, daylily tests by Elizabeth Lawrence, daylily leaf spot disease, and methods of packing and shipping daylilies by Dr. Cooley.

Dr. Fernandes and his wife contribute an important article on the origin of *Tapeinanthus humilis,* a near relative of *Narcissus.* Other *Narcissus* articles are contributed by Frank Reinelt on new daffodils, the late C. E. Bailey on pink daffodils, and Mrs. Benners on experiences with daffodils.

Dr. Uphof favors us with an article on *Leucocoryne* and related South American genera. W. T. Stearn contributes a revision of Sir Joseph Hooker's Alliums of British India.

Mulford B. Foster, the eminent plant explorer, writes on the re-introduction of *Alstroemeria caryophyllaea,* and Harry L. Stinson reports on the true *Alstroemeria Ligtu* which was re-introduced by Prof. Goodspeed of the University of California.

There are articles on *Amaryllis reticulata,* on amaryllid culture, and other valuable contributions but space limitations prevent mentioning them all in this brief preface.

At the beginning of the post-war period, it seems worth while to consider briefly the past issues of HERBERTIA, and the plans for the future. During the first decade of HERBERTIA, the following editions were brought out—

Vol. 1 (1934) Henry H. Nehrling Edition
2 (1935) Theodore L. Mead Edition
3 (1936) First British Edition—dedicated to Arthington Worsley

4 (1937) Second British Edition—dedicated to William Herbert
5 (1938) Netherlands Edition—dedicated to E. H. Krelage
6 (1939) First South African Edition—dedicated to Dr. E. E. Galpin
7 (1940) First Latin American Edition—dedicated to Amaryllid pioneers
8 (1941) First Daylily Edition—dedicated to the daylily pioneers
9 (1942) First Alstroemeria Edition—dedicated to Harry L. Stinson
10 (1943) 10th Anniversary Edition—dedicated to Elizabeth Lawrence

The beginning of the second decade of HERBERTIA coincided with the maximum American war effort in 1944. Most of the linotype operators at our printer's establishment were taken into the armed forces, and it was not possible to bring out Vol. 11 (1944) on time, and it was not published until early in 1946. We wish to thank the members for their kind consideration, understanding and patience under these conditions. Now that the war is over, the publication schedule will be brought up-to-date as soon as possible. Vol. 12 (1945) is the present issue; Vol. 13 (1946) Narcissus Edition, and Vol. 14 (1947) Daylily Edition, are scheduled for publication in 1947, and thereafter, HERBERTIA is scheduled for publication regularly toward the end of each year (October). The second decade of HERBERTIA, including the two published volumes, and the volumes tentatively planned for the future, are indicated below—

Vol. 11 (1944) Allieae Edition—dedicated to Dr. Henry A. Jones (publ. in 1946)
12 (1945) Educational Edition—dedicated to Supt. R. H. Huey (publ. in 1947)
13 (1946) First Narcissus Edition—dedicated to Guy L. Wilson
14 (1947) Second Daylily Edition
15 (1948) Second South African Edition
16 (1949) First Australasian Edition
17 (1950) Second Latin American Edition
18 (1951) Second Narcissus Edition
19 (1952) Third Daylily Edition
20 (1953) Third British Edition

Contributors to any of the volumes from 13 to 20, inclusive, should send in their articles as soon as possible after their completion so as to facilitate the planning and publication of these issues.

The details for Volume 13 (1946), NARCISSUS EDITION, are well advanced due in great measure to the wholehearted cooperation of Arno H. Bowers of the Narcissus Committee. Dr. Fernandes and wife have already sent in their article on chromosomes of the Subgenus *Ajax,* Genus *Narcissus.* Other articles on *Narcissus* have also been received, and the

[PREFACE, continued on page 7.]

TABLE OF CONTENTS

LIST OF ILLUSTRATIONS

PLATES

TEXT FIGURES

[PREFACE, continued from page 4.]

remainder are expected to arrive in the near future. The other amaryllids will not be neglected in this issue since important contributions on daylilies, *Amaryllis, Alstroemeria,* etc., will also be included.

Beltsville, Maryland, *Hamilton P. Traub*
September 6, 1946 *Editor*

NOTE FOR HERBERTIA AND PLANT LIFE CONTRIBUTORS

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

STYLE. Manuscripts *must* be *typewritten* and *double-spaced throughout* [using a new heavy black ribbon]. Check with special care all calculations, figures, tables, names, quotations and literature citations.

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

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

ERRATA

HERBERTIA, Vol. 11 (1944)

Page 3, line 18 from bottom, for "Stream" read "Stearn."
Page 8, line 18 from top, after "INTERSPECIFIC" add "STERILITY."
Page 21, between sections ANGUINUM and ALLIOTYPUS, in a separate paragraph insert "PETROPRASON F. Hermann (1939); syn., genus *Camarilla* Salisb. (1866); type-species, *A. obliquum* (Bot. Mag. t. 1508)."
Page 261, top line, and line 17 from top, for "Koidyumi" read "Koidzumi."
Page 266, line 18 from top, for "*Triple Trest*" read "*Triple Treat.*"
Page 319, line 14 from bottom, for "pistils" read "pistil."
line 10 from bottom, for "hardly" read "hardy."
line 9 from bottom, delete "and westward in Asia Minor."
lines 27-28 from top, for "*album-santi*" read "*album* Santi."
Page 356, line 29 from bottom, for "Percy Lancaster" read "Percy-Lancaster";
line 11 from bottom, for "Syney" read "Sydney."

[ERRATA, continued on page 167.]

[REGIONAL DAYLILY TRIALS, continued from page 36.]

5. DEPT. OF FLORICULTURE & ORNAMENTAL HORTICULTURE, CORNELL UNIVERSITY, ITHACA, N. Y.

Dr. L. H. MacDaniels writes that notes have been taken on the daylilies in the collection and a report will be made in a future issue of Herbertia.

6. DIVISION OF HORTICULTURE, TEXAS AGRICULTURAL EXPERIMENT STATION, COLLEGE STATION, TEXAS

Dr. S. H. Yarnell writes that rather detailed notes have been taken on the daylilies in the collection, and a report will be made in 1946 Herbertia.

DAYLILY CHECK-LIST — SECOND ANNOUNCEMENT

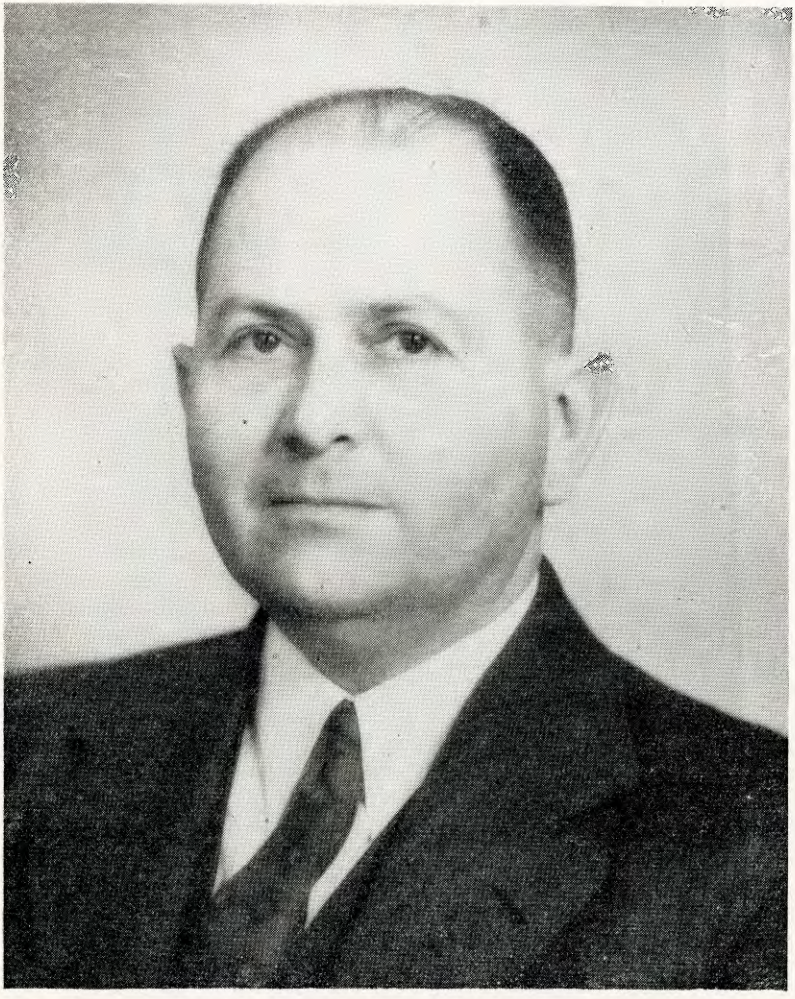
Prof. J. B. S. Norton, 4922 40th Place, Hyattsville, Maryland, reports further progress toward the completion of the comprehensive daylily check-list. According to present plans, it will be included in Vol. 14 (1947) of Herbertia, the Second Daylily Edition.

For a statement requesting the cooperation of all interested in the daylily so as to make the check-list complete, the reader is referred to page 253, Vol. 11 (1944) of Herbertia.

POSTSCRIPT.—Since the above was written, Mr. M. Frederick Stuntz, Williamsville 21, N. Y., has agreed to assist Prof. Norton with the completion of the Daylily Check-list that is sponsored by the Society, and will be published as soon as ready in 1947.—*Editor* (1-16-47).

POSTSCRIPT.—The members will be interested to hear that the Midwest Hemerocallis Society was organized in 1946. The Secretary is Daisy L. Ferrick, 416 Arter Ave., Topeka, Kansas.—*Editor* (1-16-47).

Dedicated to
ROBERT GARNETT HUEY,
the pioneer,
in the use of amaryllids
as an educational tool.



Herbert Medalist—Robert Garnett Huey

Plate 278

ROBERT GARNETT HUEY

An autobiography

Two scenes stand out among the many of my boyhood memories. One is of my father as he stood with tears in his eyes looking across row after row of shocked corn in a field already green with autumn seeded wheat and mellow with the light of the setting sun and of his words as he placed his hand on my shoulder and said, "Son, sometimes the fields are so beautiful that I feel like weeping." The other is of my mother, at the close of a long day of household work, sitting with a pencil and sheet of paper in front of a clump of hollyhocks as she sketched a spike of the flowers in infinite detail.

To this father, who taught his sons that the land was owned as a trust to be farmed in such a manner as to be continually improved and made better, who took time to teach us the trees and the plants and the infinite wealth of Nature in field and woodland, and to the mother, who brightened the home and the yard with flowers, is due, perhaps, my early and lasting interest in plant life.

My birth place was a farm home on the bank of the Ohio River in Northern Kentucky, where my ancestors from Virginia had settled in the late part of the 18th Century. The date was December 16, 1889 and I was the second son.

From the front yard of that home came my first acquaintance with amaryllids,—great naturalized patches of old fashioned "snow drops" lifting their dainty blossoms along with purple violets from the bluegrass turf. In the background clumps of narcissus and jonquils mingled their white and yellow hues. Here, I grew and played and worked. Flowers and plants, trees and shrubs, birds and small wild life were the background of my environment.

In time there were flowers of my own, a corner of the garden where I might plant and dig and experiment with the seeds and bulbs and cuttings secured from neighbors, and later, from nurseries. During one of those boyhood periods a seedling apple tree in one of the pastures bore seventeen different varieties as a result of my amateur attempts in grafting.

My elementary education was secured in the rural school. Following it came four years in the only high school in that county. A year of teaching in the two room school at the county seat provided funds to attend Georgetown College, at Georgetown, Kentucky. Upon my graduation in 1913, teaching had been selected as a profession and my first work was in Bacone College, Oklahoma, a school for Indians. Later, came a superintendency in Kentucky.

At the age of 26 I married Hallie Cheap, the daughter of a Methodist minister. We have three daughters. One is married, her husband in the Navy; another is a nurse in the Army Air Force; the youngest a student at Miami University.

The intervening years have been spent in three superintendencies. A Master's Degree from Peabody College was earned and further grad-

uate work done at Johns Hopkins and the University of Chicago. Several summer terms have been spent in teaching at Morehead State Teachers College, Murray State Teachers College, and Pikeville College.

During that first superintendency I became acutely aware of the lack of beauty and its appreciation in the homes and lives of so many of our students. There were eyes that did not respond to the skies and the flowers, lives that were colorless, souls that were barren, and homes that were ugly and unattractive. Could the school teach them to see, could it make them feel, could it bring them appreciation? For thirty years I have tried to answer that question. And, surely, it is a legitimate quest. Experience and observation have brought me the firm conviction that the child who has not had developed in him a recognition of the beautiful and an appreciation for the best has not been fully educated. To go through life without the capacity to enjoy the bounty of Nature's panorama, to not be able to see the beauty of a perfect blossom, to not feel the fascination that comes from patiently caring for a rare plant is to miss the satisfaction, the contentment, the peace, and the uplift of soul that can come only from the recognition that it is a part of the handiwork of the Infinite.

Hybridizing early became one of my interests. Twenty years ago I began to breed dahlias. From South Africa, from Australia, from India and Japan, from the British Isles, from Continental Europe, from Alaska, I collected the best available and in a school garden grew and tested and crossed them with the aid of my students. Comparative studies were made of the characteristics, the habits and the growth of seedlings from different lands and crosses. Today, in those two communities hundreds of homes grow dahlias, the best of dahlias, through the interest of those school boys and girls. One of those seedlings was last year placed upon the Pacific Coast Honor Roll.

A few years later we began to hybridize amaryllis and iris. From a few clumps of choice *Iris Kaempferi* have come a garden of magnificent seedlings. The work with amaryllis was broadened to include many of the other amaryllids and has brought increasing fascination.

To my family I have been a trial, late for meals, given to stopping the family car at every beautiful garden throughout the Eastern half of the United States and Canada over which we have frequently toured, lingering overtime in botanical conservatories, and losing myself in plant literature. To my friends I have been an eccentric; to my students perhaps a problem. But, all of them, daughters, neighbors, friends and students pridefully grow in their homes the amaryllids and other flowers that have been given them and crowd the schools when those, there, bloom.

On July 1, I became superintendent of the Ludlow, Kentucky Schools. My hobby has come with me.

A BRIEF HISTORY OF PAINTSVILLE, KENTUCKY AND ITS SCHOOLS

R. G. HUEY, *Kentucky*

Paintsville, county seat of Johnson County, lies along both sides of Big Paint Creek at its junction with the Big Sandy River in Eastern Kentucky. The name has its origin in the crude drawings of wild animals found painted on the precipitous sandstone cliffs of the creek by the early explorers. These drawings and the presence of numerous burial mounds and village sites of a prehistoric people give evidence that the area was commonly frequented by Indians in earlier days.

The early settlers were those who came across the mountains from Virginia and Maryland and into the Valley at its head, the "Breaks of Sandy." Long without roads, and isolated from communication with other sections, except through rafting down the river, the town, like others in the same area, was slow to grow until comparatively recent years.

To Colonel Northrup and John C. C. Mayo, both now deceased, must go the credit for the vision, initiative, and leadership which led to the development of the Big Sandy Valley. Through their efforts Eastern capital was interested in the vast coal deposits and timber resources of the region, The C. & O. Railroad constructed a line up the valley to Paintsville and, later, beyond to the "Breaks." A system of locks and dams was erected on the river. Then, later, two U. S. highways were constructed and crossed at Paintsville. These routes, with trade in coal and timber, opened the way for contact with other sections. Paintsville began to grow and its straggling houses and dirt lanes with dust and mud in season became a community of modern homes and paved streets.

Oil and gas began to be developed and gas from the area is now piped to supply Philadelphia and other Eastern cities. The town rapidly became a business center, the hub of a trading area sixty miles in diameter. It is, today, a thriving and rapidly growing city of the fourth class, with a population of 4500. Its two national banks, three large hospitals, and numerous wholesale and retail establishments, together with its schools and churches, serve a steadily increasing population.

To Mr. Mayo, who looked first into the future, who interested capital in the development of the region, who constructed and landscaped a palatial mansion, who erected and donated to the city a magnificent church building of native stone, and who contributed without stint his time and wealth and influence to public improvements, is due, more than to any other, Paintsville's place, today, in Eastern Kentucky.

The early schools were those of their time and area—crude and limited. In 1888, the first independent school was erected, a three story, ten room brick building. This later burned and another was erected on the same site. In these buildings was carried on all the educational training received by the young people of the community. A rapid suc-

cession of principals and teachers passed through its doors, none remaining longer than a year or so.

In 1912, an additional building was erected on the same lot and the first Grade and High School established. The growth of the school by 1928 necessitated the erection of a third building (Plate 279). At the present time, the Paintsville Schools, with their thirty teachers and 1200 students, are accredited institutions of the highest standing and carry on a modern program of public education, with approximately forty per cent of those who graduate from the high school annually continuing their education in college and university.

Two early private institutions added to the development of Paintsville. The first of these was the Sandy Valley Seminary which after a number of years became the John C. C. Mayo College. Neither institution offered work beyond that of the high school level, but both, through their emphasis upon good literature and their offerings of good instruction in music, contributed a lasting influence upon the town's cultural tastes.

With the coming of the public high school the college closed. In 1938, the site and buildings were purchased by the State of Kentucky and the Mayo State Vocational School established. This is affiliated with the Public Schools and, here, an extensive program of industrial education and training is being carried on.

AMARYLLIDS AS SUBJECTS FOR PLANT SCIENCE STUDY

R. G. Huey, *Kentucky*

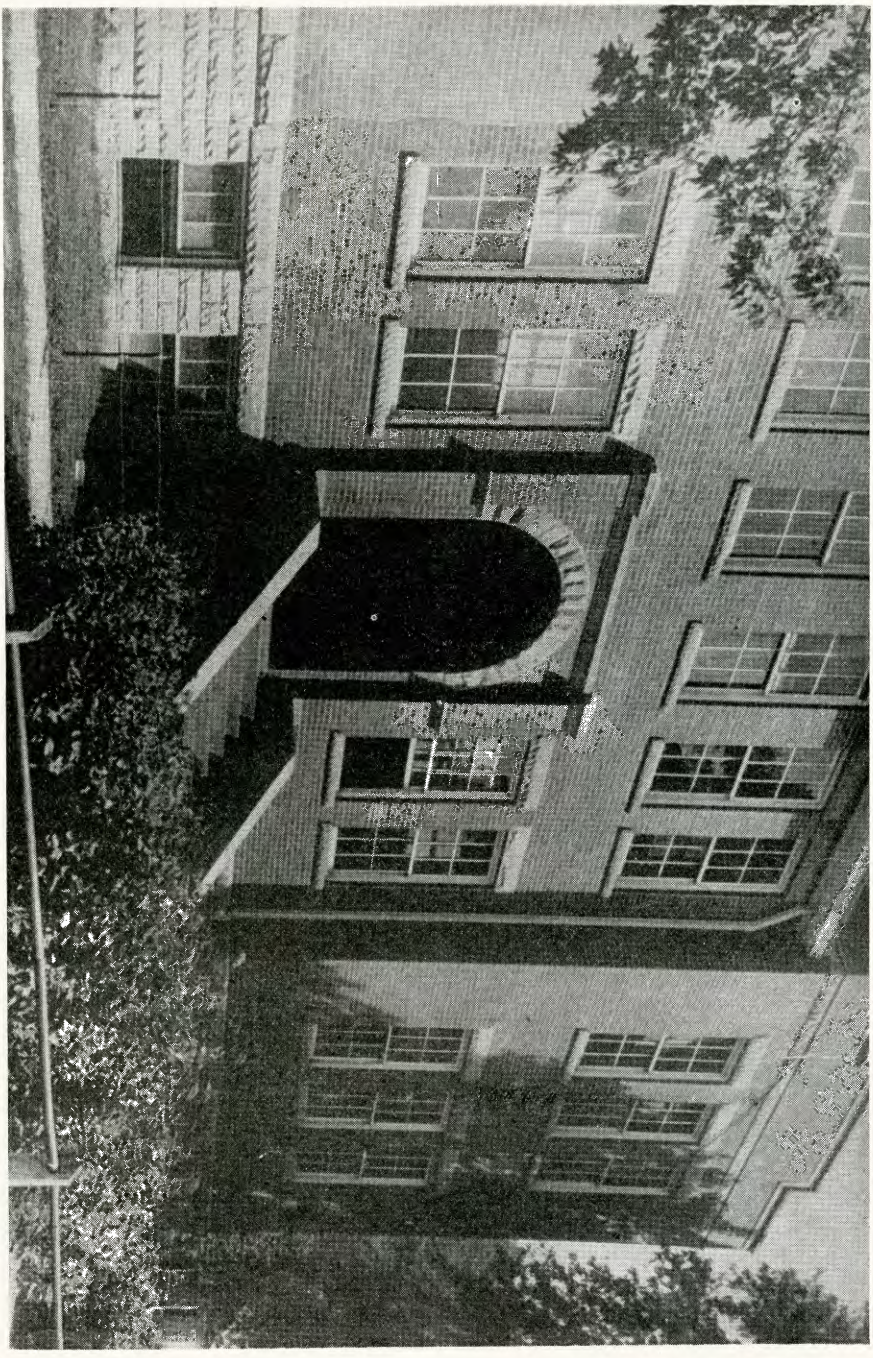
The study of amaryllids in the Paintsville Public Schools began in 1938. If the study of botany was to give to our pupils more than a cursory glimpse into the field of plant science we felt that a thorough and systematic study of some plant family should be undertaken.

The selection of amaryllids for such a study was due, partly, to our already having in the plantings on our school grounds large numbers of hemerocallis, narcissus, and iris, and to the unusual interest shown by the students in a clone of hybrid amaryllis in the superintendent's office. The latter had been received in a shipment of dahlia bulbs from India and was an extremely fine specimen.

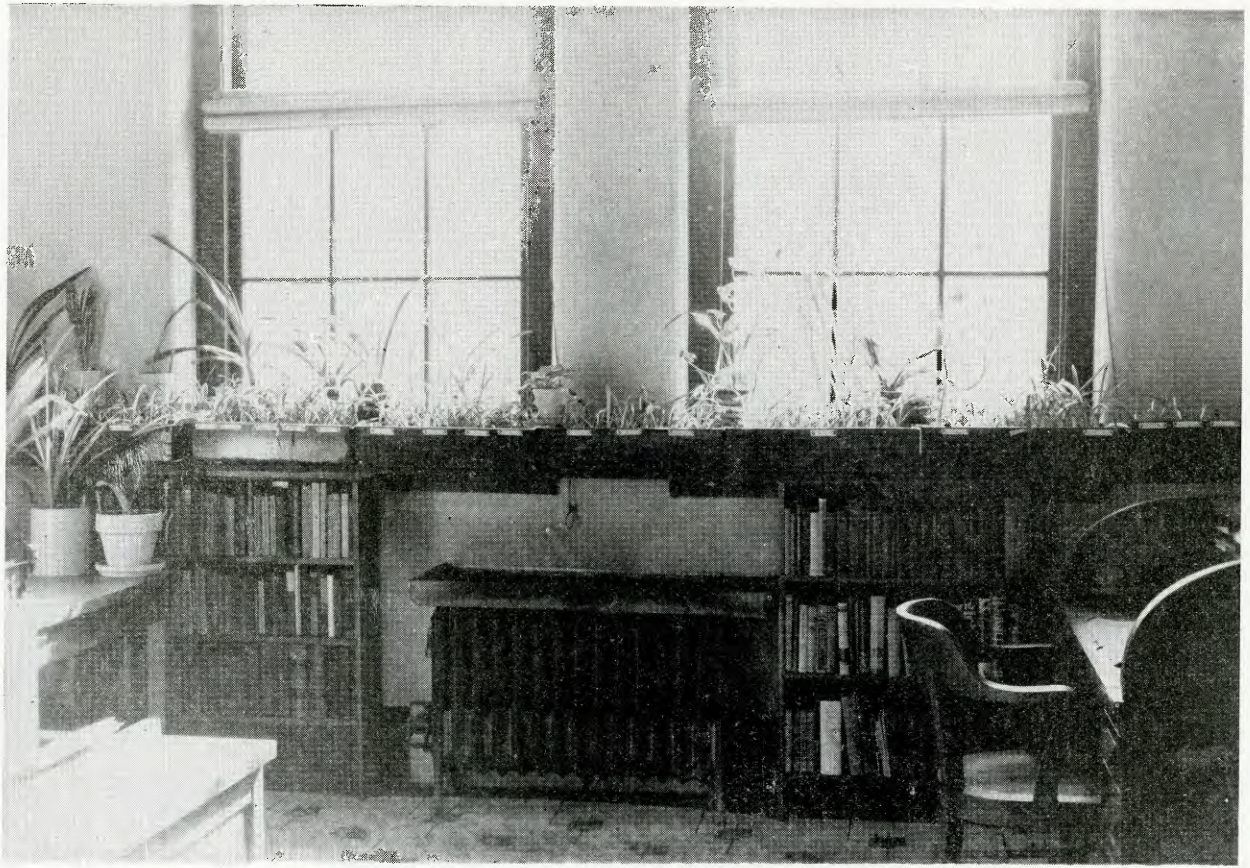
Other considerations were that few plant groups afford such a wealth of genera and species for study, and ranging from the common and well known to the very rare. Again, we were influenced by their adaptability to both indoor and outdoor culture, the ease with which they lend themselves to hybridization, the geographic interests which they represented, and the fact that their flowering range gives a season of bloom extending through almost every month of the year. Then, not the least factor was that amaryllids afford unusual beauty and perfection of bloom.

From its inception, interest in the project was keen. Membership in the classes increased until it became necessary to double the number

Plate 279



Front entrance to High School building, Paintsville, Kentucky



Corner of Supt. Robert G. Huey's office, showing flats of amaryllid seedlings from various crossings—mostly **Nerine, Amaryllis, Brunsvigia, Stenomesson** and **Cooperia.**
Plate 280

of sections. It soon became the most popular department in the school.

The interest has been contagious. During the past year, every home room in the three schools flowered in their windows hybrid amaryllis and other amaryllids. Surplus seeds and seedlings have been annually distributed to interested pupils and several hundred of them are now cultivating and hybridizing amaryllids in their homes. The schools' collection and plantings are visited daily during the flowering season by our own townspeople and by groups from neighboring communities, and information sought.

One of the first aims was to build a good library of reference material. This was collected from various sources; includes books, pamphlets, bulletins, year books, clippings, catalogues, and other material. It is being constantly added to and now comprises probably one of the best collections of general plant literature in the state, as well as the most extensive on amaryllids. Included are all the volumes of HERBERTIA except 1 and 2.

Hybridization was undertaken early and has been carried on extensively. (Plate 280). Several thousand seedlings are grown annually and careful records kept. Other trials include the testing of various soils as media of growth, pot and open growth, fertilizers, temperature controls, hardiness, cultural methods, pH requirements and ranges, and the development of color strains.

As already stated, one of our first interests was with hybrid amaryllis and our most extensive work has been with them. To the first Indian clone were added a number personally selected from Florida and Mississippi gardens and a number of Dutch and English hybrids. Later, purchases were made from the strains of Howard and Smith, Houdyshel, Rice, and Hermon Brown. We are under especial obligation to Mr. Brown for having personally selected for us a number of his outstanding individuals during the blooming season, and to Mr. Pierre S. duPont for having sent us a number from his choice collection.

Our *Amaryllis* species include *A. vittata, A. Johnsonii, A. reticulata* var. *striatifolia, A. rutila* and *A. organense.* Other amaryllids in the collection are various *Nerine* species and hybrids, *Haemanthus, Stenomesson, Crinum, Lycoris, Vallota, Sprekelia, Brunsvigia, Clivia, Urceolina, Crinodonna, Habranthus, Cooperia, Zephyranthes,* and *Cooperanthes.*

These have been secured through the purchase of seeds and bulbs, through trading, and through gifts from various individuals. Especially do we acknowledge the assistance and encouragement of Mrs. J. Norman Henry, Mr. W. W. James in charge of the Trial Gardens of the American Plant Life Society, Mr. L. S. Hannibal, Mr. Perry Coppens, Mr. Mulford B. Foster, Mr. A. C. Splinter, Mr. W. H. Brittingham, Mr. O. E. Orphet, and Dr. Hamilton P. Traub, as well as that of Mr. Hermon Brown and Mr. P. S. duPont, already mentioned. A number of former members of the classes, and now in the armed forces, are collecting seeds and bulbs in the foreign lands in which they now serve. Missionary friends have also been a source of information and helpful in locating material.

Any school project must be evaluated to measure its worth. From this one has come, first, a beginning, at least, of appreciation of real plant science and the infinite possibilities for its study. Out of it has grown, second, a far better knowledge of the geography of various lands and a more intelligent interest in their peoples. The study of amaryllids contributes to an international feeling. Correspondence with teachers and pupils, with collectors and seedsmen and hybridizers, with botanists and government officials in other countries has not only brought a far more intelligent appreciation of them and their problems but in many instances genuine and lasting friendships. Interest in a particular plant leads to interest in its native habitat. Interest in its land brings interest in its people. Interest in people strengthens friendship with them. A third outcome has been, we feel, that of a better citizenship. If intelligent interest and inquiring study, if discrimination and judgment in the evaluation and selection of the best, if alertness to changes and results, and if the acquisition of an avocational hobby can be considered desirable citizenship traits, then the study of amaryllids may be said to contribute to that end.

A final contribution from the project must be listed,—that of appreciation and enjoyment. Children's lives are probably more affected and influenced by school surroundings than we commonly recognize. Beauty brings appreciation and happiness. Ugliness leaves us depressed and with a sense of frustration. Beauty of surroundings begets beauty of life. No child or adult can live and work in the presence of beauty without unconsciously absorbing, in some degree, some of its characteristics.

People do not enjoy great music and great paintings until they have been repeatedly brought in contact with them. Neither does the appreciation of the beautiful in nature and the ability to see and recognize and enjoy it come into the lives of children except as it is developed in the presence of it. Once developed, it is a possession that can not be taken away. The poorest laborer, with the capacity to enjoy a perfect flower, the magic of genetic inheritance, or the fathomless mystery of plant life from the buried seed to the full blown flower, has a priceless possession, while the millionaire in stocks and bonds and property, and with no love and appreciation for the beautiful, is only a pauper aesthetically and spiritually.

Beauty makes better people and better citizens and it is my firm conviction that society must recognize that it has an equally great obligation to teach its children to recognize and appreciate and enjoy the beautiful and fine and best in life as it does to teach them the rudimentary arts necessary to the making of a living.

IN MEMORIAM—CARL PURDY, 1861-1945

Herbert Medalist Carl Purdy died August 8, 1946 at Ukiah, California. An autobiography and portrait of Mr. Purdy were included in HERBERTIA, Volume 6, pp. 43-45. 1939.

Elmer C. Purdy, the son, writes,—"He passed from life as he had always prayed it would be, fully active and mentally alert to his last breath. He had been grading bulbs for several hours and went into the garden to warm up. There he worked with the hoe for two hours. Passing through the house on his way back to work in the bulb shed, he was stricken with cerebral apoplexy and died instantly.

"The writer, his son, has been business manager of the Purdy enterprise since 1925 for father preferred the production, the more active and open air part of the work. His two sisters and he continue the business, under the name, THE CARL PURDY GARDENS, and under his direction."

IN MEMORIAM—AUSKER E. HUGHES, 1905-1944

Dr. Ausker E. Hughes, who was Executive Secretary of the American Amaryllis Society in the late 1930's died suddenly in October 1944. In connection with his Society activities he is best known for his article, published in HERBERTIA, on the function of the trace elements in Amaryllis growth and development.

The following memorial notice is quoted from THE WYANDOTTE WIGWAM of November 1944.

"Gone from among us is Dr. Ausker E. Hughes, supervisor in the Research Department. Gone is a southern gentleman, a friend and tireless worker.

"Dr. Hughes died suddenly on October 23rd at his home near Flatrock. He had just got his car out of the garage and was on his way to work, from which he had not been one day absent for six and one-half years.

"Born in Jefferson, N. C. in 1905, he received the certificate of proficiency in science from Bluefield College in 1925, a B. S. in chemical engineering from Carson and Newman College in 1927, an M. S. in physical chemistry from the University of North Carolina in 1929. He married Miss Lena B. Smithers, who survives him, in 1931, shortly after obtaining his doctorate from the same university.

"Dr. Hughes taught physics and chemistry at Carson and Newman College in 1927; was on the research staff of the Champion Coated Paper Co. at Hamilton, Ohio in 1929; and was chemist for the Bureau of Chemistry and Soils and the Bureau of Plant Industry, U. S. Department of Agriculture in Orlando, Florida for seven years prior to joining our ranks in 1938.

"Dr. Hughes published nine technical papers of note, held several patents, and was a member of the American Chemical Society, the Technical Association of the Pulp and Paper Industry, the Florida Horticultural Society, the American Amaryllis Society, Sigma Xi, and Alpha Chi Sigma.

"Dr. Hughes—Ed to his associates—died in the full vigor of manhood. He was only 39 years of age, strong and sturdy as an oak. His death was a great shock to the many who counted him as a close and personal friend and who admired his qualities of leadership, clear thinking and personal integrity."

SOUTH AFRICAN NEWS LETTER

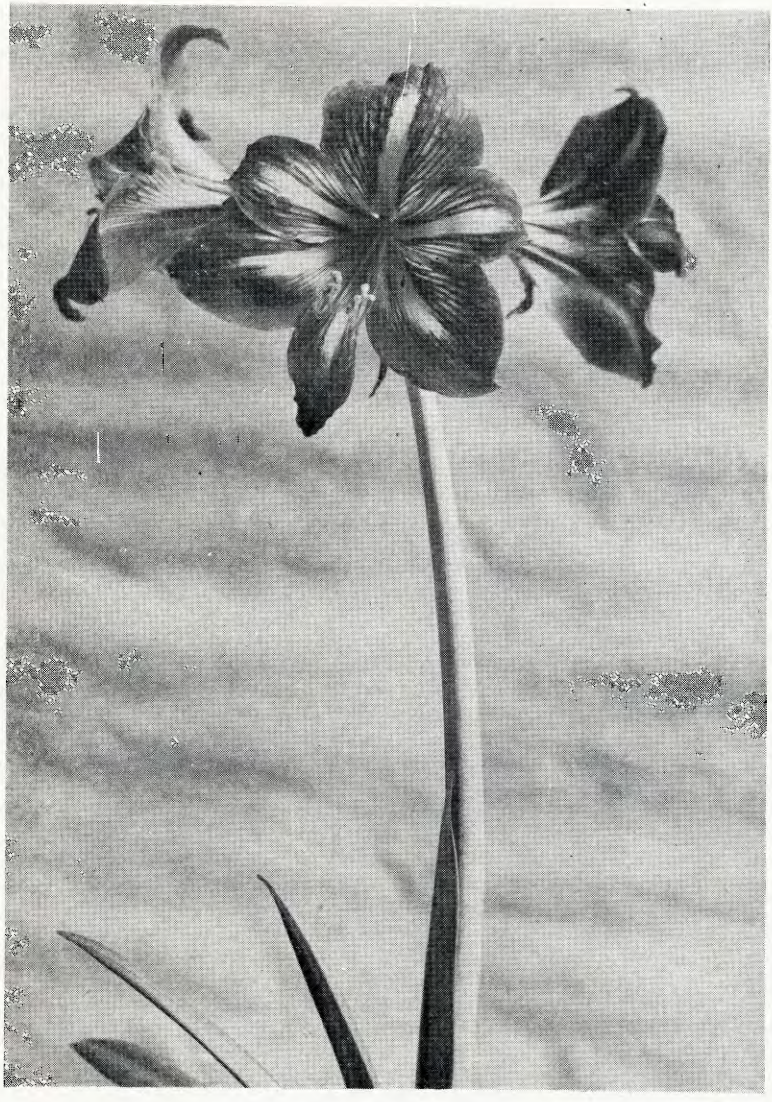
R. A. Dyer, *Chief*
Division of Botany and Plant Pathology
Department of Agriculture, Union of South Africa

Contributions to Herbertia from South Africa have been few and far between during the war period. This is no occasion for excuses. The war disorganised our small white population very thoroughly and it will be some years before research runs smoothly in all branches of science. There are many more vacancies in the professional ranks than there are suitable applicants. Botany is not unique in suffering from a shortage of trained and qualified personnel and it will be several years at least before the position can be satisfactorily restored. Obviously these introductory remarks are made to prepare the way to say that no large work on the Amaryllids is likely to be contributed from South Africa within the near future. In fact there is quite an appreciable amount of leeway to make up in studying the articles on S. A. Amaryllids, which have been published in Herbertia by "external" students of our flora since the dedication of volume 6 (1939) to the Amaryllids of the Union of South Africa.

We must for instance not overlook progress in hybridization with *Nerine* recorded by W. M. James in Vol. 7 (1940), or that Dr. Traub gave a clue to the identity of *Cyrtanthus vittatus* Desf. or that Elizabeth Lawrence made observations on Crinums in the same number. In Vol. 8 (1941) Mr. James adds some Amaryllid Musings including a reference to an apparently undescribed species of *Crinum* from S. W. Africa. I sincerely hope circumstances will soon enable me to make good my past omission in view of that plant's parental status in hybridization. The genus *Crinum* figures prominently in Vol. 9 (1942) in a review by Dr. J. C. Uphof, and *Cyrtanthus* improves its reputation in the notes by Mrs. Henry, while Mr. Coppens makes reference to *Cybistetes longifolia* and one or two other attractive S. African Amaryllids.

Dr. Uphof continues his contributions with reviews of *Agapanthus* and *Tulbaghia* in Volume 10 (1943). Here we have also a review of *Brunsvigieae* by Dr. Traub and an article on *Brunsvigia rosea* and hybrids by Mr. Hannibal. All these and other miscellaneous references in Herbertia including Vol. II (1944) cannot be overlooked in South African botany.

Although I have not been in close touch with Herbertia during the war period, the gardener at the National Herbarium, Pretoria, has not allowed the memory to be dulled. He has produced first class blooms of *Amaryllis* from a few specially selected seed kindly sent her a few years back by the American Amaryllis Society One particularly handsome inflorescence with red and white colouration was photographed in the hope that it might be considered worthy of reproduction in the Herbertia (Plate 281). The bulb flowered first in Nov. 1942, the 3rd year from seed, being grown in a 2 lb. jam tin with no special forcing. Other attractive blooms have since been produced by the sister bulbs.



Hybrid Amaryllis—*Pretoria*
Photo by R. A. Dyer, Pretoria

Plate 281

Some of the few contributions which have been made to amaryllid literature in South Africa since 1939 will be reviewed in the next volume of HERBERTIA.

AMARYLLIDS IN ENGLAND AND ON THE CONTINENT

WILLIAM LANIER HUNT, *North Carolina*

It was on the twenty-second of May when a tall English gentleman came over to where I was literally "down on all fours," examining a promising looking composite at Kew for any signs of drought resistance for the Southern United States. The gentleman turned out to be Dr. Hutchinson and his companion, Mr. Holder, one of the assistant curators. We chatted for some time, and among other subjects, Dr. Hutchinson mentioned that great society, the American Amaryllis Society (now the American Plant Life Society) with evident great pleasure. I said that I had been a member almost from the start, and he seemed to recall the photograph of my meadow filled with *Zephyranthes atamasco.*

This was the first of many meetings with English and European scientists and nurserymen during my summer there as a soldier. Everything at Kew and Wisley and at Hampton Court seemed much the same as it was when I was last there in 1927. Some bombs had fallen at Kew and at Hampton Court, but the ones at Kew had had their worst effect, apparently, on the temperate house, and Mr. Raffill had carried on in spite of them. At Hampton Court, Major Hepburn had had several bombs, but the great border against the walls was even more glorious than ever. Major Hepburn intimated that he was going to add even another three feet to its depth. Already it is ten to twelve feet deep!

Allium Macleanii. Putting first things first, in these gleanings from my notes, I shall have to say that of all the amaryllids I saw in seven months, the most exciting one was an onion! Against the wall of the administration building, I saw one day in May the most beautiful head of blue onion flowers on a three foot stem and looking for all the world, at a distance, like an agapanthus of some sort. Surely *A. Macleanii* is destined to lead the onions if this is a sample of the typical plant. The blue of the flowers is bright and clear and carried well in the landscape —so well that I went all the way across the terrace to it at once. In early August, after I had inspected it many times during the summer, it was still in good condition and seemed capable of lasting effectively as a blob of good blue color still longer.

In the several visits I had with the director of Wisley, Mr. Harrow (now retired), we never got around to discussing my favorite onion, but subsequently a request was made for seeds, and the first seed broke through the ground in its pot in June 1946. Perhaps other onion enthusiasts have grown the species.

Alstroemerias. From early summer till late July, the various types of *Alstroemeria* are very much in evidence as cut flowers in Southern England. The great border of different sorts in the experimental garden at Kew flowered from some time in May till the third week in August without a let-up. The most amazing thing about these flowers, from

the landscape standpoint, is that heavy rains pass right through the petalage and leave them looking as fresh as ever as soon as the shower is over!

Major Hepburn has certainly made good use of alstroemerias in the great perennial bed at Hampton Court where the hybrids blend well in almost any combination with other colors because of their having, seemingly, a bit of every other color in their make-up.

Nerine sarniensis and other amaryllids. Never having seen the real *Nerine sarniensis* in flower, bulb enthusiasts will know that I made a special trip to Wisley to see how they compared with the color of our Southern *Lycoris radiata.* The answer in my notes is "a yellower red than *L. radiata* and not as dramatic as to stamens." In the cool house were many fascinating nerine hybrids, *Brunsdonna Parkeri,* the rather more curious than beautiful *Haemanthus coccineus* and numerous other promising looking buds which I was not privileged to see open.

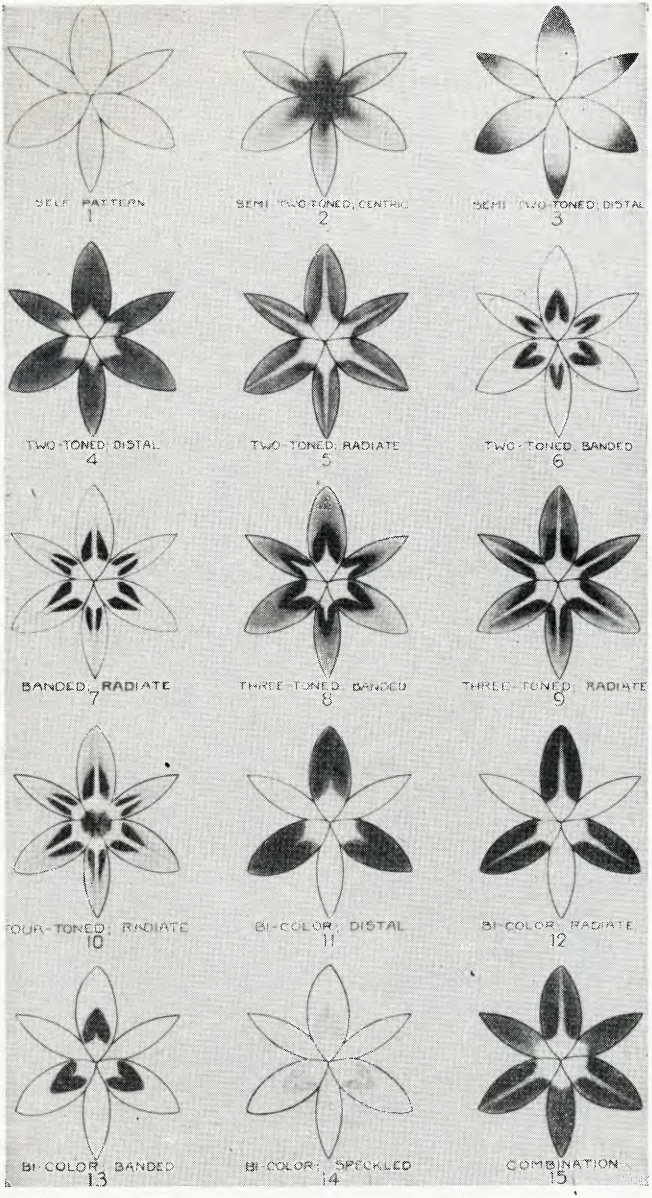
Leucojum autumnale. In the lower section of the rock garden at Wisley, a little bed of the tiny *Leucojum autumnale* bloomed on August 26th. The dainty little foliage looks like nothing more than a new lawn of sprouting winter rye grass, so the wee blossoms are a still wee-er surprise! As Mrs. Wilder said in her bulb book, they are pink and then white.

Brussels. . Brussels is, as ever, the clivia city pre-eminent. Everybody has a dog and everybody grows clivias! Fortunately, the Germans did not deny the *Jardin botanique de l'Etat* the coal to keep going and keep their collections of plants from the Belgian Congo alive. The garden is soon to be moved to the country near Brussels because it is planned to put a spur of the railroad from the *Gare du Nord* to the *Gare du Midi* right through the lovely present site of the gardens.

Those who have been there recall the rather interesting circular arrangement of plants in the out-door garden, with the "primitive" families first, followed by the more advanced ones and so on. In this garden the most outstanding group of bulbous plants was a wonderful, old clump of *Nothoscordum fragrans,* a long way from home and doing wonderfully. The bulbs were evidently *not* taken up in winter.

It was on this day, the 29th of August, that the first tulip bulbs were said to be on the way across the border from Holland, and gardeners were eagerly awaiting their appearance. Then, when I arrived in North Carolina on October 22nd, seedsmen had just displayed their first Holland hyacinths.

Nerine Bowdeni and Sternbergias. We who think of *Nerine Bowdeni* as something almost rare would be amazed to see them being sold in quantities in the flower markets at Salisbury and around the environs of London. They appeared in vases at the hotels and everywhere in October. Perhaps sternbergias are equally plentiful, but I never saw them except in botanical gardens. The little garden at Bath had the large-flowered, wide-foliaged *Sternbergia macrantha* on October 7th.



Color patterns in **Hemerocallis.** This is Plate 233, from Dr. Stout's article, page 164, Herbertia 1942, and is reprinted on request of those interested in daylilies.

1. REGIONAL ACTIVITY AND EXHIBITIONS

AMARYLLID STUDY COURSE

[The following study course on the Amaryllidaceae was prepared by the American Plant Life Society for the Lydonia Garden Club, of McRae, Georgia, Miss Anna L. Crider, Treasurer, in charge of the Amaryllid study program. The course is reproduced here so that other garden clubs may also use it. The ten divisions of the outline correspond to the ten annual meetings of the Lydonia Garden Club.]

AMARYLLIDACEAE (AMARYLLIS FAMILY) STUDY COURSE

[Note.—The student should first consult the references given for each study period, and after a list of genera has been made, then Bailey's Cyclopedia of Horticulture, and all the volumes of HERBERTIA, from 1 to 11, should be combed for the genera and the species under the genera. Standardized Plant Names, ed. 2. 1942 will be of value in evaluating the species that are of garden value. The complete literature citations, abbreviated under the study periods, are given at the end of this outline.]

FIRST STUDY PERIOD. General considerations.

a. *Definition of terms:* (1) Family, as applied to plants; (2) tribe, (3) genus, and (4) species, and sub-specific groups. References: Huxley, 1943; Cain, 1944; Encyclopedia Brittanica.

b. *General characteristics of the Amaryllidaceae:* (1) leafless scape, (2) spathe of bracts or valves, and (3) umbellate flowering habit. References: Hutchinson, 1934; HERBERTIA 2: 73-79. 1935.

c. *Classification of the Amaryllidaceae.* References: HERBERTIA 5: 110-113. 1938; Hutchinson 1934; HERBERTIA 2: 73-79. 1935.

d. *Nomenclature.* References: International Code; Stevens, O. A. 1945.

SECOND STUDY PERIOD. HEMEROCALLIEAE (Hemerocallis Tribe)

a. *General characteristics of the Tribe.*
b. *Genera, and species under genera.*
c. *Hybrids and their garden value.*

References: Hutchinson, 1934; HERBERTIA 2; 73. 1935; Bailey, 1930; Stout, 1934; HERBERTIA 5: 110-113. 1938; for daylily hybrids see HERBERTIA vols. 2 to 11, and Stout, 1934.

THIRD STUDY PERIOD. AGAPANTHEAE (Agapanthus Tribe) and ALLIEAE (Allium Tribe) .

a. *General characteristics of these two tribes.*
b. *Genera, and species of these two tribes.*
c. *Garden culture.*

References: Hutchinson, 1934; HERBERTIA 2: 77-78. 1935; 10 and 11, 1943 & 1944; and vols. 1 to 11, inclusive.

FOURTH STUDY PERIOD: IXIOLIRIEAE (Ixiolirion Tribe) and BRUNSVIGIEAE (Brunsvigia Tribe.)

a. *General characteristics of these two tribes.*
b. *Genera and species of these two tribes.*
c. *Garden culture.*

References: HERBERTIA 9: 53-59. 1942; Hutchinson 1934; HERBERTIA 2: 78-79. 1935; 10: 51-70. 1943; Bailey's Cyclopedia; HERBERTIA, vols. 1 to 11, incl.

FIFTH STUDY PERIOD: HAEMANTHEAE (Haemanthus Tribe.)

a. *General characteristics of the tribe.*
b. *Genera and species of this tribe.*
c. *Garden value.*

References: Hutchinson, 1934; HERBERTIA 2: 78-79. 1935; HERBERTIA vols. 1 to 11; Bailey's Cyclopedia.

SIXTH STUDY PERIOD. AMARYLLISEAE (Amaryllis Tribe) (Synonym: Hippeastreae).

a. *General characteristics of this tribe.*
b. *Genera and species of this tribe.*
c. *Nomenclature of the genus Amaryllis.*
d. *Garden value.*

References: Hutchinson, 1934; HERBERTIA 2; 79. 1938; Uphof, HERBERTIA 5; 101-109. 1938; Pam, 1944; HERBERTIA 5: 114-131. 1938; 6: 146-154. 1939; HERBERTIA Vols. 1 to 11, incl.

SEVENTH STUDY PERIOD. ZEPHYRANTHEAE (Zephyranthes Tribe) and CYRTANTHEAE (Cyrtanthus Tribe).

a. *General characteristics of these two tribes.*
b. *Genera of these two tribes.*
c. *Garden culture.*

References: HERBERTIA vols. 1 to 11; Bailey's Cyclopedia; HERBERTIA 2: 78-79. 1935; 5: 110-113. 1938; 6: 65-103. 1939.

EIGHTH STUDY PERIOD. NARCISSEAE (Narcissus Tribe) and GALANTHEAE (Galanthus Tribe).

a. *General characteristics of these two tribes.*
b. *Genera and species of these two tribes.*
c. *Garden culture; and hybrids.*

References: Hutchinson, 1934; HERBERTIA 2: 78-79. 1938; Bowles 1934; Baker, 1888; HERBERTIA vols. 1 to 11; Daffodil Year Books, Roy. Hort. Soc.

NINTH STUDY PERIOD. EUCHARIDEAE (Eucharis Tribe) and EUSTEPHIEAE (Eustephia Tribe).

a. *General characteristics of these two tribes.*
b. *Genera and species of these two tribes.*
c. *Garden culture.*

References: Hutchinson, 1934; HERBERTIA 2: 79. 1935; HERBERTIA vols. 1 to 11; Bailey's Cyclopedia.

TENTH STUDY PERIOD. General Review of preceding study periods; including questions and answers; and score cards and exhibition schedule.

a. *Review of Amaryllis Family characteristics.*
b. *Review of tribes and genera.*
c. *Review of garden culture.*
d. *Score cards, and exhibition schedule.*

References: (score cards and exhibition schedule): HERBERTIA 5: 141-145. 1938; 7: 125-128. 1940; Colour Chart, Roy. Hort. Soc.

LITERATURE CITED

[Note.—This is a suggestive list; other sources will possibly be available locally. Books should be ordered through the local bookseller. Books marked (*) are technical works, not ordinarily intended for the uninitiated, but are included for they are the only texts that adequately treat the subjects.]

American Joint Committee on Hort. Nomenclature. Standardized Plant Names.
Baker, J. G. Handbook of the Amaryllideae. London 1888 (out of print).
Bailey, L. H. Standard Cyclopedia of Horticulture, latest ed.
Bailey, L. H. Hemerocallis. Gentes Herbarum II. (Fasc. III): 143-156. 1930.
Bowles, E. A. A Handbook of Narcissus. London. 1934.
British Colour Council in collab. with Roy. Hort. Soc., London. Horticultural Colour Chart I (1938) and II (1941).
*Cain, Stanley A. Foundations of Plant Geography. Harper & Bros. N. Y. and London, 1944.
Encyclopedia Brittanica, Latest edition.
Herbertia, Vols. 1 to 11, incl. (1934-1944, incl.). American Plant Life Society, Box 2398, Stanford University P. O., Calif.
Hutchinson, John. The Families of Flowering Plants II. Monocotyledons. Macmillan Co., London, 1934.
*Huxley, Julian. Evolution, the modern synthesis. Harper & Bros. N. Y. and London, 1942.
*International Botanical Congress. International Rules of Botanical nomenclature. 3rd ed. 1935.

Pam, Albert. Amaryllis belladonna. Jour. Roy. Hort. Soc., London. LXIX: 102-103. 1944.
Stevens, O. A. How plants and animals get their names. North Dakota Agric. Expt. Sta. Bimonthly Bulletin, Vol. 8, No. 2, pp. 9-13. 1945.
Stout, A. B. Daylilies. Macmillan Co. 1934.
Uphof, C. J. Th. Herbertia 5: 101-109. 1938.

CLAAR DAYLILY POLL

Elmer A. Claar, *Illinois*

Last year I wrote an article for Better Homes and Gardens, in which I classified Daylilies in four groups, based on the blooming time of these Daylilies in and around Chicago, and selected Daylilies which I believed to be the best in each individual group. In an effort to secure a wider point of view relative to these groups of Daylilies, I sent the list that I used in Better Homes and Gardens to twenty-four people whom I knew to be interested in Daylilies and who have either a large collection or access to seeing a large collection. Eleven of these individuals answered. I believe one of the reasons more people did not answer was due to the fact that I sent my list after the blooming season. Another reason was that some of my color descriptions, although based on the New England Gladiolus Society color chart, which was adopted by our organization several years ago, are not clearly established and comparisons of plants can be made accurately only by direct comparison between individual plants in bloom. It is my intention to send this list out at an earlier date this year to the same individuals, plus anyone else who has a large collection or access to a large collection of Daylilies whose name is given to me.

The first group of Daylilies is for the individual who has never grown Daylilies and who wants a few for a small sum of money. The list that I selected is widely distributed and was accepted in a general way by most of the individuals who replied. However, I shall indicate those who differed from my selections.

In order to accomplish anything of value and to make a start on this kind of poll, I have had to use my own judgment in disqualifying some of the votes on account of the blooming season, color or price, even though I might be accused of being arbitrary. This I hope will be corrected in later polls.

For the individual who has never grown Daylilies and who wants a few for a *small sum of money, I suggested these:*

Group I.

My Choice

Early Bloomers:—

Lemon-yellow *Flava* Other Selections. A Florida grower indicated he preferred *Domestico* or *Semperflorens* to *Flava.*

Yellow, orange back *Gold Dust* *Gold Dust* received 100%.

Orange *Dr. Regel* One vote for *Tangerine.* One vote for *Apricot,* which I list as a cadmium yellow, so the vote is thrown out. One vote for *Aureole,* which is thrown out because it is a rich cadmium yellow in color with faint traces of brownish fulvous.

Intermediate:—

Creamy-yellow *Winsome* The vote for *Winsome* was almost unanimous, but two individuals liked *Modesty.* This is a lovely lemon yellow and should be considered in the running in this class.

Summer Bloomers:—

Light-yellow *Hyperion* or *Patricia* Seven voted for *Hyperion,* two for *Patricia* and one for *Lemona.*

Yellow *Golden Bell* There was absolutely no uniformity of opinion on this class. One individual selected *Circe,* which I am throwing out because it costs $1.25; one selected *J. R. Mann,* another *J. A. Crawford; Dauntless* is thrown out because it is a polychrome, and *Mrs. Wyman* is thrown out because it is a late variety.

Orange-yellow *Ophir* *Ophir* received six votes; *Queen Mary* one, *Stalwart* one and *Mary Florence* one.

Orange *Golden Dream* *Golden Dream* was contested by *Cressida* two, *Goldeni* two, *Midas* one, *Aztec Gold* one. There was no uniformity in this class, which needs more study.

Eyed Variety *Mikado* *Mikado* was practically a unanimous choice, with one vote for *Araby,* which I am throwing out because of price.

Red *Cissy Guiseppe* No one was enthusiastic for *Cissy Guiseppe* but it was opposed by only one vote, *Imperator. Cissy Guiseppe* isn't much to look at but it is widely distributed and inexpensive and is the parent of some of the finest red hybrids that we now have.

Polychrome *Fulva* I selected *Fulva* because of its wide distribution. One each selected *Margaret Perry* and *Bardley.* One voted for *George Yeld* and another for *Chengtu,* both of which I am throwing out on account of price.

Late Bloomers:—

Yellow *Multiflora Hybrids* In the inexpensive late bloomers we had three votes for *August Pioneer,* two for *Mrs. Wyman* and one for *Boutonniere.* In my opinion, these plants are better than *Multiflora Hybrids* but more expensive, so I do not consider them but have no objection to any of them.

In the second group I assume that the individual has had a taste of Daylilies with some of the above inexpensive types and that he wants to add another dozen plants and keep the additional cost down to between $12 and $15. I made the following suggestions and will comment on them:

Group II.

My Choice

Yellow *Flavina* or *Estmere* Other Selections. Only one differed from these selections and he voted for *Apricot,* so we will consider all three of them.

Intermediate:—

Orange-yellow (large) *Queen of May Queen of May* had one affirmative vote and five opposed, two being for *Queen Mary,* one for *Harvest Moon,* one for *Semperflorens,* and one for *Chrome Orange,* which is too high priced for this group. This class needs more study.

Summer:—

Cream-yellow (tall) *Moonbeam Moonbeam* was opposed by two votes, one for *Gaiety* and one for *Modesty.* Note that *Modesty* was selected in the inexpensive group also.

Medium-yellow (tall, large) *Hesperus Hesperus* was practically unanimous, with but two opposing votes, one for *Pollyanna* and one for *J. A. Crawford.*

Yellow *Golden Bell Golden Bell* had three opposing votes, one each for *Giantess, Theodore Mead,* and *J. A. Crawford.*

Orange *Mrs. A. H. Austin Mrs. A. H. Austin* was opposed by one vote each for *Mrs. C. L. Seith* and *Meg, Modesty* and *Patricia* also had one vote each but are being thrown out because they do not belong in this color classification.

Large, showy *Golden West Golden West* was opposed by *J. G. Gaynor.* Both of these plants are lovely and are used extensively for hybridizing. There also was a vote for *Rajah,* which is being thrown out because it is not in this color classification.

Polychrome *Linda, Geo. Yeld, Chengtu Linda* had five votes, *Geo. Yeld* two, *Chengtu* two, *Sirius* one and *Dauntless* two. This class needs more study.

Red-orange *Imperator* I was the only one who selected *Imperator* in this class. Among those selected were *Gloaming* and *Sun Gold. Byng of Vimy, Rajah, Hankow* and *Baronet* also were *listed* but all of them were thrown out on account of price, color or blooming date.

Bicolor *Chisca* One selected *Pandora,* which I grew sometime ago but do not recall as a bicolor. Stout's *Bicolor* and *Festival* got one vote each. However, these are being thrown out on account of price.

Late Bloomers:—

Yellow *Dorothy McDade* There were two votes for *Mrs. W. H. Wyman,* which I will substitute for *Dorothy McDade.* It seems to me

that my choice of *Dorothy McDade* in this group should be disqualified on account of price. I have been growing it for a long time and have a considerable stock, which is the reason for my using it.

In the third group in the Better Homes and Gardens article, I described some of the first introductions of pink, raspberry, rose, red, maroon, ruby-red and purple. Inasmuch as this list merely covered some of the early introductions, I do not think a comparison is worth recording. I think the class should be left out entirely because if it contains anything of superior quality it will be recorded in the selections in Group IV.

Asked by the editor of Better Homes and Gardens to name my favorites among the named Daylilies of each color and class, irrespective of price, I submitted Group IV.

First, however, a word about Groups I and II. In Group I, for example, I would have no criticism of a choice of the early bloomers *Apricot, Sovereign, Tangerine, Gold Dust* and *Dr. Regel.* The same is true of the intermediates or summer blooming varieties in both Groups I and II because they all have been introduced for a considerable period and are relatively inexpensive. It is in the newer classes of pinks, raspberries, maroons, ruby-reds and purples where there is a genuine need for a standard flower with which to make comparison. Everyone will not agree that the flowers selected are the best but it is helpful to have some one or two with which to compare the many others. A flood of introductions is coming. Some eighteen hundred have already been named and with this number there necessarily must be many duplications and inferior introductions that will last only a short while.

Among the individuals to whom I sent my list was Mr. H. G. Seyler, Treasurer of the Farr Nursery Company, Weiser Park, Pa., who wrote me that he had been away for several years and therefore did not feel that he was qualified to make comparisons.

Dr. Traub felt that he was disqualified from voting because of his official connection as Editor. I did not hear from Dr. Stout, Mrs. Nesmith or Mr. Russell. Dr. Kraus was so pressed for time that he could not get his votes together. These individuals have done more than anyone else in the introduction of the new color varieties. Mr. Plouff also has introduced a large number of varieties, which I know he must feel are definitely superior, but inasmuch as the other hybridizers have not voted, I felt that if I had a chance to talk with Mr. Plouff he would instruct me, this year, not to record his votes.

My favorite introduced Daylilies in each color class, irrespective of price:

Group IV.

	My Choice	Other Selections.
Early Bloomers:—		
Yellow	*Earliana* or *Elizabeth*	*Earliana* favored three to one.
Orange	*Judge Orr*	Unanimous.

Intermediate Bloomers:—

Creamy-yellow *Winsome* *Winsome* three votes, *Modesty* one. *Crown of Gold* also received one vote, but I do not believe it is in this color class.

Light-yellow *Little Cherub* There was no uniformity in this vote. *Little Cherub* is my own plant. It has been named but not introduced and for this reason I am throwing it out. I am substituting *Flavinia* and *Estmere* for it. *Star of Gold* and *Gaiety* had one vote each but they are not intermediates as I grow them.

Orange *Queen of Gonzales* This was unanimous except for *Waubun* and *Wekiwa,* both of which are not in this color class.

Red *Wekiwa* *Wekiwa* was much favored in this classification, but there were two votes each for *Sachem* and *Baronet* and one for *Queen Wilhelmina.*

Bicolor:—

Pastel *Symphony* *Symphony* was accepted unanimously except for a vote for *B. H. Farr,* which is not an intermediate.

Strongly contrasting *Zouave* This was unanimous except for one vote for *Chisca,* which is not an intermediate with me.

Polychrome *Dominion* This was unanimous except for one vote for *Lidice* and one for *Brunette.*

Eyed Variety *Gay Couquette* *Gay Couquette* is my own plant. It has been named but not introduced so it should be thrown out of this class. The others receiving votes were Dr. Stout's *Aladdin* and *Buckeye,* which should be substituted.

Summer Bloomers:—

Cream *Vespers* This was opposed by the *Duchess of Windsor.*

Light-yellow *Mongol* Opposed by one vote for *Hesperus,* one for *Mission Bell,* and one each for *Patricia* and *Princess.*

Yellow *Anna Betscher* Opposed by *Golden West* and *Nebraska,* both very fine plants.

Orange *Majestic* Opposed by *The Swan, Aztec Gold, Nebraska* and *Valiant.* This group needs more study. There also were several votes for *Joanna Hutchins,* Dr. Kraus' lovely seedling, but this is disqualified because it has not been introduced commercially.

Orange-yellow *Golden West* Opposed by *Havilah* and *Golden Sceptre.* I am not acquainted with these although I think I once had *Golden Sceptre.*

Pink *Sweet Briar* *Sweet Briar* had five votes. Was opposed by *Pink Flamingo, Helen Wheeler, Afterglow* and *Bertrand Farr.* In Group

III, two voted for *Pink Charm* and one for *Pink Lass,* which should be considered in the running. This class is wide open for study.

Raspberry *Piquante* One other individual selected *Piquante.* In Class III *Sweet Briar* was selected. None of the other votes recorded was for this color.

Purple *Potentate* Opposed by *Purple Waters, Theron* and *Black Falcon.* Several votes were thrown out on account of being the wrong color. This class is wide open for study.

Rose *Dawn Play* Opposed by *Rosalind.* Several votes thrown out on account of being the wrong color. This class wide open for study.

Red *General MacArthur* Opposed by *Honey Red Head, Peony Red, Port, San Juan, Matada, Chief Cherokee, Red Bird* and *Granada.* This must receive considerable study.

Ruby-red *Royal Ruby* This was opposed by *Ruby Supreme, Craemore Ruby, Port* and *Royalty.*

Maroon *Marocco Red* or *Wolof* Opposed by *Vulcan* and *Victory Taierhchwang.*

Bicolor:—

Pastel *Debutante* Opposed by *Caballero, Afterglow, SuLin.*

Contrasting *Bold Courtier* Opposed by *Gay Troubador, Athlone, La Tulipe,* with *Bold Courtier* having the edge in the votes. Class wide open.

Polychrome *Painted Lady, Twinkle Eye, Honey Red Head,* and *Dr. Stout* Votes for *Garden Lady, Stalwart* and *Duchess of Windsor. Class wide open.*

Eyed Variety *Mikado Mikado* received more votes than any other. Opposed by *Jubilee,* (which I am informed is not hardy in the Middle West but is in California and Florida,) *Aladdin,* which I think is an intermediate, and *Jean,* which I do not know.

Late:—

Light-yellow *Autumn Prince* Opposed by *Dorothy McDade,* which blooms much earlier in my garden, and *Hankow* and *Multiflora,* which blooms much earlier.

Many of these will be replaced soon by numbered seedlings which I have seen in various hybridizers' gardens, but the above is a list and something to compare with, no matter what its limitations.

Note.—Several years ago a Southern lady sent me two seedlings, one of which was named *Autumn Sunset* and the other *Hiawatha.* The latter is very fine red clone. I have lost the lady's address, and would appreciate it if she would communicate with me about these daylilies.

REGIONAL TRIAL COLLECTIONS: REPORTS ON REGIONAL DAYLILY TRIALS, 1945

In spite of the difficult war years, the regional trial collections have been maintained, and some progress has been made toward the evaluation of the daylily clones now being tested on a regional basis. It is suggested that daylily breeders, who have not as yet sent their introductions to the trial gardens in their regions, send them directly to the persons in charge of the regional gardens. The addresses are indicated under committees in another section of this issue of Herbertia.

1. MILWAUKEE CITY AND COUNTY PUBLIC PARKS

THE DAYLILIES AT WHITNALL PARK, MILWAUKEE COUNTY, WISCONSIN

CHARLES E. HAMMERSLEY, *Milwaukee, Wisconsin*

Many master gardeners throughout the land have been vieing with each other to produce new and better daylilies. Their work has progressed so far that the results are certainly revolutionizing daylily colors and forms. This development will make the daylily one of the most popular of perennials. The season of bloom has been much extended and now we have several varieties that bloom in May, others that do not open until September, and a continuous procession of blooms between these dates.

Many of the newer daylilies produce far more flowers to the stem than the older types and remain open for a longer period. The flowers of some of these newer varieties are very large, up to nine inches in diameter, while others, especially the multiflora hybrids are much smaller but are borne in clusters. The color range now includes not only the older orange and yellow, but we have buff, pink, purples and bicolors in various shades. Some varieties have short grassy foliage, while in others, the foliage is more vigorous, thus offering a large variety.

A rapid development and improvement in daylilies is giving gardeners many splendid new varieties to brighten and charm their gardens. By noting the flowering time one can select a number of varieties that can supply blooms from May until October.

I have been unable to make as many visits to Whitnall Park as I should have liked during the war period on account of gas rationing and the inability to make daily trips, which are necessary to properly evaluate the various varieties. Whitnall Park has a very large number of the newer and better varieties of daylilies. Among the better varieties are the following: *Helen Wheeler, Wekiwa, Fire Red, Sachem, Cardinal, Peony Red, San Juan, Victory Taierhchwang, Wolof, Granada, Festival, Dr. Stout,* and many others. A more detailed evaluation of the clones in the collection will be included in a future issue of Herbertia.

We are greatly indebted to the Farr Nursery Company and Professor Watkins for helping us to obtain this collection.

A list of the 108 clones now under trial in the garden follows:

Ajax
Aladdin
Amaryllis
Apricot
Aurantiaca
Aurantiaca major
Aureole
Autumn Prince
Baghdad
Bardeley
Baronet
Bicolor
E. A. Bowles
Brunette
Buckeye
Burbank
Burmah
Caballero
Calypso
Carnival
Chengtu
Cinnabar
Corinne Robinson
Cressida
Dumortieri
Dr. Hughes
Dr. Regel
Dr. Stout
Domestico
Dominion
Duchess of Windsor
Dwarf Yellow
Eldorado
Elaine
Emberglow
Yeldrin
Emily Hume
Estelle Friend
Fire Red
Florham
Fred Howard
Fulva Cypriana
George Kelso
Golconda
Gold Dust
Golden Bell
Golden Mantle
Gold Imperial
Goldeni
Granada
Gypsy
Harvest Moon
Helen Wheeler
Hiawatha
Hyperion
J. A. Crawford
John Blaser
Mrs. John Tigert
J. R. Mann
Kwanso
La Tulipe
Lidice
Lovett's Lemon
Lovett's Orange
Mayor Starzyski
Margaret Perry
Midas
Mikado
Mildred Orpet
Miranda
Mrs. Wyman
Yellow Hammer
Modesty
Monarch
Mulleri
Multiflora
Nocernsis
Ochroleuca
Ophir
Pale Moon
Patricia
Peony Red
Queen of May
Queen Wilhelmina
Radiant
Rajah
Reba Cooper
Rouge Vermilion
Royal
Russell Wolfe
Sachem
San Juan
Semperflorens
Senator Andrews
Sirius
Sir Michael Foster
Summer Multiflora Hybrids
Symphony
Tangerine
Theodore Mead
Theron
Triumph
Victory Montevideo
Victory Taierhchwang
Virginia
Wekiwa
Woodlot Gold
Zouave

2. DES MOINES (IOWA) PARKS

THE DAYLILY TRIAL COLLECTION AT GREENWOOD PARK

Dr. Paul L. Sandahl, *Supt. of the Des Moines Park Board*

The garden is located at Greenwood Park on high ground in beautiful landscape surroundings not far from the Iris collection and the rose garden. It is also adjacent to the area where a new art museum will be built in the park this year.

During the war years the garden has not suffered, but it also has not been given the usual kind or amount of fertilization and cultivation that is usually given to push things along. We have had two successive years of abnormal weather which has not been conducive to good growth and bloom. However, on the whole, all plants are alive and growing and prospects now (May 1, 1946) are good for the coming season.

It is not possible to give an evaluation of the clones at the present time but this will be done in future reports. The following plants are in the garden under trial at present:

3 Florham
1 Chengtu
1 Miranda
1 Aurantiaca Major
3 Gypsy
3 Yellow Hammer
3 Ajax
1 Semperflorens
2 Mikado
3 Fulva Cypriana
1 Shirley
2 Hyperion
2 Ochroleuca
1 Cressida
3 Golden Bell
1 Bardeley
3 Virginica
3 Harvest Moon
3 Ophir
4 Margaret Perry
1 Dr. Regel
1 Mrs. John J. Tigert
1 Lovetts Lemon
2 Cinnabar
2 Sir Michael Foster
2 Nocerensis
2 Burmah
1 Domestico
1 Sirius
3 Woodlot Gold
1 E. A. Bowles
3 Mulleri
1 Bijou
3 Queen of May
3 Boutonnierre
1 Pale Moon
4 H. Aurantiaca
2 Bagdad
1 Hankow
1 Dwarf Yellow
2 Senator Andrews
1 Emily Hume
1 Golden Mantle
1 Lovetts Orange
1 Goldconda
1 Calypso
3 Eldorado
1 Fire Red
1 George Kelso
1 San Juan
1 Peony Red
1 Helen Wheeler
1 Victory Taierhchwang
1 Reba Cooper
1 Mayor Starzyski
1 Granada
1 Dr. Stout
1 Lidice
1 Emberglow
1 Victory Montevideo
1 Theodore Mead
1 Russell Wolfe
2 Dr. Hughes
2 Carnival
1 Elaine
1 Estelle Friend
1 Fred Howard
1 Duchess of Windsor
1 Queen Wilhelmina
1 Rouge Vermilion
1 Corinne Robinson
1 La Tulipe
1 Mildred Orpet
1 John Blaser
1 Amaryllis
1 Aureole
1 Anna Betscher
1 Fulva (wild type)
1 Golden Dream
1 Kwanso
1 Modesty
1 The Gem
1 Apricot
1 Bay State
1 J. A. Crawford
1 Gloriana
1 Goldeni
1 Lemona
1 Mrs. W. H. Wyman

3. SOUTHWESTERN LOUISIANA INSTITUTE, LAFAYETTE, LOUISIANA

Prof. Ira S. Nelson writes "During the war we managed to keep the garden intact, and now that things are returning to normal, we hope to make this garden into a very fine display for our section of the Country. Certainly the daylily is as much at home in Lousiana as any plant that we grow."

Prof. Nelson promises a report on the clones under trial for 1946 Herbertia.

4. DEPT. OF HORTICULTURE, UNIVERSITY OF FLORIDA, GAINESVILLE, FLORIDA

Prof. Watkins writes that on account of the pressure of his teaching load with the many returned war veterans, it is not possible for him to make any report this season. However, we can expect reports in future years.

[REGIONAL DAYLILY TRIALS, continued on page 8.]

2. DESCRIPTION, CLASSIFICATION AND PHYLOGENY

HERBERT'S APPENDIX

H. S. MARSHALL
Royal Botanic Gardens, Kew

Herbert's APPENDIX (containing "Preliminary Treatise," pp. 1-14) was published in London in 1821. The title-page of the Kew copy reads as follows:—

> "An /Appendix/ /By/ The Hon. and Rev. William Herbert /[short rule]/ With Plates /[short rule]/ London:/ Printed for James Ridgway, Piccadilly;/ And Sherwood, Neely, and Jones, 20 Paternoster Row./1821."

There are 52pp. The "Preliminary Treatise" ends on p. 14 and is followed by two uncoloured plates of line drawings of dissections. On p.15 begins "A Treatise &c." containing the descriptions which run to p.46, followed by the "Postscript" (pp.47-50). After this comes the text of *Nerine versicolor* and *Hippeastrum splendens* accompanied by two coloured plates.

According to the Catalogue of the Library, British Museum (Natural History) the work was issued as an appendix to vol. 6 of Edward's Botanical Register. It is described as an appendix to vol. 7 in the Kew Library Catalogue while the entry in Pritzel Thesaurus (1872), p. 141, no. 3983 states "An Appendix (to the Botanical Register)" . . . without giving a volume number. I am, however, unable to find the evidence on which these statements are based, and my efforts in this direction have been restricted by the fact that many of our older periodicals which might contain information on the matter, have been evacuated for the duration of the war, while other London Libraries are in similar case. Botanical Register 6 runs from March 1, 1820 to Feb. 1, 1821, and Botanical Register 7 from March 1, 1821 to Feb. 1822. The "Postscript" in Herbert's APPENDIX is dated Oct. 1821 and in Botanical Register 7 the APPENDIX is cited in literature under tt. 596 & 600 dated Jan. 1, 1822 & Feb. 1, 1822, but it is not cited under tt. 567 & 579 dated Sept 1 & [Nov. 1] 1821 respectively. The APPENDIX would thus appear to have been issued between Oct. & Dec. 1821 considerably after vol. 6 of Botanical Register was finished and while vol. 7 was still in progress. Mr. Stearn has suggested that it was probably published in December (see Sealy in Kew Bull. 1939, p. 66).

In Botanical Register 7 (as in other vols.) a list is given of the books cited in the volume, and among them is "An Appendix by the Hon. and Rev. William Herbert. With plates. London, 1821, 8vo." and it seems strange if the work was really part of the Botanical Register that this fact is not mentioned. Moreover, there is an Index to the first 23 volumes of Botanical Register but Herbert's APPENDIX is not included.

There seems little doubt that the APPENDIX was not issued *with* either volume 6 or 7 of Botanical Register but as a separately published work. Although it was published by the same firm that issued the Botanical Register (and also Herbert's AMARYLLIDACEAE) its connection with that periodical seems to have been very loose. I cannot, however, find any connection between Herbert's Preliminary Treatise and the Botanical Magazine 49 (1822) neither can I find any evidence to show that a 50 page appendix was ever published in the Botanical Magazine.

Cooperia brasiliensis Traub **sp. nov.**

In 1939, Mr. Mulford B. Foster brought back from Brazil an amaryllid that he had collected while on one of his bromeliad exploration trips. He entrusted this amaryllid to the writer for identification. At the writer's former home, Mira Flores, Orlando, Florida, the plant did not flower apparently because the bulbs were too small. However, from 1943-1944, at 109 Carmel Avenue, Salinas, California, under outdoor culture, the plant bloomed at intervals from spring until fall each season. Later, under greenhouse culture, at Beltsville, Maryland, 1945-1946, it also thrived and bloomed regularly. This amaryllid proved to be a new species of the genus *Cooperia,* the first from Brazil.

It is important to consider first of all the karyology. Preliminary studies on root tips, using Meyer's technique (Stain Tech. 20: 121-125. 1945) indicate that the 2n, or diploid, chromosome complement of the present species consists of 69 chromosomes plus 1 fragment. Its nearest relatives, when gross morphological characters are taken into account, have smaller chromosome complements—*Cooperia Traubii,* 2n=24, and *C. Drummondii,* 2n=48.

The present species differs from *Cooperia albicans* in important particulars. The filaments are not united towards the base, the stigmatic lobes are blunt, round, 1 x 1 mm., the perigone-limb has 3.5 cm. to 4.5 cm. expansion, the leaves are linear, up to 63 cm. long; whereas, in *C. albicans,* the filaments are slightly united towards the base, the stigmatic lobes are spatulate, 3 x 4 mm. expansion, the perigone-limb has a 7.5 cm. expansion, and the leaves are linear-oblanceolate and only 20 cm. long. The present species differs from *Cooperia Drummondii* var *Chlorosolen* in a number of characters. It is larger in all its parts, has relatively wider and lighter green leaves, the capsule is green, 1.4 to 1.9 cm. tall, 1.8 to 2.2 cm. wide, very deeply lobed, not narrowed towards the base; whereas, *C. Drummondii* var. *chlorosolen* has narrower, darker green leaves; the capsule has a reddish tinge over a dark green ground color, 1.1 to 1.4 cm. tall, 1.5 to 1.7 cm. wide, not deeply lobed, and narrowed towards the base. The best diagnostic character is therefore the matured scape just before the seeds are shed. The fact that the chromosome complement is different, and the species is readily distinguished from its nearest relatives and is geographically isolated from them, entitles it to specific rank.

Dried specimens of amaryllids, particularly those made by the old drying and pressing methods, are quite unsatisfactory for accurate work. A new and better technique of preserving herbarium specimens of amaryllids is long over due. Therefore, the following description is based on living specimens observed over a number of years. The species is named for the United States of Brazil, its native habitat.

Cooperia brasiliensis Traub **sp. nov.** (1947)

Bulbus tunicatus, collo longo; folia griseo-viridia, 4-7 (saepe 5 vel 6), supra canaliculata, usque ad 6.3 dm. longa et 4 mm. basi lata, apice rotundata uque 1 mm. lata; scapus fere teres, post anthesin elongatus; spatha monophylla, tubulosa; perigonium rectum, 8.5 cm. longum, usque ad 4.5 cm, lata, tubo 7 cm. longo; stamina pistillo paullo breviora, filamentis brevibus, complanatis, antheris stylo approximatis; stigma staminibus longius, obtuse trilobum; capsula viredis, 3-loculata, alte triloba, basin versus non angustata; semina numerosa, complanata, D-formia, exalta, nigra.

Rootstock a tunicated bulb, deeply seated in the soil, the neck reaching to the ground; bulblets freely produced; leaves 4 to 7, usually 5 or 6, gray-green up to 6.3 dm. long, channelled on the upper surface, up to 4 mm. broad at base, and up to 1 mm. broad near the rounded tapered apex; scape 11.2 to 12.3 cm. tall at anthesis, elongating after anthesis assuming a green color, finally reaching up to 4.4 dm. in height. 5 x 6.5 mm. at base, and 4 x 4.5 mm. below the spathe; peduncle at anthesis minutely mottled reddish on green background in upper half, gradually changing to reddish brown toward base, hollow, almost round, somewhat flattened, 5 x 3 mm. in diameter, 11.2 to 12.3 cm. tall; umbel 1-flowered, upright, ovary sessile, 1 cm. long, 4 mm. in diameter; spathe monophyllous, ribbed, rose-red, 4.5 cm. long, united to 2.5 to 3.3 cm. below, tips single, or bifid tips nearly opposite; perigone 8.5 cm. long, tube 7 cm. long, slightly widened at top, faintly ribbed, greenish changing to greenish-whitish at top, limb 3.5 cm. expansion before 6 p. m., 4.5 cm. spread after 7 p. m.; ground color white, perigone-segments broadly lanceolate-acute; sepaline segments 2.3 cm. long, 1.3 cm. wide, with a mucro at tip, faintly tinted rose on outer center, but not as a distinct band, becoming more pronounced to rose or rose-brownish at tip; petaline-segments 2.1 cm. long, 1.3 cm. wide, margins wavy, pure white; stamens 2 mm. shorter than pistil, anthers apressed in a ring around style; filaments white, 2 mm. long, 1 mm. broad, flattened; anthers yellow, subulate, affixed at lower third, 5 mm. long, 1 mm. wide at base; pistil 8.2 cm. long; white, stigma bluntly trilobed, lobes round, 1 x 1 mm.; capsule 3-celled, green, 1.4 cm. high, 1.7 cm. wide, very deeply 3-lobed; seeds numerous, 8.3 ± 0.08 mm. long 4.7 ± 0.01 mm. x 1.6 0.15 mm. wide (on basis of 10 variates), flattened, not winged, black.

The type specimen has been deposited in the U. S. National Herbarium, Smithsonian Institution, Washington, D. C. (No. 1,898,317)

Range.—State of Parana, Brazil, 100 miles northeast of Curybita.

Notes—This is an interesting species well worthy of extensive cultivation out of doors in sub-tropical climates, and as a pot plant in more

northern locations. Under pot-culture six to eight bulbs, evenly spaced in an 8-inch pot will give a maximum display.

Beltsville, Maryland HAMILTON P. TRAUB

Habranthus juncifolius Traub & Hayward **sp. nov.**

In 1940, Sr. Jose F. Molfino of Buenos Aires, Argentina, sent to the Society unidentified amaryllid seeds and bulbs collected by Sr. R. A. Spegazzini "en los campos," Province of Corrientes, Mercedes, Argentina. One of the subjects included in the lot of bulbs proved to be a new *Habranthus* species. It flowered for the first time in the Society's trial garden at Winter Park, Florida in 1941. Later it flowered out of doors at Salinas, California, from 1943 to 1944, and under greenhouse culture at Beltsville, Maryland, from 1944 to 1945. Careful comparison with other species of the same genus has shown that it is in fact a new species. Superficially the usual inflorescence resembles somewhat the rarely-produced two-flowered scape of *Habranthus robustus,* and the individual flowers remind one of *H. brachyandrus,* but the present species is distinct in the character of the leaves (cylindrical, hollow), normal number of flowers (two, rarely three or four per scape), the paracorolla (minute feathery processes), the character of the roots (relatively short, and rather fleshy), and other minor characters.

Habranthus juncifolius Traub & Hayward **sp. nov.** (1947)

Bulbus tunicatus, collo longo, radicibus brevibus crassisque; folia basi amplexicaulia, 2-5 (saepe 3 vel 4), cylindrica, fistulosa, usque ad 3.5 mm. basi diam., sursum angustata, apice obtusa, 81 cm. longa, griseoviridia; scapus 2-4-florus. (saepe 2-florus), floribus secundariis interdum quam primariis minoribus, fere teres, post anthesin elongatus; spatha deorsum tubulosa; pedicelli longitudine variabili; perigonium plus minusve declinatum, tubo brevissimo, paracorolla processis minutis plumosis prope basin segmentorum composita; stamina stylo approximata; stylus ca. 1/2 longitudine limbi; stigma trifidum; stamina stylo breviora, inaequalia (4 longitudinum); capsula 3-loculata, alte triloba; semina numerosa, alata, nigra.

Rootstock a tunicated bulb, deeply seated in the soil, the neck reaching to the surface; bulblets rarely produced; roots relatively short and rather fleshy, 1.5 mm. to 4 mm. in diameter; leaves sheathing at the base, 2 to 5, usually 3 or 4, cylindrical, hollow, up to 3.5 mm. in diameter near base, tapering to a blunt point at apex, up to 81 cm. long, gray-green; scape 2- to 4-flowered, usually 2-flowered, flowers may grade from larger to smaller, flower number per scape not a constant character, the same plant may produce 2-flowered scapes at one time, and 3- to 4-flowered scapes at another; scape reddish-brownish-greenish, almost round, 4 mm. x 6 mm. at base, up to 19 cm. tall at anthesis of flowers, but elongating and turning green after anthesis, up to cm. in height; spathe up to 7 cm. long, split almost to base in 3- to 4-flowered, not

so deeply in 2-flowered scapes; upper part greenish, lower part reddish-brownish-purplish, sometimes with two points, sometimes with tips united and open slit below; especially in 3- to 4-flowered scapes, bracts appear as white hairs; pedicels brownish-reddish, up to 4.8 cm. in primary flower, 3.8 cm. in next larger flower, other secondary flowers with correspondingly shorter pedicels; ovary up to 1.1 cm. long, 2 mm. wide at base, enlarging to 3 mm. at top, brownish-green; ovules numerous, central placentation; unopened flower buds red; flowers somewhat declinate; tube very short, reddish-greenish, throat greenish, outer segments up to 5.7 cm. long, 1.5 cm. wide in center, tapering to a sharp pink tinted point, rest of segment very slightly veined pinkish over white, deeper at midrib on outside, except lower part which is brownish-pinkish; inner segments similar to outer, but tips not so pointed; on inside all segments greenish-pinkish in lower part changing to white upwards; paracorolla a very minute feathery process near base of segments slightly above junction of stamens; stamens and style close together, declinate, pinkish in lower 2/3, upper 1/3 white; style somewhat more than ½ as long as limb, stigma trifid, stamens shorter than style, of 4 sets of lengths; capsule 1.5 cm. high, 1.8 cm. in diameter, deeply trilobed, secondary capsules may be smaller; seeds numerous, 9 mm. x 6 mm. winged, black.

The type specimen has been deposited in the U. S. National Herbarium, Smithsonian Institution, Washington, D. C. (No. 1,898,318)

Range.—Argentina, Mercedes, Province of Corrientes.

Notes.—The flowers of the bulbs studied proved to be self-sterile, but set seeds freely when pollen from another plant of the same species was applied. Attempts at reciprocal crossing with *Habranthus texanus* and *H. Andersoni* proved unsuccessful.

In California it thrived out of doors and it should also be at home in Arizona, New Mexico and Texas. It may also be adapted to Southeastern United States, but the plant was less vigorous in central Florida. This may have been due to the heavy rains and the relatively lower pH reaction of the soil. It should be tried out in the Upper South, and from New York westward to Iowa and Nebraska.

The plant is deeply seated in the soil. When the bulbs are planted at a shallow depth, they will work themselves down, becoming much elongated in the process. Under these conditions it is very difficult to dig them since the slender bulbs break easily. Under pot culture, it is outstanding. Eight bulbs, evenly spaced are planted in a 6-inch pot for the maximum effect. Water should be withheld from June to the latter part of August. Flowers are produced from two to three times from September to June. The leaves are long and damage or break off easily. To avoid this, a support should be given. Three slender bamboo stakes are spaced in a triangle in the pot so that 8 to 10 inches protrude above the ground. A ring of strong string is fastened near the top of the stakes and the leaves allowed to grow up inside and arch over.

Hamilton P. Traub and Wyndham Hayward

AMARYLLIS RETICULATA var. STRIATIFOLIA

MULFORD B. FOSTER, *Florida*

I have long been interested in Amaryllids although I have never been known as a grower or fancier. Wherever we go on our collecting trips I always take a few bulbs of any amaryllids that I come upon whether they are in bloom or not. Consequently I have had some most interesting surprises.

My introduction to what I consider one of the choicest of amaryllids was several years ago when I acquired an old colored print of *Amaryllis reticulata* var. *striatifolia* (syn. *Hippeastrum reticulatum* var. *striatifolium*). Its unusual beauty fascinated me.

No association came to mind, however, when I was collecting in Brazil in 1940 and was attracted to seed pods with brilliant orange-red interiors filled with canna-like black seeds. The stalk that supported them rose from a cluster of dark green leaves with a thin milk-white stripe in the center. Little did I realize what these bulbous plants would prove to be. I took bulbs from three different collection areas, and the few which I brought back survived the long journey favoring us with blooms the year after our return. I was, naturally, highly pleased to find that two were *A. reticulata* var. *striatifolia* and that the third one taken from another collecting area was *A. reticulata*. In this connection the reader is referred to a former Volume of Herbertia. On page 96, Volume 3, Herbertia, 1936, there appears a very good illustration of the typical form of *Amaryllis reticulata* var. *striatifolia*.

The first blooms were hand pollinated; the seeds matured and from them I have raised some very thrifty seedlings. They seem to be happiest in an acid soil and are satisfied with a minimum amount of light.

Every seedling that I have raised from these bulbs has come true—each one from the species variety had clear white center striped leaves. This undoubtedly shows that it is a true native variety and not a horticultural one as has been supposed. The plain green leaf form has produced only plain green leaf offsprings from seed and while the flowers are not as fine in conformation and color and the leaves are shorter, it is nevertheless a worth while amaryllis.

Both of these forms hold their beautiful foliage throughout the year which makes growing them a great pleasure. In fact I think there is nothing in the genus that has such lovely foliage and I would enjoy growing them even if they never showed a flower. The enjoyment of this plant is not limited to the beautiful foliage nor the exquisite, long-lasting, pink and white flowers, but continues through the seed pod stage which bursts open a few weeks later displaying their brilliant orange-red interiors encasing black succulent seeds. This third stage is a show for many weeks.

Three years ago Mrs. Norman Henry of Gladwyne, Penna., kindly sent me a specimen labeled "*H. reticulatum*" which she purchased from Holland several years previous (Plate 283). Now I have been able to compare this with my collected material. The Dutch bulb produces much

Dutch hybrid of *Amaryllis reticulata* var. *striatifolia*
Photo by Mulford B. Foster

Plate 282

larger leaves but the leaf striation is not pure white, rather it is a light green and not clearly defined. The flowers are larger than my collected *A. reticulata* and of a more lavender-pink; the reticulation is not as distinct and the lower sepals do not show the pure white as in the best species variety forms. I feel that possibly this Holland bulb is the result of a cross between the variety *stratifolia* and the species *A. stylosa* or some other species.

I would like to consider more thoroughly the differences in various striated phases of this species. I found the striated phases in low wooded sections where there is a very heavy rainfall in the heat of the summer. I learned from the bulbs which I brought back that they can take much water and can also go long periods without water.

Tabulated descriptions of the various phases follow:

Phase I: species variety; with pure white leaf-striation, has purplish underside leaf; petals have dark pink reticulation and half of two lower sepals and the lower petal is pure white. The lower sepals are distinctly divided in color and the lower inner half is pure white.

Phase II: species variety; leaves are narrower and lighter green with distinct striation; petals and sepals narrower; the lower sepals do not show distinctly the pure white as in Phase I.

Phase III: true species, has the smallest flowers—no distinction in color in lower sepals; reticulation is not as distinct in contrast—the leaves are shorter and broader with no indication of striation.

Of all the bulbs which I found in two different areas, of the variety form, I did not find a single plant without striated leaves, so the characteristic seems to be constant and not just an occasional variegated form as one might expect to find.

Every one of the seedlings of phase No. I and No. II have shown the pure milk white stripe in the center of the leaf.

There are very few ovules, generally not more than 36 in the variety phase but in the Holland bulb which has been known so many years there are generally at least 72 seeds and of course they are not as round and plump as in my collected species, further evidence which makes me inclined to think that the Dutch bulb is possibly one of the original crosses with *A. stylosa* or another species.

All phases send forth bloom (including the Holland hybrid) in late summer or fall.

It has proven to be most interesting and profitable to re-collect known plant material and compare it with what is now in horticulture, especially when it has been almost seventy years (1878) since the first *A. reticulata* was taken.

ALSTROEMERIA CARYOPHYLLAEA

MULFORD B. FOSTER, *Florida*

In 1939 while in the state of Espirito Santo, Brazil, I collected the first *Alstroemeria* I had ever seen but it was a year later when I learned

that it belonged to that genus, and it was six years later when I learned that this beautiful amaryllid was the long lost *Alstroemeria caryophyllaea* (Fig. 135).

Fig. 135. Alstroemeria caryophyllaea
Photo by Mulford B. Foster

It had bloomed sparsely in our garden for three years but the plant increased very little in size. Finally, I sent the flower, leaves and photo with my description of the peculiarities of the plant to Mr. Harry L. Stinson in Seattle, Washington, an American authority on this genus. I quote from his first letter:

"It was a thrill to the nth degree to receive your very interesting letter in today's mail and to lay violent hands upon a species of *Alstroemeria* which I have tried repeatedly to obtain in the Continental [European] gardens. It is one of the oldest in botanical literature but

also the scarcest to obtain. It is *Alstroemeria Caryophyllaea* Jacquin. It fulfills Jacquin's description about 100%."

This enthusiasm, of course, aroused my interest and I then gave my plant special attention. I separated the plant and placed a part of it in the shade of my azalea garden where the soil was much more acid. The plant grew with leaps and bounds; today it is very much at home in Florida. We do not know the lowest temperature that it will stand but no light frosts have affected it so far.

It is very thrilling to find a beautiful flower growing in its native habitat. Still more thrilling to carry it several thousand miles to a new home where it thrives and seems to be very happy, but yet more thrilling later to learn that it is a plant which has been lost for 150 years. This fact gave the whole adventure quite a climax, and my eyes will ever be more alert to the alstroemerias.

This species is ever-green and now that I have it growing in quite favorable conditions it is almost ever-blooming. This past year we had three distinct blooming periods, winter, summer and fall. The main season, however, is from December until March.

The fragrant flowers of this *A. caryophyllaea* which send off their perfume day and night will be a wonderful addition to any sub-tropical or tropical garden. As winter cut flowers they will be much appreciated for their long lasting qualities.

According to Stinson's painstaking research Herbert *(5)* writes of this *Alstroemeria* that "it is easily cultivated in the stove, requiring absolute drought in the autumn and early winter, and will send up flower stems as soon as it is started in the very early spring, if placed on a hot flue and abundantly watered. When it has done flowering, it may be removed into a cooler situation. Its time for flowering will depend upon the time of ceasing and re-commencing to water it."

But my experience with this species has been that it loves water, good drainage and apparently requires almost no rest at all. The flowers are more brilliantly colored in the winter blooming period than those that bloom in mid-summer. It undoubtedly does best in partial shade.

Mr. Stinson says that it is the only fragrant *Alstroemeria* so far known, and it is pleasant to associate the lovely carnation odor with the beauty of an *Alstroemeria* species.

I am indebted to Mr. Stinson for compiling the following historical data:

"About 1776 there was introduced into the gardens of Europe an *Alstroemeria* which Linnaeus, Jr., took for granted was the same one that his father had accepted from Feuillet's description as *Alstroemeria Ligtu.* Linnaeus Jr., *(1)* re-described it in his Supplement as *A. Ligtu.* Curtis *(2)* and Redoute *(3)* and several others fell into the same error. In 1804 Jacquin *(4)* correctly described it, and renamed it *A. caryophyllaea,* because of its carnation-like odor and because it was not the *A. Ligtu* of Feuillet."

Mr. Stinson further states that:

"According to Jacquin's account it soon perished and was not in general cultivation. Herbert gives a few cultural directions for it in his

Amaryllidaceae, (quoted above) so he must have been familiar with it. Since then I find no reference to it in literature, nor have I seen it listed in any catalogue."

I am further indebted to Mr. Stinson for passing on to me the following historical data translated from Jacquin, Schoenbr. vi. 33 t. 465 (1804):

"*Alstroemeria* with an erect stem; spathulate-like leaves, sessile, pressed up tight on the flowering stem; on the sterile stem there are others besides the top ones, longly lanceolate, petioled and scattered; corolla two-lipped.

"The entire plant is glaborous. The perennial stems grow from the fasciculated tubers, which are round, about as thick as the little finger, obtuse, an inch long, fleshy, dirty pale color, sending out fibrous branches from the apex. Many annual stems, inclined to be suberect, round, greenish and becoming purplish, clothed with spathe-like leaves, lying up flat to the stem and far apart; some are sterile, slender, 3-9 inches long, bedecked on the top with many leaf-like, alternate leaves; others carry a few flowers, the thickness of a dove's feather, without leaves, longer, terminate in an involucral umbel. Leaves are petioled, narrowly lanceolated, sharp on both edges, entire, three veined, open, 1-3 inches long. Leaflets of the involucre many, lanceolate-linear, entire, very much open and erect, some twice shorter than the peduncles, others tolerable longer. Peduncles more or less in fives, erect, round, upper part six grooved, 1-inch. Petals six, in one row, acute, open, two-lipped, unequal, lanceolate from the channeled claw; the three lowermost ones flexed and entirely red, with the middle one smaller and shorter; the three ascending ones white with the topmost part red, middle one quite long. Filaments six, awl-shaped, smooth, declined, unequal in length. Anthers oblong, erect and red. Ovary inferior, obverse-ovate, green, six grooved. Style shorter than the stamens, reddish; stigma opening very wide into three linear divisions. The odor of the flowers is of the aromatic carnation.

"Linnaeus, Sr., in his "Systema and Species of Plants" took for granted the species of the *Alstroemeria* from Feuillet; but he abstained from describing plants which he had not seen. While on the other hand, I do remember having seen this plant in flower under the title of *A. Ligtu,* thirty years ago (1774) in the gardens of Caesar Schoenbrunn. The plant afterwards perished. Not only have I described it, but I have also illustrated it. In so far as I recall, this plant which I have called *caryophyllaea* on account of its odor is not Feuillet's *Ligtu,* although it is similar to his drawing and has been taken for *Ligtu* in Botanical Works.

"Native country is unknown. It flowers in the warm climate during December and January."

After a century of confusion it has been a great satisfaction to reintroduce this delightful *Alstroemeria* species to northern hemisphere gardens.

REFERENCES

(Furnished by Harry L. Stinson)

1. Linnaeus f., Suppl. to Species Plantarum, 206-207. 1781.
2. Alstroemeria Ligtu, in Curtis' Bot. Mag. t. 125.
3. Redoute, Les Liliacées, 40-46. 1802.
4. Alstroemeria caryophyllaea. Jacquin, Schoenbr., VI, 33, t. 465. 1804.
5. Herbert, William, Amaryllidaceae, 1837, p. 89.

ALSTROEMERIA LIGTU

HARRY L. STINSON, *Washington*

Since the time that Father Feuillet found and described *Alstroemeria Ligtu,* there has been confusion and doubt in the minds of many great botanists as to which type he referred. This name "Ligtu" has been given to several types due to this uncertainty, showing that they did not fulfill the original description, which was considered to be quite inadequate.

During several years study and observation of these various types called "Ligtu," I have been unable to bring myself to the conclusion that we had in cultivation the true type of Feuillet. Endeavoring to reach a final conclusion I have imported seeds and plants from every source that I could contact. Finally, I received some seeds, which I was given to understand were from stock collected by Dr. T. Harper Goodspeed and his party of botanists on their recent Botanical Trip to South America. Among the plants from these seeds were a few which were definitely not like the others. They plainly exhibited characteristics in keeping with Feuillet's description, and when they bloomed and produced seeds, all doubt was removed. The two upper interior petals contained white, just as Feuillet had said they did. The seeds are less than one half the diameter of other species (Figure 136).

Since Feuillet's Journal is very rare and not to be found on every library shelf, I will give here for your pleasure and information a translation of his *A. Ligtu.*—

"The roots of this plant go in obliquely, it has thickened tubers covered with some little short hairs, it is round, three lines thick, and covered with a whitish skin. Its stem arises obliquely to the height of a foot, following the same direction as the roots; it is winged, covered with a reddish-brown bark, round, crowned with six or seven leaves, from between which emerge as many branches which bear several flowers at their summits.

"The leaves which are borne the length of the stem are placed on all sides, they embrace half the stem by their bases, their length is in the vicinity of two and three-quarter inches, their width some five lines, they are a bright green, end in a point, and are traversed for their length by several little ribs which originate at the base and continue to the extremity of the leaf.

"The flowers are borne on the young ovary of the fruit at the end of the peduncle of a beautiful green. This young ovary is ridged its

length with five [this is an error and should be six] ribs, and they carry a flower of a beautiful red, which is divided into six parts, two of which are streaked with white bands which form acute angles with the ribs of the same color which traverse their length. These are narrower and more pointed than the other four, which are 1-5/16 inches long and 9 lines wide. I have not seen the fruit, having been obliged to leave before its maturity.

"This plant is found along streams. I noticed this one along the river which passes through the center of the village of Conception in the Royalty of Chili."

Fig. 136. Alstroemeria Ligtu
Photo by Harry L. Stinson

The following description was made from one year old seedlings grown at Seattle, Washington,—

"Stems several, erect, simple, glabrous and glaucous, round, slender, reddish-brown, 3/16 to 1/4 inch in diameter, 24 inches high, not inclined to be rosulate, solid, leaves scattered along the entire length.

"Leaves ovate-lanceolate, acutely pointed, entire, *no cilia,* blade 3/16 to 5/16 inch wide, 3 to 5 inches long, narrowing into a petiole 1/8 to 3/16 inch wide. sessile and clasping the stem about half way, slightly glaucous and shiny on top, resuspinate, lower leaves on the stem more scale-like, becoming more leaf-like up the stem, prominently veined on the bottom, 7 veins, no pubescence on the veins.

"Roots fasciculated, filiform, tuberous portion about 2 inches long, 5/16 inch in diameter, covered with a whitish pubescence, white skin, brittle, sweetish to the taste. [I can give more information on the tuberous roots after I dig the mature plants this fall].

"Peduncles umbellated, 2 to 3 inches long, involucral leaves as many or one more than the number of peduncles, linear-lanceolate, acute, 2 to 3 flowers on each peduncle, pedicels about one inch long with a small linear-lanceolate bract at the point of branching.

"Flowers about 1½ inch wide, almost 2 inches long, oblique-erect, three outer segments pink, obovate, apiculated, reflexed, slightly crenulated, not finely serrated, the upper one shorter and more reflexed. Three inner segments wedge-shaped, narrower than the outer three, upper two the longest, channeled at the base, erect, center portion white, with maroon lines running out fan-shaped from the base, very sharply pointed, upper portion pink, lowermost one the narrowest and entirely pink.

"Capsule about ½ inch in diameter, six sided with six ribs.

"Seeds many, small—about 1/32 to 3/64 inch in diameter."

I believe this *Alstroemeria* species will prove to be as hardy as the *A. chilensis* hybrids, as it comes from about the same locality in Chile. After I have grown it for a few years I will learn more about it and may arrive at different conclusions as to its cultural requirements.

Feuillet could not have sent seeds of this plant back to France for he writes that he was obliged to leave before the plants were mature. Ruiz and Pavon, two famous Spanish botanists, were the next to visit this region and they mention having found this *A. Ligtu* on their trip back to Conception from Culento, [an haciendo twelve leagues East of Conception and on the same river—Rio Andalien—on which Feuillet writes that he found it growing.] Ruiz makes no reference in any of his lists of having sent seeds or tubers of this alstroemeria back to Spain. I do find where they sent seeds of *A. pelegrina* and a sample of flour (liutu) made from the tubers of the alstroemerias by the Chileans. The shipment containing sketches and specimens of *A. Ligtu* were lost in a ship wreck at sea. Dombey, the French Botanist, accompanying Ruiz and Pavon sent his cases from this area on a different ship and they arrived safely, but I find no record of the contents of his cases so have no idea if they contained our plant. A visit to the Herbarium at Paris would be extremely interesting and possibly profitable.

At the time (1754) Don Claudius Alstroemer went to Cadiz, Spain, to assume his duties as commercial advisor to the Swedish Consul, Don Bellman, he found *A. pelegrina* being grown for the beauty of their flowers, but nowhere is there any reference to seeing *A. Ligtu.* Linnaeus was quite enthusiastic about *A. pelegrina* but barely mentions that Feuillet had found and described another called, "Ligtu."

Linnaeus, Jr., assumed that the Brazilian species, *A. caryophyllaca,* was the same as the one his father had taken from Feuillet's description as *A. Ligtu,* and described it in his Supplement as such. Mr. Curtis in Bot. Mag. and Redoute in his "Les Liliacées" and others fell into the same error. Herbert, in his "Amaryllidaceae," writes that the name "Ligtu" was given by "a great and unaccountable error in the Bot. Mag. . . . . to a tropical plant, in no way resembling it, which has been generally cultivated under a wrong name, being properly *A. caryophyllaea* of Jacquin." Curtis admits that this plant does not fit Feuillet's description but it has gone under this name for so long a time that it would be useless to correct the mistake.

Dr. Goodspeed in his interesting and informative book, "Plant Hunters in the Andes" mentions having seen the pink *A. Ligtu* growing near the summit of the Andes along the Trans-Andean Railroad. I am wondering about this. If convenient I plan to go through his herbarium specimens this summer to see what it is.

The search into the history of *A. Ligtu* has led to some interesting experiences, one of which was Ruiz's reference to having found alstroemerias in the "Province RERE." Days and days I spent days and days in looking through old geographies and encyclopedias for this old province, with no success. In desperation I thought it might be a Latin abbreviation, so spent more days tracing down about every irregular verb in the Latin grammar. Still no luck. Here the matter stood until I was able to get a translation of Ruiz's "Travels in Peru and Chile" by the Field Museum of Natural History. This solved the mystery, for here it was, a province East of Conception, Chile, later incorporated into a larger province.

In conclusion, I am of the opinion that all the alstroemerias that we have been growing in our gardens under the name of *A. Ligtu* are varieties and hybrids of *A. chilensis.* Kunth in his "Enumeratio Plantarum" Pl. v., page 778-91, states that several forms are grown in the Royal Horticultural Garden of Berlin. My observations lead me to believe that about four forms or species have become so thoroughly hybridized that it is almost hopeless to separate out the true types involved and give them a species standing. As difficult as it may be I am endeavoring to take seeds from the various forms to see if they by chance might throw some light upon their parentage.

The name "Ligtu" is euphonious and has historical interest to the alstroemerian, but I have no doubt that the flowers will be just as beautiful under the name *"chilensis"* as they were as A. Ligtu when parading incorrectly under the name, *A. Ligtu.*

LEUCOCORYNE AND RELATED GENERA OF SOUTH AMERICA

J. C. Th. Uphof

The beautiful Glory of the Sun, *Leucocoryne ixiodes* var. *odorata,* illustrated in color on the Plate facing page 126, in Volume 3, 1936, of Herbertia, is fairly well known in American gardens, but the remainder of the species in the genus *Leucocoryne,* and the related South American genera *Tristagma* and *Steinmannia,* and the South American portions of the genera *Nothoscordum, Brodiaea* and *Triteleia,* are little known. Representatives of these genera are rare in collections of living plants, and even in herbariums of the larger institutions there are but a few specimens to be found for study and comparison. Detailed descriptions of these little known genera and species are given in the following pages in the hope that these "orphans" may receive more attention in the future.

1. THE GENUS LEUCOCORYNE

The Genus *Leucocoryne* was described in 1830 by John Lindley, Professor of Botany in the University of London, in Edward's Botanical Register [1] where we find on plate 1293 a colored illustration of *Leucocoryne odorata* which he calls in English "Sweet-scented Leucocoryne." Opposite this hand-colored plate we find the first description of the genus. The name *Leucocoryne* he derives from the Greek [=white and club] "in allusion to the club-like sterile stamens." That same plate gives us also a longi-section of the flower, showing along the throat of the perigone peculiar appendages that represent the staminodes or sterile stamens. Lower down toward the middle of the perigon tube, the normal fertile stamens may be seen. Lindley says: "From *Brodiaea* this genus differs in the texture of its sterile stamens, and in the place of the insertion of its fertile ones; it is also distinguishable by the want of the hypogenus scales, which although not much developed in *B. congesta,* undoubtedly exist in *B. grandiflora,* where, however, they have been overlooked by Dr. Hooker in the Botanical Magazine, both in his figure and description."

A year later there was published in The American Journal of Science and Arts [2] a contribution on plants, collected by Bertero in Chile. On page 301 we find the first mention of *Antheroceras,* "A new genus, which bears great resemblance to the *Sowerbaea,* Smith, originally from New Holland. There are two species; the *A. ornithogaloides,* (Guill.) and the *A. odorum,* Bertero, (Guilli de San Francisco). They grow in sterile and stony pastures; the first on the mountains, the second on the plains. Both merit cultivation." From this statement it is

1 J. L. [indley], **Leucocoryne odorata.** Pl. 1293. Edward's Botanical Register. 1830.

2 **W. S. W. Ruschenberger.** List of the plants of Chile, by Dr. C. Bertero; translated from the "Mercurio Chileno" and forwarded for this Journal. Am. Journ. Science and Arts. 19:301, 1831.

difficult to derive any relationship to *Leucocoryne,* Lindley. However, in a later publication written by Baker [3] we notice that *Antheroceras* [he prints here *Anthoceras,* Bertero, MSS.] is considered a synonym of *Leucocoryne.* There are some other interesting items in the history of nomenclature of this genus and its species, that may be mentioned. Lindley in Botanical Register gives us a description of *L. odorata* with a colored plate opposite the text. On the next page we find also a short description in Latin of *L. ixioides* giving as synonym *Brodiaea ixioides,* Hooker, and refering at the same time to the description and thus also to plate 2382 of Curtis' Botanical Magazine 1823. The next species that is described by Lindley is *L. alliacea,* with *Brodiaea alliacea,* from Miers' travels, as synonym.

From colored Plate 1293 in Botanical Register and Plate 2382 in Botanical Magazine, one concludes that there must be two distinct species involved, namely *L. odorata* and *L. ixioides,* yet in the publication of Baker, the two are grouped together as one species, namely *L. ixioides* Lindl., with *L. odorata* as a synonym.

Genus LEUCOCORYNE Lindley

Lindley, Bot. Reg. pl. 1293, 1830; syn. *Antheroceras,* Bert., American Journal Science and Arts, 19:301, 1831; *Loucoryne,* Steud. Nom. Ed. 2 II. 38, 1841; *Anthoceras,* Baker, Journal Linn. Soc. 11:374, 1871.

Bulbous plants; leaves narrow, linear; scape simple; flowers conspicuous, grouped into umbels, surrounded by two linear-lanceolate, membranous bracts; perigone-tube cylindrical or drawn together above the ovary, longer or shorter than the lobes; tepals long-ovate, or narrowly extended; stamens 3, opposite the outer tepals, enclosed in the tube of the perigon; filaments very short, anthers long-linear; staminodes 3, enclosed by the tube, linear or widened toward the base, no remnants of anthers visible; ovary elongated, rounded off at the apex, 3-ribbed; style short with a small stigma; fruit a membranous capsule, ovate or longish; seeds black, many, small, spherical.

Fourteen species of *Leucocoryne* are recognized. These are all native to Chile. Lindley, who founded the genus *Leucocoryne,* placed the description of *L. odorata* before those of *L. ixiodes* and *L. alliacea.* Baker reduced *L. odorata* to a synonym of *L. ixioides,* and the latter is therefore the nomenclatural type of the genus.

DESCRIPTION OF SPECIES

1. *Leucocoryne ixioides* Lindl., Bot. Reg. sub. t. 1293, 1830; Kunth Enum. Plant. 4: 473, 1850; C. Gay Flor. Chil. 6: 121, 1853; *Brodiaea ixioides* Hook. Bot. Mag. t. 2382, 1823; *L. odorata* Lindl. Bot. Reg. t. 1293, 1830; *Antheroceras odorata* Bertero, Journ. Am. Science. 19: 301, 1831; *L. narcissiflora* Phil. Flor. Atacam. 52, 1860.

Description.—Bulb roundish, 12 to 18 mm. in diameter, tunicate; leaves many, green, 16 to 24 cm. long, 2 mm. wide; scape erect, fragile,

[3] **J. G. Baker.** A Revision of the Genera and Species of Herbaceous Capsular Gamophyllous Liliaceae. Journ. Linn. Soc. 11:374-375, 1871.

fistulose, 15 to 25 cm. long; spathe-valves linear-acuminate, 24 to 30 mm. long; umbels 3 to 12-flowered, pedicels 18 to 36 mm. long; perianth 18 to 30 mm. long, light violet; segments lanceolate-spatheolate, 5 to 6 mm. wide; staminodes short.

Notes.—*L. odorata* Lindl. Bot. Reg. t. 1293, 1830 is considered by Baker as belonging to *L. ixioides* Lindl. He states "*L. odorata* est mera *forma pedicellis brevioribus.*" Lindley says that "this pretty little plant was found by Mr. M'Rae in November 1825, along with two other species, upon the sides of the mountains lying between St. Jago and Valparaiso, in places where the snow has been a few days melted." The plant was received from Mr. M'Rae by the Horticultural Society in the spring of 1826 and flowered for the first time in August of the same year.

2. *Leucocoryne angustipetala* C. Gay. Flor. Chil. 6: 124, 1853; Baker. Jour. Linn. Soc. 11: 375, 1871.

Description.—Bulb 16 to 18 mm. in diameter, tunicate; leaves many, firm, 15 to 25 cm. long; scape 12 to 20 cm. long; spathe-valves 16 to 18 mm. long; umbel 3 to 4-flowered, pedicels 6 to 12 mm. long; perianth 10 to 12 mm. long, pale purple, segments linear, acute; staminodes linear, acuminate.

Notes.—Has been reported to be native to Chile.

3. *Leucocoryne macropetala,* Phil. Linnaea 29: 74, 1857-58.

Description.—Umbel 3 to 5-flowered. Spathe-valves narrow; pedicels double the length of the tube of the flowers; flowers white, 16 to 20 mm. long, lobes of the perianth linear to lanceolate, reflex; tube long; staminodes broad, cylindrical.

Notes.—Native to Chile; La Serena leg. el Gal Herb. Chil. no. 449.

4. *Leucocoryne alliacea,* Lindl., Bot. Reg. t. 1293, 1830; Hook. et Arn. Bot. Beech. 48, 1840; Kunth. Enum. Plant. 4: 474, 1850; C. Gay Flor. Chil. 6: 123, 1853; *Brodiaea alliacea* Miers. MSS.; *Antheroceras Ornithogaloides,* Bertero, Jour. Am. Science. 10: 301, 1831.

Description.—Bulb ovoid, 18 to 24 mm. in diameter, truncate; leaves many, green, 12 to 16 mm. long, 2 mm wide; scape 12 to 24 mm. long; spathe-valves linear-acuminate; perianth 16 to 18 mm. long, pale violet; segments linear; staminodes linear, acuminate, 6 to 8 mm. long; flowers are united into 2 to 4-flowered umbels; pedicels 6 to 8 mm. long.

Notes.—This species is native of Chile.

5. *Leucocoryne coquimbensis,* F. Philippi, Plantas Nuevas Chilenas, Ann. Univ. Chile. 273-274, 1896.

Description.—Leaves narrow linear; 28 mm. long and 2 mm. wide, bright green; scape produced after the leaves, about 35 cm. long and 2 mm. wide; umbel 2 to 5-flowered; spathe scarious, linear, reaching about the middle of the limb of the perianth; perianth hypocrateriform, violet and white toward the base of the limb; tube greenish, about 11 mm. long; staminodes yellow, conical, 4 mm. long.

Notes.—This species was first found near Coquimbo, Chile, September 1893. It is apparently related to *L. purpurea* from which it differs by the almost white throat of the perianth and the yellow staminodes.

6. *Leucocoryne connivens,* R. A. Philippi, Plantas Nuevas Chilenas, Ann. Univ. Chile. 273, 1896.

Description.—Leaves usually 3 in number, somewhat grooved, linear, 2 mm. wide; scape 3-flowered, 22 cm. high and, like the leaves, bright green; spathe dry, purplish at the base, 2 cm. long and more or less of the same length as the pedicels; limb narrow campanulate, 16 mm. long and 5 mm. wide; lobes much longer than the half of the flower, a little grooved, white; staminodes 9 mm. long.

Notes.—Native to Talca, Chile. Philippi mentions that a bulb which was collected in Talca flowered in the Botanic Garden.

7. *Leucocoryne incrassata,* R. A. Philippi, Plantas Nuevas Chilenas, Ann. Univ. Chile. 272-273, 1896.

Description.—Umbel about 7-flowered; pedicels long subequal, 2 to 4 cm. long; spathe about 30 mm. long; lobes of the perianth oblong-lanceolate; tube 11 mm. long; staminodes oblong.

Notes.—This species was first reported from Vallenar, Chile, February 1883, by Belisario Rojas, Philippi mentions that this is the only species of *Leucocoryne* that flowers at the end of the summer; the others flower during the spring.

8. *Leucocoryne foetida,* R. A. Philippi, Plantas Nuevas Chilenas, Ann. Univ. Chile. 272, 1896.

Description.—Bulb about half the size of that of *L. odorata;* leaves narrow linear, 25 to 30 cm. long and 2 mm. wide; umbel 3 to 5-flowered; scape 25 to 30 cm. long, purplish at the base; spathe as long as the pedicels; pedicels 13 mm. long; lobes white or pale violet, ovate-lanceolate, acuminate, 29 mm. long and 9 to 10 mm. wide; staminodes light yellow.

Notes.—This species was first reported from Quilpué, Chile. The plant gives off a strong odor which is much more pronounced than in *L. alliacea.* This species differs from *L. ixioides* and *L. odorata* by its lesser number of flowers to each umbel; from *L. montana* by its shorter pedicels and from *L. pauciflora* by its shorter staminodes.

9. *Leucocoryne violescens,* R. A. Philippi, Plantas Nuevas Chilenas, Ann. Univ. Chile. 271-272, 1896.

Description.—Bulbs resemble those of *L. odorata;* leaves linear, narrow, 40 to 45 mm. wide; umbel about 6-flowered; scape 45 mm. long; spathe-valves narrow and as long as the pedicels; pedicels 20 to 30 mm. long; tube of the perianth 10 mm. long, sometimes dark colored; lobes 24 mm. long and 6 mm. wide, white, tinged with violet.

Notes.—This species was first collected in Colina, Chile, October 1887. The narrow shape of the lobes of the perianth distinguishes this species. It approaches *L. oxypetala.*

10. *Leucocoryne narcissoides,* R. A. Philippi, Plantas Nuevas Chilenas, Ann. Univ. Chile. 271, 1896.

Description.—Scape 2-flowered; limb of the perianth lanceolate, much longer than the tube; staminodes cylindrical, short, following hardly the middle of the length of the tube.

Notes.—Reported from Cachinal de la Sierra, Chile. 26° 4′ lat. at 2000 meter elevation.

11. *Leucocoryne appendiculata,* R. A. Philippi, Plantas Nuevas Chilenas, Ann. Univ. Chile. 270-271, 1896.

Description.—Bulbs resemble those of *L. ixioides;* leaves *linear,* 3 mm. wide, much shorter than the scape; scape 20 cm. long, plump; spathe 35 mm. long, green, membranous toward the apex; tube of the perianth 13 mm. long; lobes 26 mm. long, usually however, 23 mm. long and 10 mm. wide; staminodes 7 mm. long, their appendix being 1 mm. in length.

Notes.—This species was first collected in Caldera a Paulo Ortega, Chile.

12. *Leucocoryne oxypetala,* R. A. Philippi, Plantas Nuevas Chilenas, Ann. Univ. Chile. 270, 1896.

Description.—Spathe reflexed; umbel 3 to 6-flowered; pedicels about 22 mm. long; tube of the perianth 8 mm. long; lobes of the perianth narrow, acuminate, 15 mm. long and 5 mm. wide; sterile stamens (staminodes) 4 mm. long, laciniate with an attenuate base.

Note.—First found near Pabellon, Capiapo, Chile by Francisco San Roman, Caldera. Philippi mentions that the lobes of the perianth have a very unique shape.

13. *Leucocoryne pauciflora,* R. A. Philippi, Plantas Nuevas Chilenas, Ann. Univ. Chile. 269-270, 1896.

Description.—Bulb covered with reddish scales like those of *L. ixioides;* Leaves narrow, linear; inflorescence 23 cm. high, 3-flowered; pedicels short, 10 mm. long; spathe 23 mm. long; tube of the perianth 9 mm. long; lobes ovate-lanceolate, 10 mm. long; staminodes pale yellow; capsule 16 mm. long and 5 mm. wide.

Notes.—This species was collected at Montenegro, Chile by Aug. Borchers, 1884. The fruits are much smaller than are those of *L. ixioides.*

14. *Leucocoryna montana,* R. A. Philippi, Plantas Nuevas Chilenas, Ann. Univ. Chile. 269, 1896.

Description.—Leaves linear, narrow, 3 mm. wide; scape 4-flowered, 20 cm. high or less; pedicels elongate, 55 mm. long; spathe 28 mm. long; perianth 3 cm. in diameter; sterile stamens (staminodes) yellow, narrow.

Notes.—was first reported from Campana de Quillota, Chile by Aug. Borchers in 1884. *L. montana* differs from *L. ixioides* by its narrow tube and the much narrower lobes of the perianth.

2. THE GENUS TRISTAGMA

The Genus *Tristagma* was mentioned for the first time in a small publication of 30 pages by Ed. Poeppig,[1] containing the descriptions of a number of new genera and species that were obtained from Chile. *T. nivale,* Poeppig, was the only species of this genus that was described in this publication and is therefore the type with which all the other species have to be compared. Later on there appeared the name of *Stemmatium* given by Rudulfo A. Philippi[2] as a "nuevo jenero de las Liliaceas." He gave only one species, namely *S. narcissoides,* Phil. He believed that this

1 **Eduardo Poeppig.** Fragmentum synopseos plantarum phanerogamarum ab auctore annis MDCCCXXVII ad MDCCCXXIX in Chile lectarum. 8-9 Lipsiae, 1833.

2 **Rudulfo A. Philippi.** Descripcion de las plantas nuevas incorporadas ultimamanta en al herbaria chileno, por el doctor don Rudulfo A. Philippi. Anales de la Universidad de Chile. 43: 551-552, 1873.

species is closely allied to *Leucocoryne.* A few years later the name of *Stephanolirion,* Baker[3] was proposed with *St. narcissoides,* Baker, as the only species. He described the genus and the species in considerable detail. However, he did not mention *Stammatium narcissoides,* Phillippi. Modern works, like that of K. Krause, Liliaceae, in Engler and Prantl, Die Naturlichen Pflanzenfamilien 2 ed. vol. 15 a: 324, 1930, consider *Stammatium* and *Stephanolirion* as synonyms of *Tristagma.* Whether Baker knew anything about the publication of Phillippi is not certain. It is of interest to note the description of the fruit. Phillippi describes the fruit as "fructus capsula ovata, in parte superiore loculicide deshiscens." Baker on the other hand had not seen the fruit, indicating "Fruit not yet known." It may be purely accidental that both authors had given to this plant the species-name of *Narcissoides.*

Genus TRISTAGMA Poeppig

Poepp. Fragm. Synops. Phaner. Chile. 8, 1933; syn. *Stemmatium* Phil. Anal. Univ. Chile. 43: 551, 1873; *Stephanolirion* Baker Gard. Chron. new ser. III; 234, 1875.

Bulbous plants; leaves few, narrow, linear; scape simple and short; inflorescence an umbel, composed of but a few flowers, enclosed in membranous bracts; perianth with a cylindric tube and narrow extended lobes; stamens 6, enclosed in the perianth-tube; filaments very short, the anthers long; ovary superior, ovate, 3-celled, many ovules in each cell; style short; fruit a capsule with many seeds.

The species of the Genus *Tristagma,* all native to Chile, are described below.

DESCRIPTION OF SPECIES

1. *Tristagma nivale,* Poepp. Fragm. Synops. Phaner. Chile. 9, 1833.

Description.—Bulb tunicate, ovate, attenuate; outer scales membranous; leaves linear, narrow, obtuse, bright green; scape simple; spathe-valves bipartitate; pedicels unequal; flowers scentless, united into an umbel; perianth tube cylindrical; filaments short with long anthers; style simple, stigma obtuse; ovary ovate; capsule 3-celled, many seeded.

Notes.—Native to Southern Chile, Andean Region.

2. *Tristagma narcissoides,* (Phil.) Benth. et Hook., Gen. Plant. 3 pars 2: 798-799, 1883; *Stemmatium narcissoides,* Phil., Ann. Univ. Chile. 43: 551-552, 1873; *Stephanolirion narcissoides,* Baker, Gard. Chron. Ser. III: 234, 1875.

Description.—Bulb globose, about 2.5 cm. in diameter, covered by brown membranous scales; leaves 3 to 4, appearing at the same time with the flowers, erect, 30 cm. long, 5 mm. wide, glabrous, narrow linear, acuminate; scape slender, terete, purple, 30 cm. long; umbel 5 to 6 flowered; spathe-valves two, 24 to 30 mm. long, linear, acuminate, membranous; pedicles slender 6 to 12 mm. long; perianth hypocrateriform,

[3] **J. G. Baker. Stephanolirion,** Baker, genus novum. Gardener's Chronicle. Ser. III, 234, 1875.

tube about 12 mm. long, cylindrical, dingy white; segments 6, oblanceolate, subacute, 16-18 mm. long, 6 mm. wide, pure white with a slender, two-nerved, greenish keel; corona erect from the throat of the tube, clearly orange, 2mm. deep; stamens 6, the small sessile oblong, yellow anthers grouped tightly in two sets of three each in the upper half of the tube; pistil not reaching more than half way into the tube; ovary 3-celled, cylindrical with several horizontal ovules in each cell; style erect, considerably shorter than the ovary; stigma capitate; fruit an ovate capsule.

Notes.—Philippi records his species from Carrizal-Baja, Province of Atamaca, Chile where it was found by Tomas King. Baker notes that "this interesting novelty was imported by Messrs. Veitch from Chile and flowered in their London garden last September (1874)." He also states that its general appearance at a first glance is most like that of the slender varieties of *Narcissus Tazetta* with a white limb and orange crown. Bentham and Hooker brought this species under *Tristagma.*

3. *Tristagma dimorphopetala,* C. Gay, Flora Chil. 6: 126, 1853; Atlas t. 69 bis.; *Leucocoryne Gayi,* Baker, Journ. Linn. Soc. 11: 375, 1871.

Description.—Bulb unknown; leaves linear, 12 to 18 cm. long and 3 mm. wide; scape fragile, fistulose, about as long as the leaves, 6- to 8-flowered; spathe-valves lanceolate, attenuate, 24 to 30 mm. long; pedicels variable in length on the same umbel, from 2 to 7 cm. long; perianth 10 to 12 mm. long; segments about half as long as the tube, oblong to oval, 5 to 6 mm. long; the three largest stamens 8 mm., the three shortest, 5 to 6 mm. long; ovary oval, truncate, 3 to 4 mm. long and about ¾ mm. wide, slightly grooved, 3-celled, terminated by an obtuse stigma; capsule 8 to 12 mm. long and 5 to 7 mm. wide.

Notes.—Gay found this species among arid hills of Arquero near Coquimbo, Chile.

3. THE GENUS STEINMANNIA

The Genus *Steinmannia* was founded by Philippi [1] in 1884, in honor to a certain Steinmann. Very few data could be found about this monotypic genus.

Genus STEINMANNIA Philippi

Phil. f. in Anal. Univ. Chile, 10. 1884; Krause, Liliaceae, in Engler and Prantl, Die Natűrlichen Pflanzenfamilien. 15a: 324, 1930.

Bulbous plants; perianth tubular to campanulate; the six perianth lobes longish, blunt; stamens becoming free at upper half of perianth tube; filaments thread-like; anthers small, roundish to oval; ovary elongated, 3-celled, many ovules in each cell; style round, stigma simple, shield-shaped; fruit a capsule, longish with black warty seeds.

1. *Steinmannia graminifolia,* Phil., in Anal. Univ. Chile, 10, 1884.

1 F. Philippi. Anales de la Universidad de Chile. 10, 1884.

Small bulbous plants with narrow, linear leaves; scape simple thin and short; flowers greenish-yellow, surrounded by a thin membranous bract.

The description of this species is otherwise identical with that given above for the Genus.

Notes.—This species grows between rocks, and was first reported by Philippi from Santiago, Chile.

4. THE GENUS NOTHOSCORDUM (SOUTH AMERICAN PART)

The species of this genus are distributed in North and South America. Some have been reported as having escaped along the Mediterranean and other parts of the Old World. *Nothoscordum* is closely allied to *Milla* and to *Brodiaea*. In this contribution only the two species from South America need to be considered, namely *N. aureum* and *N. hirtellum*.

1. *Nothoscordum hirtellum* (Kunth) Baker, Gard. Chron. III. 20: 459. 1896; *Triteleia hirtella* Kunth, Enum. Plant. 4: 456, 1843; *Milla hirtella* Baker Journ. Linn. Soc. 11: 385, 1871.

Description.—Bulb subglobose to ovoid; leaves 10 to 18 cm. in length, filiform, about 1 mm. wide; scape 15 to 18 cm. in length; perianth yellow; segments elliptic; tube campanulate; stamens inserted in the tube; anthers subulate; ovary sessile; style filiform.

Notes.—Montevideo, Gaudichaud.

2. *Nothoscordum aureum* (Lindl.) Johnston & Parodie, Rev., Fac. Agron. Vet. Buenos Aires 7: 182, 1930; *Triteleia aurea* Lindl. Bot. Reg. 27: Misc. 76, 1841; *Milla aurea* Baker Journ. Linn. Soc. 11: 386, 1871; *Brodiaea aurea* Macloski. Rep. Princeton Univ. Exped. Patag. 81: 304, 1903/06.

Description.—Bulb round, 6 to 10 mm. in diameter, tunicate, membranous, whitish; leaves 6 to 8, cavnose-herbaceous, filiform, 16 to 20 cm. in length; spathe-valves 2, lanceolate, connate at the base, 6 to 8 mm. long; umbels 2 to 6 flowered; pedicels 16 to 22 mm. long; perianth 8-12 mm. long; segments oblong-spathulate, subobtuse, greenish striped; tube short; stamens biseriate; filaments 2 to 3 mm. long; ovary sessile; style 2 mm. in length; seeds 5 to 6 in a locule.

Notes.—Bonaria, Gillies; *Montevideo,* Hibert; *Entre Rios,* Tweedie.

5. THE GENUS TRITELEIA (SOUTH AMERICAN PART)

In the present account, only the South American representatives of the genus will be considered. The species of this genus have often been associated with *Brodiaea* and *Milla*. Krause in his Liliaceae, in Engler and Prantl, Die Natuerlichen Pflanzenfamilien, ed. 2. 15a: 323-324, 1930, considers *Triteleia,* together with *Callipora,* as subgenera of the genus *Brodiaea*. Baker, in Journ. Linn. Soc. 11: 378-387, 1871, puts them under the generic name *Milla*. Only three species of South American origin need to be considered here.

1. *Triteleia conspicua* Baker in Saund. Refug. Bot. t. 43; *Milla uniflora* R. Grah. in Edinb. Nat. Phil. Journ. 174, 1833.—Hook. Bot. Mag. t. 3327.

Description.—Bulb ovate; leaves 30 cm. long, ½ line wide, glaucous, linear, upper surface concave; scape 10 to 12 cm. long, erect, glabrous, slightly compressed; spathes bidentate, valves connivent, somewhat unequal in length; pedicel longer than the spathe; perianth 2.5 to 3.5 cm. in diameter; marked from the base of the tube to the apex of the segments with six dark lines, purplish-green below and lilac in front; segments of the limb longer than the tube, spreading, ovate, acute; stamens unequal in length adhering to the tube; anthers yellow, oblong, bifid; stigma capitulate, small, white, pubescent; style grooved; ovary oblong, six-furrowed, capsule clavate, depressed at the apex.

Notes.—This species was discovered by Dr. Gillies in 1820 on river banks near Buenos Ayres, Argentina and was marked "Milla Nov. Sp." Later on Mr. Neill received bulbs, in June 1832, that were collected by Mr. Tweedie from the same locality. They flowered at Canon Hills, England at the end of 1833 and again in March 1834.

2. *Triteleia coerulea* (Scheele) Andrè; *Milla coerulea* Scheele in Linnaea 25: 260, 1852.

Description.—Bulb globose-ovate, tunicate, membranous; leaves 4, erect, fistulose, ½ line wide; scape erect, fistulose, glabrous, furcate, 2-flowered, seldom 1- or 3-flowered; spathes bifurcate; pedicels erect; perianth funnel-shaped; tube elongate, oblong-campanulate; ovary ob-ovate; style filiform.

Note.—Growing in dry prairies, probably in Argentina and Chile.

3. *Triteleia graminofolia* Presl, Bot. Bemerk. 116, 1844.

No description of this species could be found. Presl states: "*Bulbocadium graminifolium* Bert. in herb. chil. in it.—est *Triteleia graminifolia* Presl., [Abh. Boehm. Ges. Wiss. V. 3: 116, 1845]—Eandem stirpem legit in Chile clar. Cuming."

6. THE GENUS BRODIAEA (SOUTH AMERICAN PART)

No attempt will be made to present here a general description of the genus *Brodiaea* because only the South American representatives are considered. It is worth while to mention that Baker,[1] in 1896, described the South American species of *Brodiaea*. At that time, many of these species and those of allied genera were exhibited by Messrs. Wallace & Co., of Colchester, England. It is also of interest to note that Baker[2] monographed in 1871 a number of *Brodiaea* species that were grouped by older authors—Cavanilles, Smith, Lindley and Kunth—with *Milla, Brodiaea, Triteleia, Callipora, Hesperoscordum, Dichelostemma* and *Senbertia*. He merged all of these genera into two, namely *Brodiaea,* characterized by having three of the six stamens imperfect, and *Milla,* in which all six stamens are uniform and fertile. Later on, in 1879, Sereno Watson, who worked with this group, presented a different classification. He merged the above mentioned genera into *Brodiaea,* exclusive of *Milla*, which he considered as monotypic. This classification

1 **Baker, J. G.** The genus Brodiaea and its Allies. Gard. Chron. Ser. 3.20: 213-214, 238-239, 459, 687, 1896.

2 **Baker, J. G.** A Revision of the Genera and Species of Herbaceous Capsular gamophyllous Liliaceae. Journ. Linn. Soc. 11:249-436, 1871.

was also followed by Bentham in his Genera Plantarum. It should be especially emphasized however that Watson considered the North American species only, which have recently been adequately treated by Hoover. In the present enumeration no attempt will be made to clear up the nomenclature of the South American species which is a greater task than could be undertaken during the war years.

DESCRIPTION OF THE SPECIES

1. *Brodiaea sessiliflora* Baker in Gard. Chron. Ser. 3. 20: 459, 1896. —*Milla sessiliflora* Baker in Journ. Linn. Soc. 11: 382, 1871; *Triteleia sessilis* Philippi, Linnaea 29: 72, 1857-8; *Brodiaea* sessilis (Philippi) Meigen in Engler's Bot. Jalub. 17: 225, 1893.

Description.—Bulb ovoid, 7 to 10 mm. in diameter; membranous, tunicate; leaves 4 to 5, carnose, herbaceous, filiform; scape 25 to 35 mm. long; spathe valves 2, linear; flowers solitary, white, 20 to 24 mm. long; segments ascending, lanceolate; stamens about the middle of the tube; filaments filiform; anthers oblong; ovary sessile; style 12 to 15 mm. long.

Note.—Native to Chile.

2. *Brodiaea Poeppigiana* (Gay) Kurtz, Bol. Acad. Noc. Cienc. Córdoba 13: 199, 202, 1893; Gard. Chron. Ser. 3.20: 459, 1896.—*Milla Poeppigiana* Baker in Journ. Linn. Soc. 11: 383, 1871.—*Triteleia Poeppigiana* C. Gay in Flora Chil. 6: 117, 1853.

Description.—Bulb oval; leaves 5 to 7, carnose, herbaceous 16 to 24 cm. in length, 6 to 8 mm. wide; scape 2 to 3, flaccid; spathe valves 2 (seldom 3 or 4), lanceolate, 2 cm. long, connate at the base; umbels 4- to 8-flowered; pedicels 28 to 35 mm. long; perianth funnel-shaped, pale lilac, 20 to 24 mm. long; segments oblong-spathulate; tube funnelform, 5 mm. in diameter; filaments filiform, 5 mm. long; ovary sessile; style thread-like, 5 mm. in length.

Notes.—Gay dedicated this species to Poeppig who did much work on the flora of Chile. Native to Chile.

3. *Brodiaea patagonica* Baker in Gard. Chron. Ser. 3. 20: 459, 1896. *Triteleia patagonica* Baker. *Milla patagonica* Baker in Journ. Linn. Soc. 11: 383, 1871.

Description.—Leaves 4 to 5, filiform, 12 to 20 cm. in length; scape 1-flowered, 8 to 15 cm. long; spathe valves 2, lanceolate, erect, 20 to 22 mm. long, connate at the base; pedicels 14 to 22 mm. long; perianth 22 to 28 mm. in length, light lilac; segments lanceolate, acuminate, erect; tube funnelform; stamens biserate; filaments filiform, 8 to 10 mm. long; ovary sessile; style 7 to 8 mm. long.

Note.—This species resembles *B. uniflora,* from which it differs by its filiform leaves, and its segments, that are lanceolate, acuminate. It has been reported from Patagonia by Capt. Middleton.

An earlier description of the species (Journ. Linn. Soc. 11: 383. 1871) is given below:

Description.—Bulb, accordingly to the description of Baker, unknown; leaves filiform, moderately firm, 12 to 20 cm. in length; scape

1-flowered, 8 to 15 cm. long; spathe valves 2, lanceolate, erect 16 to 18 mm. long, connate at the base; pedicels 10 to 15 mm. long; perianth 12 to 15 mm. long, pale violet; segments lanceolate, acuminate erect; tube narrow funnelshaped; stamens in the tube biseriate; fllaments filiform 4 to 6 mm. long; ovary sessile; style 5 mm. in length.

4. *Brodiaea subbiflora* (Colla) Baker in Gard. Chron. Ser. 3. 20: 459, 1896.—*Milla subbiflora* Baker in Journ. Linn. Soc. 11: 385, 1871.—*Allium subbiflorum* Colla in Act. Taur. 39: 13, t. 52. *Triteleia Berteri* Kunth, Enum. Plant. 4: 467. C. Gay, Flora Chil. 6: 116, 1853.

Description.—Bulb ovoid, 10 to 14 mm. in diameter, membranous, tunicate, leaves 4 to 6, firm, 1 to 3 cm. long, 1 to 1½ mm. wide; scape ½ to 1 cm. in length, one or two-flowered; spathe 2, lanceolate, 10 to 12 mm. long connate at the base; pedicels 2 to 5 mm. long; perianth funnel-shaped, white, 10 to 14 mm. long; segments oblong-spathulate, subacute, distinctly brown-carinate; tube campanulate; stamens biserate; filaments filiform, 4 mm. long; ovary sessile; style 2 mm. long.

Note.—Gay reported this species from the hills near Valparaiso, Chile. Bridges nr. 342.

5. *Brodiaea Sellowiana* (Kunth) Baker, in Gard. Chron. Ser. 3, 20: 459, 1896. *Triteleia Sellowiana* Kunth, in Enum. Plant. 4: 466, 1843. *Milla Sellowiana* Baker, in Jour. Linn. Soc. 11: 383, 1871.

Description.—Bulbs globose or globoid, membranous, tunicate, 10 to 15 mm. in diameter; leaves 6 to 12, firm, 1 to 2 cm. long, 1½ to 3 mm. wide; scape, 1 to 3 in number, 2 to 4 cm. long; flowers solitary; pedicels 4 to 8 mm. long; spathe-valves 2, lanceolate, 10 to 15 mm. long, connate at the base; perianth 20 to 24 mm. long, yellow; segments oblong-spathulate, purplish to carinate, 6 to 10 mm. wide; tube funnelshaped; stamens inserted in the tube; filaments filiform, 5 to 7 mm. long; ovary sessile; style 7 mm. long.

Note.—"Brasilia meridionalis et Montevideo, Sello nr. 3664; Gibert nr. 512."

6. *Brodiaea nivalis* (Poeppig) Baker (Macloskie ?) in Gard. Chron. Ser. 3. 20: 459, 1896.—*Milla nivalis* Baker, in Journ. Linn. Soc. 11: 383, 1871.—*Tristigma nivalis* Poeppig, in Nov. Gen. 2: 28, t. 140, 18—C. Gay. Flora Chil. 6: 125, 1853.

Description.—Bulb ovoid, membranous, tunicate; leaves 5 to 6, linear, obtuse, carnose-herbaceous, much broader at the base, bright green, 12 to 18 cm. long, 4 mm. wide; scape subequal to the leaves; spathe valves 2, lanceolate, 2 cm. in length, connate at the base; umbels 2 to 3-flowered; pedicels 7 to 32 mm. long, irregular in length; perianth funnel-shaped, 20 to 24 mm. long; segments linear, green, carnose, acute; tube cylindric, 1½ mm. wide; anthers distinctly biseriate, sessile; ovary sessile; style filiform, 2 mm. thick.

Notes.—Poeppig described this species from a specimen found in the Cordilleras of Antuco, Chile.

7. *Brodiaea setacea* Baker in Gard. Chron. Ser. 3. 20: 459, 1896.—*Milla setacea* Baker in Journ. Linn. Soc. 11: 385, 1871.

Description.—Bulb ovoid, 8 to 10 mm. thick, membranous, tunicate; leaves 5 to 6; 6 to 10 cm. in length, setaceous, firm; scape filiform, glabrous, 4 to 6 cm. long, 1-flowered; spathe valves 2, linear, 8 to 10 mm. long, connate at the base; pedicels 4 to 5 mm. long; perianth funnel-shaped, white, 10 to 12 mm. long tenate; segments oblong-spathulate, subacute, light brown; tube campanulate; stamens inserted in the tube, biseriate; filaments filiform, 4 to 5 mm. long; ovary sessile, style filiform, 5 mm. long.

Note.—This species was first reported from Tucuman, Argentina.

8. *Brodiaea Leichtlini* (Baker) Nichols, Gard. Dict. 4: 93. 1887; Gard. Chron. Ser. 2 20: 459, 1896; *Milla Leichtlini,* Baker in Bot. Mag. t 6236; Gard. Chron. 1875: 234; *B. brevipes* (Kunth) Baker Gard. Chron. Ser. 2. 20, 1896. *Milla brevipes* Baker in Journ. Linn. Soc. 11: 386, 1871.—*Triteleia brevipes* Kunze Linnaea 20: 9, 1847.

Description.—Leaves 8 to 18 cm. in length, 3 mm. wide; scape shorter than the leaves; spathe valves 2, connate at the base, 14 mm. long; umbel 3-flowered; pedicels about 3 mm. long; perianth white, 12 to 14 mm. long; segments lanceolate, brown-carinate; stamens biseriate; filaments filiform, complanate; ovary sessile.

Notes.—Reported from Chile.

9. *Brodiaea violacea* (Kunth) Baker Gard. Chron. Ser. 2. 20: 459, 1896. *Milla violacea* Baker Journ. Bot. 12: 5, 1874. *Triteleia violacea* Kunth. Enum. Plant. 4: 468, 1843.

Description.—Leaves 5 to 6, linear, glabrous, carnose-herbaceous, 6 to 10 cm. long, 2 to 4 mm. wide; scape debile; spathe valves 2, lanceolate, 12 to 25 cm. long; perianth violet, funnel-shaped; segments oblong-lanceolate, 6 mm. wide; tube campanulate; stamens in the tube biseriate, filaments linear, 6 mm. long; style filiform, 6 mm. long.

Notes.—Chile, Bertero nr. 290. in Herb. Candollei. Baker states: "On view of type specimens I find this is distinct from *bivalvis,* to which I joined it, though very nearly allied." It has a larger flower with a longer style and narrower filaments.

10. *Brodiaea Speggazinii* Macloskie Rep. Princeton Univ. Exped. Patagonia. 1896-1899. 8: 305, 1903/06. *B. patagonica* Speg. non Baker.

Description.—Bulb ovate; leaves synanthic, obtuse, narrow-linear, green to violetish; scape slightly longer than the leaves, erect, slender, glabrous, 1-flowered; spathe valves 2, perianth subtubular; segments white, marked with green line, linear, acute of equal length as the tube; pedicels half as long as the flower.

Notes.—Common Rio Sta. Cruz, and Golfo de San Jorge, Patagonia.

11. *Brodiaea porrifolia* (Poepp.) Meigen, in Engler's Bot. Jahrb. 17: 225. 1893; *Triteleia porrifolia* Poepp. Fragm. Synop. Phan. Chile 10, 1833; Kunth, Enum. Plant. 4: 468, 1843.

Description.—Bulb globose; leaves narrow, carnose; scape 3- to 5-flowered; spathe valves narrow, laciniate; flowers white-violet; segments lanceolate; obtuse, 1-veined, tube campanulate; stamens inserted at the base of the tube; filaments subulate; anthers oblong, emarginate, 2-lobed

at the base; ovary sessile, ovate-oblong, 3-celled; ovules about 10 in each cell, amphitropous; style longer than the ovary; stigma 3-lobed, recurvate.

Notes.—Reported from Chile.

12. *Brodiaea Luzula* (Speg.) Macloskie in Rep. Princeton Univ. Exped. Patag. 1896-1899. 8: 305, 1903/06. *Luzula patagonica* Speg. in Plant. Pat. Austr. nr. 366.

Description.—Stem fistulose, several leaves at the base, subglabrous, acute; scape erect; inflorescence short and thick, rather remote; segments of the perianth 3 external, lanceolate-awned, 3 internal, obtusely acute; stamens antheriferous; fruit ovate, 3-sided. var. *angustiloba* (Speg.) Macloskie is larger than the species, the pedicels are as long or longer than the bracts; perianth is larger; tube is whitish with 5 green stripes; segments are narrower-linear without white margins.

Notes.—This species is distributed from Rio Chubut to Rio Gallegos, Patagonia.

13. *Brodiaea Gaudichaudiana* (Kunth) Fuentes, Bol. Mus. Nac. Chile 12: 110. 1929; *Triteleia Gaudichaudiana* Kunth, Enum. Plant 4: 467, 1843.

Description.—Bulb ovate, tunicate; leaves 3 to 6, linear, glabrous; scape 5 cm. long, glabrous; spathe 2-valved; valves lanceolate, acuminate; umbels 2 to 3-flowered; pedicels 8 to 12 mm. long; flowers erect, like those of *Gagea pratensis* ("magnitudine floris Gageae pratensis"); segments oblong, rotundate-obtuse, 1-veined, equal; stamens inserted in the perianth; ovary sessile, obovate, three-sided, with many ovules; style erect; stigma three-lobed.

Notes.—Reported from the environs of Valparaiso, Chile.

14. *Brodiaea bivalvis* (Lindl.) Meigen. Bot. Jahrb. 17: 224, 1893. *Milla bivalvis* Baker Journ. Linn. Soc. 11: 386, 1871.—*Triteleia bivalvis* Lindl. Bot. Reg. sub. t. 1293. Kunth. Enum. Plant. 4: 468, 1843. C. Gay Flor. Chil. 6: 117, 1853.

Description.—Bulb ovoid, 12 to 20 mm. wide, membranous, tunicate; leaves 4 to 6, carnose, herbaceous 12 to 20 cm. long and 2 to 3 mm. wide; spathe valves 2, linear-lanceolate, connate at the base, 8 to 12 mm. long; umbels 2 to 4 flowered; pedicels flaccid, 10 to 18 mm. long; perianth funnel-shaped, white or white-violet, 10 to 14 mm. long; segments oblong-spathulate, distinct brown cariate; tube campanulate; stamens biseriate; filaments 3 mm. long; ovary sessile; style filiform, 2 to 2.5 mm. in length; seeds 5 to 6 in each loculus.

Notes.—Chile, Beechey, Cuming nr. 651.

15. *Brodiaea Berteri* (Kunth) Fuentes, Bol. Mus. Nac. Chile 12: 110. 1929; *Triteleia Berteri* Kunth, Enum. Plant. 4: 467, 1843. *Allum striatello proximum* Bert. in herb. un. item. no. 1802.

Description.—Bulb ovate; leaves narrow linear, obtuse, canaliculate; scape 5 to 7 cm., 1-flowered, erect, glabrous; spathe two-valved; valves lanceolate-linear; lobes of the perianth oblong, acute, one-veined, subequal.

Notes.—Valparaiso, Gaudich, Bertero.

16. *Brodiaea Ameghioni* Speg. in Rev. Agron. La Plata 575, 1897. *Tristagma Ameghioni* Speg.

Description.—Bulb ovate, 35 to 50 mm. thick, tunicate; leaves 5 to 8, linear, 8 to 12 cm. long and 2 to 3 mm. wide; scape 1 to 2-flowered, erect, slender; scape valves short, seldom of the same length, 50 to 80 mm. long, 0.8 mm. wide, terete, glabrous, linear-lanceolate; perianth tubulose; tube cylindric, 12 mm. long and 2 mm. wide, greenish-white; segments linear, 7 to 9 mm. long and 0.5 to 0.8 mm. wide, obtuse or short acute; filaments slender, pale, glabrous; ovary ovate, 3 mm. long and 1.5 mm. wide, glabrous, green; style 3 mm. long.

Notes.—In dry sandy fields, Golfo de San Jorge, February 1896. Has been reported by Carolo Spegazzini from Argentina.

17. *Brodiaea circinata* Sandwith in: Hooker's Icones Plantarum. Pl. 3350, 1937.

Description.—Perennial herb; bulb oblong to ovoid, about 2.5 cm. in length, and 1.5 cm. in diameter; membranes whitish-hyline, striate; sheathe 7.5 cm. in length; leaves 3 to 4, glacous, rolled up toward the apex, 10 to 16 cm. long, about 6 to 8 mm. wide; scapes one or two, purplish, 7.5 to 13 cm. long and 2 mm. thick; spathe-valves 2, connate at the base, white, membranous, with violet veines, 1.8 to 2.1 cm. in length and 7 mm. wide, obtuse, erect, reaching above the tube of the perianth; flowers solitary, sessile, white, erect; tube of the perianth narrow funnel to bell-shaped, 1.2 to 1.4 cm. long and 6 mm. wide at the top, violet, vittate; segments spathulate, rounded at the top, cuculate, emarginate, 1.7 to 1.8 cm. long and 6 to 8 mm. wide, white, membranous; stamens 6, about 8 mm. long, occurring above the tube; filaments unequal, alternate, about 8 to 10 mm. long; anthers oblong, 2 to 3.75 mm. long; ovary ovoid to ellipsoid, 5 mm. long and 2 to 3 mm. in diameter; style well pronounced ending in a faintly three-lobed stigma. Fruit unknown.

Notes.—This species is known from very high altitude on the eastern slopes of the principal chain of the Andes, including Gobernación del Neuquen; Cerro Colohuincul near San Martin de los Andes at 1800 to 2100 meter in Argentina. Plants have been found near the snow-line. Sandwith mentions that *B. circinata* is apparently related to *B. patagonica* (Baker) Baker, a species with a wide distribution throughout Patagonia and occurs in the region of Neuquen at low level up to 1650 meter elevation.

18. *Brodiaea Felipponei* (Beauvd.) Herter in: Estudios Botanicos en la Region Uruguaya. IV Florula Uruguayensis, Plantae Vasculares. 47, 1930. *Nothoscordium Felipponei* Beauverd in: V Plantes nouvelles de l'Uruguay. Bull. Soc. Bot. Genève. 13: 7, 267, 1922.

Description.—Bulb ovate to elongate, about 2 cm. long and 1 cm. in diameter, white tunic 1 cm. long; leaves glabrous, unequal, 3 to 8 cm. long and 1 to 2.5 mm. wide, recurved, base dilate, narrow lanceolate; scape glabrous, erect, 1.5 to 3 cm. long; spathe-valves 1 to 1.2 cm. long, white, scariose, 2 to 4 veined; perianth with short pedicel which is about 6 mm. long, erect, gold-yellow; filaments yellow, inserted on the segments of the perianth, 6.5 mm. long; anthers yellow, about 2.5 mm. long; ovary oboconic, 3 mm. long; style erect about 4 mm. long; stigma slightly three-lobed.

Notes.—This species is related to *Brodiaea uniflora* from which it differs because of its beautiful golden-yellow colored flowers, striped with purple. G. Beauverd observes: "*Triteleia Sellowiana* Kunth. ?'teste cl. Osten, exsicc. no. 3620 in herb. Boissier: "Per flavo, tepalis, nitidis dorso atro purpureo-vittatis vel pectis; tepala basi connata, folia canaliculata dorso haud carinata.—Uruguay, Dep. Montevideo, "Cerro in saxosis 31 Jule 1898; leg. Cornelius Osten "non *Nothoscordon Sellowianum* Kunth. in Enum. plant. IV (1843) 457 et seq. ! - "Cuchilla de Pereira, Montevideo "mense Junii 1920, leg. cl. Dr. F. Fileppone cui hoc *Nothoscordium* insignum dictatum est (exsicc. no. 3493)."

19. *Brodiaea Tweedinna* (Baker) Hicken, Apuntes Hist. Nat. Buenos Aires 2: 68, 1910; *Milla uniflora var. Tweediana* Baker, Journ. Linn. Soc. 11: 382-383, 1871.—*Milla Tweediana Griseb.* in Symbolae ad Floram Argentinam in Abhandl. König. Gesellsch. Wiss Goettingen. 24: 318, 1879.

Description.—Much smaller than *B. uniflora;* leaves 1 mm. wide; scape is 4 to 7 cm. long; pedicels 7 cm. long; perianth 10 to 12 mm. in diameter; segments oblong-spathulate.

Notes.—Bonaria, Tweedie.

2. *Brodiaea vittata* (Grieseb.) Baker Gard. Chron. Ser. 3.20: 459, 1896.—*Milla vittata Griseb.* Symbolae ad Floram Argentinam in Abhandl. Konigl. Gsellsch. Wiss. Goettingen. 24: 318-319, 1879.

Description.—Bulb subglobose; scape one-flowered; pedicels 3 to 4 mm. long, not articulate; bracts connate toward the base, lanceolate to linear, erect, 6 to 8 mm. long; perianth white, tinged with red; tube funnel-shaped, 1½ mm. long.

Notes.—Reported *from Concepcion in Uruguay.* Accordingly to Grisebach this species is related to *B. Sellowiana* (Kunth) Baker.

21. *Brodiaea recurvifolia* Wright in Decades Kewensis. Misc. Inf. Kew. 117, 1915.

Description.—Bulb ovoid, about 1 cm. in diameter; leaves linear, obtuse, recurvate, flat, glabrous; the margin being minutely denticulate, 6 cm. long and 2.5 mm. wide; peduncles slender, 2 cm. long, one-flowered; spathe 18 mm. long, membranous, two-lobed; pedicels 1 to 3 mm. long; perianth white or yellowish; tube of the perianth 1.5 mm. long; lobes elliptic, 3 mm. long; anthers oblong, 1.5 mm. long; ovary subglobose, locules of ovary with 10 to 12 ovules; style 1.5 cm. long; stigma short, three-lobed.

Notes.—Reported from Montevideo, Arechavaleta 19, Canelan Chico, Berro nr. 5898. Wright states that this is quite a diminutive species of *Brodiaea* and has the appearance of a dwarf *Zephyranthes.* This species is supposed to be related to *B. Sellowiana (Kunth) Baker.*

22. *Brodiaea uniflora* (Lindl.) Engler in Engl. & Prantl Nat. Pflanzenfam. 2, pt. 5: 57, 1887; Baker in Gard. Chron. Ser. 3, 20: 459, 1896.—*Milla uniflora Graham.* Edinb. Nat. Phil. Journ. Dec. 1832. —Hook. Bot. Mag. t. 3327.—*Triteleia uniflora* Lindl. in Edward's Bot.

Reg. 15: pl. 1293, 1829; Kunth. Enum. Plant. 4: 466, 1843. Flor. Jard. 3. 177. *Milla bonariensis Gillies* M.SS.

Description.—Bulb ovoid, proliferous, membranous, tunicate, 12 to 20 mm. in diameter; leaves 6 to 9, 12 to 24 cm. long and 3 to 6 mm. wide, glaucous; scape one, seldom two-flowered; spathe-valves two, lanceolate, 20 to 32 mm. long, connate; pedicels 2 to 4 mm. long; perianth 20 to 40 mm. long, light lilac to white, sometimes blue; segments lanceolate-spathulate, expanding from the tube, 5 to 6 mm. wide; filaments filiform; ovary sessile; style filiform, 6 to 10 mm. long. Several garden varieties of this species are in existence.

Notes.—Native to Argentina.

23. *Brodiaea viridior* Killip in Journ. Wash. Acad. Sci. 16: 566, 1926.

Description.—Bulb globose, 1 cm. in diameter; leaves 3 to 4, narrow linear, 25 to 35 cm. in length and 5 to 12 mm. broad, almost flat; scape one- or two-flowered, erect, 20 to 30 cm. in height; spathe bivalved; bracts linear, 15 to 25 mm. long, connate toward the base, white; pedicels slender, 2 to 3 cm. in length; tube of the perianth white, green along the vein; cylindric, 8 to 12 mm. long, and 5 to 6 mm. broad; segments oblong-lanceolate, 15 to 20 mm. long and 4 to 5 mm. broad, tapering to a subcaudate apex; stamens in two groups, inserted at the throat of the tube; filaments filiform, 3 to 5 mm. in length; style 9 to 10 mm. long; ovary sessile.

Notes.—First collected by Walter Fischer (nr. 122) in the vicinity of General Roca, Rio Negro valley, Argentina, at the altitude of 250 to 360 meters, September 28, 1914. Type specimen in the U. S. National Herbarium nr. 704305. Killip states: "In Baker's key to this group of species *B. viridior* would come nearest *Brodiaea (Milla* of Baker) *Poeppingiana,* a Chilean plant with lilac flowers having shorter, nearly acute segments."

24. *Brodiaea gracilis* (Philippi) Fuentes, Bol. Mus. Nac. Chile 12: 110, 1929; *Brodiaea Philippiana* Baker in Gard. Chron. Ser. 3, 20: 459, 1896.—*Trileleia gracilis A. Philippi* in Description de los plantas nuevas incorporados en el herbario chileno por el doctor don Rodulf A. Philippi in Anales Univ. Chile. 550, 1873.

Description.—Bulb ovoid; leaves narrow linear, 30 cm. long and 4 mm. wide; scape slender, two-flowered; spathe valves linear, 14 mm. long; pedicels 11 mm. long; perianth 18 mm. long, length of the lobes 3 mm.; style as long as the half the length of the perianth and as long as the stamens.

Notes.—A. Philippi states that this species resembles *B. bivalvis* (Lindl.) Meigen. Reported from different parts of Chile.

NEW ALLIUM NAMES AND A DELETED SPECIES

In connection with the preparation of an article on the North American species of *Allium,* evidence was uncovered that makes necessary the following nomenclatural changes.

Allium sanbenitense Traub, **nom. nov.**

SYN.—*Allium robustum* Eastw. Leafl. West. Bot. 2: 110. 1938, non Kar. et Kir. (1841).

NOTES.—*Allium robustum* Karelin et Kirilov [Bull. Soc. Nat. Mosc. XIV: 853. 1841, non Eastwood 1938; Vvedensky, in Komarov, Flora USSR IV: 265. 1935; Herbertia 11 (1941): 205. 1946], native to Central Asia has priority by almost 100 years and the present species was therefore without a name. The name here proposed commemorates San Benito County, California, the native habitat of the species.

Allium Douglasii Hook., var. **Tolmiei** (Baker) Traub, **comb. nov.**

SYN.—*Allium Douglasii* Hook., var. β, in Fl. Bor. Amer. 2: 185. 1839; *A. Tolmiei* Baker, Bot. Mag. 102, (mentioned in connection with pl. 6227, *A. anceps* Kell.), 1876, non Coulter, 1885.

NOTES.—In connection with *A. anceps* Kell. (Bot. Mag. 102, under pl. 6227. 1876), Baker observes that there are two other species similar in habit in the same region—"*A. falcifolium* Hook. & Arn., and *A. Tolmiei* Baker MSS., the latter described as a variety of *A. Douglasii* in Hooker's Flora Boreali-Americana vol. ii., p. 185." The description given by Hooker, on which Baker apparently based his published name, records only a difference in length of the leaves with reference to the scape between the proposed species, *A. Tolmiei* Baker 1876, non Coulter 1885, and *A. Douglasii* Hooker. On biological grounds this is not a sufficient difference to warrant the elevation of var. β, of *A. Douglasii* Hooker to species rank.

After the description of *A. Douglasii,* Hooker lists "var. α" which apparently is the type. He then lists "var. β., foliis scapo longioribus." Since the description in Baker's MSS., has never been published, the name, *A. Tolmiei,* proposed by Baker in 1876 must be applied only to *A Douglasii* var. β, otherwise it is a *nomen nudum,* and is again available. Baker however definitely states that his *A. Tolmiei* is described as a variety of *A. Douglasii* in Hooker's Flora Boreali-Americana vol. ii, p. 185, and we assume that he has read Hooker's text correctly. *A. Tolmiei* Baker 1876, non Coulter 1885, is then the same as *A. Douglasii* excepting that in the former the leaves are longer than the scape.

The paragraph by Hooker following the listing of vars. α and β of *A. Douglasii* is not as clearly written as it might be and this has caused confusion of names by later workers as indicated under the following species.

Allium idahoense Traub, **nom. nov.**

SYN.—*Allium Tolmiei* Coulter, Bot. Rocky Mtn. Reg., 349. 1885, non Baker 1876; Index Kewennsis I: 83. 1893; Howell, Fl. NW. Amer. 1 (fasc. 6): 640. 1902; Rydberg, Fl. Rocky Mts. 161. 1917; Abrams, Illus. Fl. Pac. States 1: 387. 1923.

TYPE DESCRIPTION ADAPTED FROM COULTER (1885): Bulbs ovate, not rhizomatous, membranous coats mostly without reticulation; leaves 2, broadly linear, flat and falcate, thick; scape stout, 5—10 cm. tall, much compressed and 2-winged, low and mostly shorter than the leaves; spathe 2-valved; flowers light rose-color, with a darker mid-vein; segments lanceolate, acute, gibbous at base, a half longer than the stamens; ovary very obscurely crested.

RANGE.—According to Coulter (1885), this species ranges "From the Wahsatch Mountains to southern Idaho." This range was extended by later workers to include Eastern Oregon, Washington and southern Idaho to Utah.

NOTES.—The paragraph that follows Hooker's description of *A. Douglasii* reads as follows, (insertions in brackets [ ] are the present writer's): The flowers of this [*Allium Douglasii* Hook.] a great deal resemble the preceding [*Allium acuminatum* Hook.] in shape and colour, but the apex of the sepals is not recurved, the stamens are longer and the leaves are totally different, being more than half an inch broad, in the dry state thick and somewhat coriaceous, indicating that in the recent plant they are thick and fleshy. Mr. Douglas had marked it *A. fragrans,* but with the *fragrans* Spreng. (*A. inodorum* Gawl.) it has no sort of affinity whatever. Tab. CXCVII. Fig. 1, flower; f. 2 sepals and stamens; f. 3 pistil." It is clear that Hooker is not contrasting varieties α and β of *A. Douglasii,* for var. β differs from the type (var. α) only in having leaves longer than the scape. Hooker is in fact contrasting *A. Douglasii* Hooker with *A. acuminatum* Hooker which precedes it in the text. An examination of the details of Hooker's Tab. CXCVII (*A. Douglasii* Hook.) and Tab. CXCVI (*A. acuminatum* Hook.) will convince anyone that the description in the quotation from Hooker fits *A. Douglasii,* the type, and cannot therefore also serve as the list of distinguishing characters for a variety of it.

Sereno Watson (Proc. Amer. Acad. 14: 228. 1879) apparently misinterpreted Hooker, for Watson observes with reference to *A. Douglasii* Hook., that "The figure and description in Hook. Fl. Bor.-Am. refer, with the exception of the scape and the details of the flower, to his var. β, i. e. to *A. Tolmiei,* Baker."

Coulter (1885) apparently also misinterpreted this paragraph from Hooker and erroneously read "var. β" in place of A. Douglasii, and "var. α" in place of *A. acuminatum* in the quotation from Hooker. Accordingly he used the name, *A. Tolmiei* in connection with an *Allium* species sufficiently distinct but somewhat similar to *A. Douglasii* in certain of its characteristics. This species evidently is not the *A. Tolmiei* Baker 1876, non Coulter 1885, that is identical with *A. Douglasii* var. β Hooker.

Coulter (1885) indicates that his type is also based on "*A. tribracteatum* [Torr.], Watson in Bot. King's Exped. v. 353, in part." In the Index Kewensis (I: 83. 1893), *A. Tolmiei* Coulter 1885, non Baker 1876, was reduced to the synonymy of *A. tribracteatum* Torrey *("A. Tolmiei* Baker ex Coulter. Rocky Mt. Bot. 349.=*tribracteatum")*, but *A. Tolmiei* Coulter 1885, non Baker 1876 apparently is distinct after all for later workers have consistently identified the name "*A. Tolmiei*" with Coulter's type description, but made no reference to Coulter,—Howell (1902), Rydberg (1917) and Abrams (1923).

Rydberg (1917) placed *A. anceps* var. *aberrens* M. E. Jones under *A. Tolmiei* Coulter 1885, non Baker 1876, but no reasons are given for such a disposition which apparently is not acceptable for Morton (Herbertia 7 (1940): 71, 1941) transferred *A. anceps* var. *aberrens* M. E. Jones tentatively to the synonymy of *A. Cusickii* S. Wats.

Abrams (1923) reduced *A. platyphyllum* Tiedstrom to the synonymy of *A. Tolmiei* Coulter 1885, non Baker 1876, but Morton (Herbertia 7 (1940): 75. 1941) points out that "an examination of the type shows it [*A. platyphyllum*] to be different."

Since no valid published name is available for the present species, the name *Allium idahoense* is proposed for it. The name commemorates the State of Idaho.

Allium roguense M. E. Peck, Proc. Biol. Soc. Wash. 49: 109 1936. [**Deleted species.**]

NOTES.—In a letter to the writer, dated Dec. 10, 1945, Prof. Morton E. Peck writes that "*A. roguense* was based on material confused by the collector, the bulb described belonging to a *Brodiaea;* the species is therefore discarded."

Beltsville, Maryland —*Hamilton P. Traub*

SECTIONS AND SUBSECTIONS OF THE GENUS ALLIUM IN EUROPE

F. HERMANN

[Translated from the Latin (Fedde—rep. sepc. nov. reg. veg. 46: 57-58, 1939) by Edith K. Cash, Assistant Mycologist, U. S. Bureau of Plant Industry, Beltsville, Maryland.]

Pedicels not broadened above into a disk, tepals 1-nerved, more or less equal, fruit not becoming catilaginous.

A.[1] Inner filaments broadened, flat, elongated at each side by a tooth, ovary sessile, with three nectaries covered by a prominence, ovules basal, in twos in each locule, style entire, leaves distichous, sheath surrounding the peduncle to some height .....PORRUM

B. Leaves not hollow, flat, conduplicate in vernation. Type: *Allium scordoprason* L. .....SCORDOPRASON F. Hermann

BB. Leaves flat in vernation. Type: *Allium vineale* L. ONEOPRASON F. Hermann

AA. Filaments not dentate or inner filaments with a short tooth at the base on each side, ovary more or less sessile, without a prominence.

C. Leaves sessile, ovary scarcely tricoccous.

D. Ovary having a nectary with exterior opening in each septus, peduncle terete, inflorescence without bulbils, style entire.

E. Ovules in twos at the base of each locule.

F. Leaves distichous, flat in vernation, margins not wrapped around each other.

G. Tepals 4-6 times as long as wide, more or less keeled, greatly exceeding the stamens, leaves awl-shaped, hollow, plants caespitose. Type: *Allium schoenoprasum* L. SCHOENOPRASON

GG. Tepals as long as the stamens or shorter, bulb covered with a full coat, innovations within the sheath. Type: *Allium saxatile* M. B. .....OREIPRASON F. Hermann

FF. Leaves broadly channelled in vernation, each lower one in turn with margins wrapped around the following, finally flat.

H. Tepals yellowish-green (96 1a), conspicuously exceeded by the stamens, leaves distichous, sheath covering the upper peduncle to some height, innovations within the sheath. Type: *Allium obliquum* L. PETROPRASON F. Hermann

HH. Tepals conspicuously longer than the stamens, leaves spiral, surrounding the peduncle slightly at base. Type: *Allium roseum* L. .....RHODOPRASON F. Hermann

EE. Ovary with 4 or more central ovules in each locule, in two series, leaves spiral, convolute in vernation, flat, 0.5-7 cm. broad, long acuminate, surrounding the peduncle slightly at the base, ovary smooth. Type: *Allium nigrum* L. *Allium stripurpureum* W. K. also belong here .....MELAMPRASON F. Herman

[1] [Letters of the alphabet (capitals) are used for contrasting characters in place of the miscellaneous marks used in Hermann's original.—Ed.]

DD. Ovary without nectaries in the septs.
I. Peduncle and fruit-pedicels recurved, leaves conduplicate in vernation, basal. Type: *Allium Chamaemoly* L.
CHAMAEPRASON F. Hermann
II. Peduncle and fruit-pedicels straight, leaves distichous, not conduplicate in vernation.
J. Leaves flat in vernation.
K. Leaves hollow, sheaths surrounding the peduncle to some height.
L. Spathe long-rostrate (up to 25 cm.), persisting. Type: *Allium carinatum* L. RHYNCHOPRASON F. Hermann
LL. Spathe not rostrate, leaves very narrow, channelled bulbs not seated on rhizomes. Type: *Allium melanantherum* Pantschitsch .....HAEMOPRASON F. Hermann
KK. Leaves not hollow, flat, surrounding the peduncle slightly at the base, bulbs seated on a short, oblique or horizontal rhizome .....RHIZIRIDEUM
M. Tepals 1-2 cm. long, about twice as long as the stamens, inflorescence nodding before anthesis, then erect. Type: *Allium narcissiflorum* Vill.
NARKISSOPRASON F. Hermann
MM. Tepals 0.4-1.6 cm. long, pistil undivided, coat scarcely reticulately fibrous. Type: *Allium angulosum* L.
ORTHOPRASON F. Hermann
JJ. Leaves convolute in vernation, broad, narrowed toward the base and apex. Type: *Allium Moly* L.
XANTHOPRASON F. Hermann
CC. Lower leaves conspicuously petiolate, ovary tricoccous, without nectaries, style entire, capsule tricoccous.
N. Peduncle terete, leaves plicate in vernation with several longitudinal folds, outer coats finally reticulately fibrous. Type: *Allium victorialis* L. .....NIKEPRASON F. Hermann
NN. Peduncle acute-angled, leaves in vernation with revolute margins, coat thin-membranous, diaphanous, seeds globulose. Type: *Allium ursinum* L. .....ARKTOPRASON F. Hermann

THE ALLIUMS OF BRITISH INDIA

Sir Joseph D. Hooker

[Revised and supplemented by William T. Stearn]

[The following survey is extracted from Hooker, Flora of British India, vi (1892) 338-345 and describes a number of Himalayan and Sino-Himalayan species not included in the accounts of *Allium* by Boissier (1882) and Vvedensky (1935) since they do not occur in the areas covered by these authors. All the Alliums of British India grow in the Himalayan region. Some occur as well in Central Asia or in China and one *(A. Hookeri)* is even found in Ceylon, but most of them are confined to the Himalaya. Of these Himalayan endemics *A. sikkimense* has long been in cultivation, and there are others which deserve introduction.

Dates have been added to Hooker's citations below as well as the metric equivalents of the English measurements given in his descriptions. Descriptions of species described by Vvedensky or by Boissier are omitted.

The descriptions of *A. fasciculatum*, *A. phariense* and *A. tibeticum* which follows Hooker's account are partly translated, partly transcribed from the original descriptions published by Rendle in 1906. *A. fasciculatum* is now known from Sikkim and *A. phariense* and *A. tibeticum* may yet be found there.—*W. T. S.*]

SECT. I. SCHOENOPRASON. Bulbs free or clustered, not seated on a rootstock. Leaves and scape fistular or filiform. Stamens inserted usually much above the base of the perianth; filaments dilated and connate at the base.

* Leaves fistular.

1. A. Semenovi Regel, Enum. Pl. Semenov [1868] 126; All. Monogr. [1875] 85; Baker in Journ. of Bot. 1874, 293.

[Description: See Vvedensky no. 80; Herbertia 11 (1944): 141-152. 1946.]

Western Himalaya, alt. 8-14,000 ft., from Kashmir to Garwhal.—Distrib. Alatau and Thian-chan Mts.

[Notes.—Spelled *A. Semonovii* by Hooker but *A. Semenovi* by Regel.—*W. T. S.*]

2. A. Schoenoprasum Linn. Sp. Pl. [1753] 301; Regel, All. Monogr. [1875] 77; Baker in Journ. Bot. 1872, 292; Boiss. Fl. Orient. v. [1882] 250; Reichb., Ic. Fl. Germ. [1848] t. 1085, *A. sibiricum* Linn. Mant. [1881] 562.

[Description: See Vvedensky no. 82; Herbertia 11 (1944): 141-144. 1946.]

Western Himalaya, alt. 8-11,000 ft.; from Kashmir to Kumaon.—Distrib. Westwards to the Atlantic, N. America.—Chives.

3. A. atrosanguineum Schrenk in Bull. Sci. Acad. Sci. Petersb. x. [1842] 355; Lebed. Fl. Ross. iv. [1852] 168; Kunth, Enum. [1843] 684; Regel, All. Monogr. [1875] 83.

[Description: see Vvedensky no. 81; Herbertia 11(1944): 142-143. 1946.]

Western Himalaya: Cashmir at Gilgit, Tanner.—Distrib. Turkestan. The Gilgit specimens have rather smaller flowers with more obtuse segments than the Turkestan.

[Notes.—*A. atrosanguineum* Schrenk with dark red flowers, *A. Fedschenkoanum* Regel with yellow flowers and *A. monadelphum* Turcz. with rose-purple flowers are united by Vvedensky (1935) into one species under the name *A. monadelphum,* as they were by Regel himself in 1887 (Acta Horti Petrop. x. 307) and by Lipsky in 1900 (Acta Horti Petrop. XVIII. iii). All possess rhizomes. The Gilgit specimens mentioned by Hooker may belong to another species. —*W. T. S.*]

4. A. FEDSCHENKOANUM *Regel,* All. Monogr. [1875] 82.

[Description: see Vvedensky no. 81; Herbertia 11 (1944): 142-143. 1946.]

Western Himalaya; Kashmir, at Barzil, alt. 12,000 gt., Clarke.—Distrib. Turkestan.

** Leaves filiform.

5. A. RUBELLUM M. Bieberstein, Fl. Taur. Cauc. i. [1808] 264; Regel, All. Monogr. [1875] 106; Fl. Turkest. [1876] t. 10. f. 9; G. Don, Monogr. All. [1827] 36; Kunth, Enum. iv. [1843] 399; Boiss., Fl. Orient. v. [1882] 253; Baker in Journ. of Bot. 1874, 280. *A. rubellum* and var. *grandiflorum,* Lebed., Fl. Ross. iv. [1852] 171. *A. leptophyllum* Wall., Cat. [1829-32] 5073. A; Kunth, l. c. 456. *A. Jacquemontii.* Kunth l. c. 399. *A. longisepalum* Bert. in Nov Comm. Acad. Bonon. [1842] 429. *A. tenue* G. Don Monogr. All. [1827] 34; Koch in Linnaea xxii [1849] 238.

[Description: see Vvedensky no. 117; Herbertia 11(1944): 162-163. 1946.]

The Punjab and western Himalaya, alt. 1500-8000 ft.; from Kashmir to Kumaon.—Distrib. Westwards to the Ural and Caucasus, and in Siberia.

I have followed Boissier in the limitation of this species and its varieties. Regel refers Don's *tenue* to *A. Pallasi* Murray which is described as having a long style; he retains as a species Boissier's *A. Griffithianum,* which the latter author has reduced to a variety of *rubellum.*

Var. 1. *grandiflorum* Boissier, Fl. Orient. v. [1882] 253; pedicels longer, flowers larger, sepals 1/6 to ⅓ in. [4-8 mm.] long subacute, filaments much shorter, and broader. *A. Griffithianum* Boiss. Diagn. Ser. 2, iv [1859] 117; Regel, All. Monogr. [1875] 108; Baker, l. c. [1874] 290. *A. vulcanicum* Boiss., in Plant. Gotsch. Pers. Bot. No. 49.—Kashmir, alt. 5-7000 ft., Westward to Persia.

Var. 2. *parviflorum* Ledebour, Fl. Ross. iv [1852] 171; flowers smaller, sepals 1/6 in. [4 mm.] long. *A. syntamanthum* C. Koch in Linnaea xxii [1849] 239; Regel, All. Monogr. [1875] 110.—Western Himalaya. Westward to S. Russia.

[Notes.—*A. rubellum* sensu lato, as accepted by Ledebour, Boissier and Hooker, is divided by Vvedensky into several species of which *A. Griffithianum* Boiss. and *A. Jacquemonti* Kunth, non Regel, occur in India.—*W. T. S.*]

6. A. Roylei Stearn, *nom. nov.;* [*A. lilacinum* Royle, Ill. (1840) 392 (name only)]; leaves terete or channelled, longer or shorter than the scape, head hemispheric, pedicels twice as long as or longer than the campanulate small pale red flowers, sepals ovate or ovate-lanceolate acute or obtuse, filaments exserted inner 2-toothed at the very base. Regel, All. Monogr. [1875] 89. *A. rubena* Baker in Journ. of Bot. 1874, 293 (not of Schrad.).

Western Himalaya, alt. 6-7000 ft.; from Garwhal westwards.

Bulb ovoid; coats scarious, red-brown. Leaves 2-3, Scape 8-10 in. [c. 20-26 cm.], fistular. Head 1-1½ in. [2.5-2.8 cm.] diam.; spathes 2, acuminate; pedicels ¼ to ⅛ in. [6-8 mm.]. Sepals ¼ in. [6 mm.] long, with the filaments inserted near their bases; anthers large.

[Notes.—A new name, *A. Roylei* Stearn, is needed for *A. lilacinum* Royle ex Regel, All. Monogr. (1875) 89, owing to the earlier publication of *A. lilacinum* Klotzsch in Klotzsch et Garcke, Bot. Ergeb. Reise Pr. Waldemo (1862) 50, syn. *A. Klotzschi* Regel, l. c. (1875) 255, nom provis., an obscure Himalayan plant inadequately described from a specimen without bulb or leaves but apparently distinct from *A. Roylei* in having a one-valved spathe and oblong-spathulate perianth-segments. *A. Roylei* commemorates John Forbes Royle (1799-1858), pioneer economic botanist in India and author of Illustrations of the Botany . . . of the Himalayan Mountains (1833-40); cf. Kew Bull. *1933*, 378-390; Journ. Arnold Arb. xxiv (1943) (484-487) wherein *A. lilacinum* Royle is mentioned as occurring "on Mussooree" but not described.—*W. T. S.*]

SECT. II. RHIZIRIDEUM [Spelled *Rhiziridium* by Hooker but *Rhizirideum* by G. Don.—*W. T. S.*] Bulbs solitary or clustered upon an erect or creeping rootstock. Leaves flat.

A. Scales of bulb membranous, not of reticulated fibres.

* Stamens longer than the perianth.

7. A blandum Wallich, Pl. As. Rar. iii [1832] 38, t. 260; tall, stout, leaves flat broadly linear obtuse shorter than the tall scape, head globose very dense-fld., pedicels shorter than the campanulate pale pink flowers, sepals oblong obtuse, filaments simple subulate much exserted. Kunth, Enum. iv. [1843] 396; Baker in Journ. of Bot. 1874, 295. *A. obtusifolium* Klotzsch & Garcke, Bot. Reise Pr. Wald. [1862] 51, t. 95.

Western Himalaya, alt. 13-17,000 ft.; in the interior ranges, and in Western Tibet, from Kumaon to West Nepal.

Bulb large, oblong, often 5 by 1½ in. [12.7 by 2.5 cm.]; scales coriaceous, entire. Leaves 5-10 [12.7-25.5 cm.] by ⅓-½ in. [8-13 mm.], ensiform, recurved tip rounded. Scape 1-2 ft. [30.5-61 cm.] terete, leafy below the middle. Head 1-1½ in. [2.5-3.8 cm] in diam.; spathes ovate, obtuse. Sepals ⅓ in. [8 mm.] long. Filaments much longer than the sepals, inserted near their bases, rather longer than the style.

[Notes.—An earlier name for *A. blandum* seems to be *A. carolinianum* Redouté, Liliac. ii [1804] t. 101. This was published as a North American species but is "not known in America" (S. Watson in Proc. Amer. Acad. Arts Sci. xiv [1879] 234.)—W. T. S.]

8. A. STRACHEYI Baker in Journ. of Bot. (1874) 293; slender, leaves narrowly linear obtuse, scape slender compressed above, head globose or hemispheric dense-fld., pedicels shorter than the campanulate rosy or pale yellow flowers, sepals oblong obtuse, filaments simple, free, much exserted. Regel, All. Monogr. (1875) 135. A. longistamineum Royle, Ill. [1840] 392 (name only).

Western Himalaya; from Kashmir, alt. 9000 ft., *Clarke*, to Kumaon, alt. 10-12,000 ft., Strachey & Winterbottom, Edgeworth.

Bulbs small, clustered, narrowly ovoid, outer scales fibrous, produced into a long neck. Leaves 3-4, 12 by 1/12 in. [30.5 by 0.2 cm.], tips rounded. Head 1 in. [2.5 cm.] diam.; spathes small, deltoid; pedicels 1/12-¼ in. [2-6 mm.], about as long as the sepals. Filaments filiform, inserted on the bases of the sepals. Ovary globosely trigonous, cells 2-ovuled.—The Kashmir specimens have very pale yellow flowers.

9. A. CONSANGUINEUM Kunth, Enum. iv. [1843] 431; leaves slender, narrowly linear, obtuse, flat keeled, head hemispheric, pedicels equaling or rather longer than the campanulate golden flowers, filaments simple, filiform, much longer than the oblong obtuse sepals. Regel, All. Monogr. [1875] 131; Baker in Journ. Bot. 1874, 293.

Western Himalaya; Kashmir, alt. 8-10,000 ft., *Jacquemont, Thomson*, etc.

Habit and characters of *A. Stracheyi*, but larger, flowers golden yellow, with longer pedicels, and larger, longer bulbs with fibrous sheaths. Filaments inserted on the bases of the sepals. Style slender, far exserted.

10. A. PLATYSPATHUM Schrenk, Enum. Pl. Nor. i [1841] 7, ii. [1842] 8; Kunth, Enum. iv. [1843] 453; Regel, Monogr. All. [1875] 135; Ledeb., Fl. Ross [1852] 184 (excl. var. β).

[Description: see Vvedensky no. 54; HERBERTIA 11 (1944): 128-129. 1946.]

Western Tibet: (Var. β., only), Herb. Calcut. (Regel).—Distrib. Kensu.

Var. β. falcatum Regel l. c.; leaves ligulate, glaucous, falcate; head globose dense-fld., flowers rose-lilac. I have seen no specimen of this variety, which Regel suggests may be a different species.—The type inhabits Soongaria and Turkstan.

11. A. THOMSONI Baker in Journ. of Bot. 1874, 294; leaves rather stout linear, fleshy, obtuse, shorter or longer than the scape, head globose, pedicels equaling or shorter than the red-purple campanulate flowers, sepals oblong-lanceolate, acute, filaments simple, filiform, much exserted, anthers minute. Regel, All. Monogr. [1875] 141.

Kashmir; alt. 12,000 ft., *Thomson*.

Bulbs tufted, narrowly ovoid; outer scales hard, chestnut-brown, entire. Leaves 4-5, 6-9 by 1/6-⅓ in. [15.2-22.8 cm. by 4-8 mm.], sheath-

ing the lower third of the stout, terete scape, which is 1-2 ft. [30.5-61 cm.] long, tip rounded. Head 1-1½ in. [2.5-3.8 cm.] diam.; spathes short, deltoid. Sepals ¼ in. [6 mm.] long; with the filaments on the bases. Ovary globose, cells 2-ovuled, style much exserted.—Baker observes that this is closely allied to *A. blandum*, differing in the slender habit, narrower leaves, and longer, more acute sepals.

12. A. Bakeri Regel, All. Monogr. [1875] 141; leaves basal, narrowly linear, scape tall, slender, head lax-fld., pedicels much longer than the campanulate red-purple flowers, sepals orbicular or oblong obtuse, filaments simple, linear-subulate, inner dilated, and 2-toothed at the base, anthers minute. *A splendens* Miq. Ann. Mus. Bot. Lugd. Bat. iii. [1867] 154; *A. exsertum* Herbert in Bot. Reg. xxxiii [1847] under t. 5.

Khasia Hills; alt. 4-5500 ft.—Distrib. China, Japan.

Bulbs clustered, 1 in. [2.5 cm.] long, ovoid-oblong; scales white, membranous. Leaves 2-4, 6-9 by 1/12 in. [15.2-22.8 by 2 mm.], shorter than the slender terete scape. Head few- or many-fld.; pedicels ¼-¾ in. [1.3-1.9 cm.]. Sepals 1/6-¼ in. [4-6 mm.] long, with the filaments on their bases. Ovary subglobose, style far exserted.

** Stamens equaling or shorter than perianth.

13. A. Wallichi Kunth, Enum. iv. [1843]; tall, leaves long linear or ensiform, flat, longer than the stout triquetrous scape; head lax-fld., pedicels much longer than the simple filaments elongate-subulate. Regel, All. Monogr. [1875] 142; Baker in Journ. Bot. 1874, 291. *A. caeruleum* Wall. Cat. [1829-32] 5076 (not of Pallas) *A. violaceum* Wall. mss.

Temperate Himalaya, alt. 8-13,000 ft. from Kumaon to Sikkim. Gilgit, *Tanner*.

Bulbs hardly developed, clustered, base of stem thickened, clothed with membranous entire and toen sheaths. Leaves basal, 2-3 ft. [61-92 cm.] by ⅓-3/3 [8-17 mm.], margins erose, narrowed to a point. Scape 1-2½ ft. [30.5-76 cm.] ft. Head 2-3 in. [5-7.6 cm.] diam.; pedicels 1-1½ in. [2.5-3.8 cm.]; spathes caducous, as long as the pedicels. Sepals ½ in. [1.3 cm.], obtuse; filaments inserted on their bases. Capsule turbinate.

14. A. Hookeri Thwaites, Enum. [1946] 339; slender, leaves basal, linear, membranous, shorter than the tall subtrigonous scape, 1-nerved; head globose, laxly many-fld., pedicels much longer than the stellate white flowers, sepals linear acuminate, about equaling the filiform filaments. *A. Wallichi* var. Regel, All. Monogr. [1875] 143.

Khasia Hills; at Kala Pana, alt. 5000 ft. *J. D. H. & T. T. Ceylon:* Newera Elia, alt. 7000 ft., *Thwaites*.

Bulb hardly any; base of stem clothed with long narrow membranous sheaths. Leaves 12-18 by ¼-⅓ in. [30.5-45.7 cm. by 6-8 mm.], acute. Scape 1-2 ft. [30.5-61 cm.]; heads 1½ in. [3.8 cm.] diam.; spathe with a long tail; pedicels ½-2/3 in. [1.3-2 mm.], capillary. Sepals ¼ in. (6 mm.); filaments inserted on their bases. Capsule obcordate; cells usually 1-seeded.

[Notes—*A. Hookeri* occurs also in Tibet, Yunnan and Szechwan; cf. Airy Shaw in Notes Roy. Bot. Gard. Edinburgh xvi (1931) 139.—*W. T. S.*]

15. A. SIKKIMENSE Baker in Journ. of Bot. 1874, 292; leaves basal, narrowly linear, channeled, shorter than the slender flexuous scape; head dense-fld., pedicels unequal, longer or shorter than the campanulate lilac-purple flowers, filaments broadly subulate, much shorter than the oblong subacute or obtuse sepals. Regel, All. Monogr. [1875] 146.

Sikkim Himalaya; in the inner ranges, alt. 11-14,000 ft. *J. D. H., Elwes.*

Bulbs tufted, slender, cylindric; outer scales of long parallel fibres. Leaves 2-3, 3-4 by 1/12-¼ in. [7.6-10.2 cm. by 2-6 mm.], subacute. Scape 4-12 in. [10.2-30.5 cm]. Head 6-15-fld.; pedicels 1/12-¼ in. [2-6 mm.]; spathe solitary, broadly ovate. Sepals ⅓ to nearly ½ in. [8-12 mm.]; inner filaments with a broad triangular base adnate to the bases of the sepals, outer narrower, free. Capsule 3-lobed. Ovary subglobose; style included, cells 2-ovuled. Baker regards this species as intermediate between the smaller vars of *A. angulosum* and *Schoenoprasum.*

[Notes.—*A. sikkimense* is figured in Bot. Mag. cxlvi (1920) t. 8858. —*W. T. S.*]

B. Outer scales of the bulb of reticulated fibres, obscurely so in *tuberosum.*

* Stamens longer than the perianth.

16. A. JACQUEMONTI Regel, All. Monogr. [1875] 162 (not of Kunth); leaves basal filiform, subterete, shorter or equaling the slender strict scapes; head globose or subglobose, pedicels shorter or longer than the lilac campanulate flowers; sepals oblong-lanceolate, obtuse or subacute, filaments exserted, subulate, inner with a dilated 2-toothed base. *A. junceum* Jacquem. mss.; Baker in Journ. Bot. 1874, 295 (not of Smith). *A. leptophyllum* Wall., Cat. [1829-32] no. 5073 B [not of Schur].

Western Tibet, alt. 12-14,000 ft., *Jacquemont, Thomson;* north of Kumaon, alt. 16,500 ft., *Strachey & Winterbottom.*

Bulbs tufted, cylindric, elongate; fibrous coats very finely reticulate, rusty brown. Leaves 3-6, 4-6 by 1/24 in. [10.2-14 cm. by 1 mm.]. Scape 3-9 in. [7.6-22.9 cm.]. Head 1-1½ in. [2.5-3.8 cm.] diam.; spathes 2, membranous; pedicels 1/12-¼ in. [2-6 mm.]. Filaments inserted much above the bases of the sepals, shortly exserted, inner obscurely toothed at the base. Capsule globosely ovoid; style very long. Much eaten in Western Tibet. Baker regards it as possibly a variety of the Siberian *A. lineare,* which has broader leaves and much broader inner filaments.

[Notes.—The correct name for *A. Jacquemonti* Regel (1875) non Kunth (1843) is probably *A. Stoliczki* Regel, All. Monogr. (1875) 161; these two appear to be conspecific, and the first name must be rejected as a homonym. *A. Stoliczki* commemorates the explorer Ferdinand Stoliczki (1838-1874).—*W.T.S.*]

17. A. AURICULATUM Kunth, Enum. iv. [1843] 418; leaves narrowly linear, flat, obtuse, stout, shorter than the terete striate scapes; head globose, very dense-fld., pedicels about equaling the very small campanulate purplish flowers; filaments as long as the oblong obtuse sepals,

outer broadly subulate, inner auricled at the base, stigma penicillate. Baker in Journ. of Bot. 1874, 295.

Western Himalaya; Kumaon, Jacquemont.

Bulb elongate, narrow, seated on an oblique rootstock; scales brown, reticulate, exactly as in *A. Jacquemonti*. Leaves 6-9 by 1/6-⅓ in. [15.2-22.9 cm. by 6-8 mm.], margins erose. Scape 12-18 in. [30.5-45.7 cm.], strict. Head ¾ in. [1.9 mm.] diam.; spathes 2-3, short, acuminate; pedicels ⅛ in. [3 mm.]. Sepals ⅛ in. [3 mm.] long; filaments on the base of the sepals, outer rather shorter than the inner. Ovary subglobose.

18. A. Victorialis Linn. Sp. Pl. [1753] 295; Kunth, Enum. iv. [1843] 432; G. Don, Monogr. All. [1827] 96; Regel, All. Monogr. [1875] 170; Baker in Journ. of Bot. 1874, 291; Boiss. Flor. Orient. v [1882] 245; Jacq. Fl. Austr. iii [1775] t. 216; Reichb., Ic. Fl. Germ. x [1848] t. 508; Redoute, Lil. v. [1809] t. 265; Bot. Mag. [1809] t. 1222. *A. ellipticum* Wall., Cat. [1829-32] no. 5069; Kunth, l. c. 456.

[Description. see Vvedensky no. 1; Herbertia 11 (1944): 98-99. 1946.]

Temperate Himalaya, alt. 7-12,000 ft., from Kashmir eastwards to Sikkim. Distrib. Europe, N. Asia to Japan; N. W. America.

Var. *augustifolium;* leaves ½-1¼ in. [1.3-3.2 cm.] broad, flowers pale pink.—Interior of Sikkim, alt. 10-12,000 ft. West Nepal, *Duthie*.

[Notes.—The occurrence of the true *A. Victorialis* in the Eastern Himalaya, i. e., east of Kumaun, is doubtful. The Sikkim plants referred to *A. Victorialis* and *A. Victorialis* var. *augustifolium* by Hooker and W. W. Smith and G. H. Cave in Rec. Bot. Surv. India, iv (1911) 247, appear to be specifically distinct in having normally only two leaves (in young plants only one leaf) which are more or less basal, narrowly lanceolate, and less than 4 cm. broad; the flowers are rose or red (not whitish), with the stamens hardly longer than the perianth segments. The young leaves have their margins inrolled but are not markedly plicate. On a journey through Sikkim in May 1945, I found this species to be not uncommon in northern Sikkim, near the Lachen River between Tãlam and Thanggu, growing in deep leaf-mould and alluvial soil beneath bushes of Rosa, Rhododendron, Salix and Betula, but it was not yet in flower. The local inhabitants gather the leaves for seasoning curries and call it "Kok-pa," a Tibetan word applied to garlic and related plants (cf. Gould and Richardson, Tibetan Word Book, no. 902: 1943) and not confined to this species. Pending the comparison of type-material this species of Sikkim and adjacent Tibet and Bhutan may be referred provisionally to *A. Prattii* C. H. Wright in Journ. Linn. Soc. Bot. xxxvi (1903) 124, described from western China (Sikang: Tatssienlu, Tongola).—*W.T.S.*]

19. A. Schrenki Regel, All. Monogr. [1875] 172.

[Description: see Vvedensky no. 14; Herbertia 11 (1944): 106-107. 1946.]

Himalaya Mts., Hort. Calcutt. (Regel). Distrib. Siberia.

I have seen no Himalayan specimen. Regel says it differs from the widely diffused *A. strictum* Schrad. in the capitate stigma.

[Notes.—Vvdensky (1935) unites *A. Schrenki* Regel with *A. strictum* Schrader.—*W.T.S.*]

** Stamens shorter than the perianth.

20. A. ODORUM Linn., Mant. [1767] 62; Kunth, Enum. iv. [1843] 185; Regel, All. Monogr. [1875] 175; (excl. syn. *A. tuberosum* etc.) Baker in Journ. of Bot. 1874, 291; *A. tataricum* Linn. fil., Suppl. [1781] 196; Ait., Hort. Kew ed. 2, ii [1811] 233; Redoute, Lil. [1804] t. 98; Bot. Mag. [1808] t. 1142.

[Description: see Vvedensky no. 36; HERBERTIA 11 (1944): 118. 1946.]

Western Tibet; alt. 10-14,000 ft. *Thomson.* Western Nepal, alt. 13,000 ft. *Duthie.* Distrib. N. Asia, Japan.

[Notes.—The correct name for *A. odorum* Linn. is *A. ramosum* Linn. Sp. Pl. i (1753) 296. —*W. T. S.*]

21. A. TUBEROSUM Roxburgh, Hort. Beng. [1814] 24 (name only); Fl. Ind. ii [1832] 141; leaves 4-5, basal, erect, narrow-linear, flat, tall, compressed or trigonous above; head lax-fld., pedicels much longer than the small white or pink stellate flowers, sepals oblong-lanceolate; filaments simple, linear, included, connate below and perigynous, style short. Baker in Journ. of Bot. 1874, 292; Kunth Enum. iv. [1843], 454; Wall. Cat. [1829-32] no. 5068; *A. Roxburghii,* Kunth l. c. 454. *A. uliginosum* G. Don, Monogr. All. [1827] 60; Kunth, l. c. 422. *A. senescens* Mig. Ann. Mus. Bot. Lugd. Bat. iii [1867] 154.

Western Himalaya, *Royle.* Khasia Mts., alt. 5-6,000 ft. (apparently wild), Griffith etc. Cultivated in Bengal, *Roxburgh.* Distrib. China, Siam, Japan.

Bulbs elongate, cylindric, with white fleshy root-fibres; scales grey, fibrous. Leaves 6-12 by 1/12-1/6 in. [15.2-30.5 cm. by 2-4 mm.]; sometimes concave and twisted. Scape 1-1½ ft. [30.5-45.7 cm.]. Head 20-40 fld., hemispheric, 1-1½ in. [2.5-3.8 cm.]; spathes 1-2, small; pedicels ascending ½-1¼ in. [1.3-3.2 cm.]. Sepals 1/6-¼ in. [4-6 mm.)] acute or obtuse, at length reflexed, filaments inserted on the bases of the sepals, gradually dilated from below the middle to the base, outer shorter, broader. Ovary globosely obovoid, deeply 3-lobed; stigma obscurely 3-toothed; cells 3-ovuled. Capsule obcordate. Regel cites this as a synonym of *A. odorum,* and it is possible that it may be the cultivated form of that plant. Wallich's specimens are from the Mission Garden, Tranquebar.

[Notes.—This species should be cited as *A. tuberosum* Rottier ex Sprengel, Syst. ii (1825) 38. —*W.T.S.*]

22. A. GOVANIANUM Wallich, Cat. [1829-32] no. 5071; leaves many, basal, sub-distichous, linear, flat, obtuse, about equaling the acutely angled scape, tip rounded; head many-fld., pedicels equaling or exceeding the white stellate flowers, sepals narrow at length reflexed, filaments very short, perigynous, subulate, included, bases dilated, connate. Baker in Journ. of Bot. 1874, 293; Regel, All. Monogr. [1875] 177. *A. humile* Kunth, Enum. iv. [1843] 443; Regel l. c.; *A. nivale* Jacquem. mss.

Temperate Himalaya; from Kumaon westwards, alt. 8-12,000 ft.

Bulbs and foliage as in *A. odorum,* from which it differs in the acutely angled scape, in the larger flowers with narrower sepals, ½ in. [1.3 cm.] long, and much shorter stamens. The name *humile* being quite inappropriate, except for a very dwarfed state, I follow Baker in retaining Wallich's, which commemorates the discoverer of the species.

[Notes.—Under the International Rules of Botanical Nomenclature, the correct name for this species is *A. humile* Kunth (1843), no matter how inappropriate; *A. Govanianum* Wall. was a nomen nudum until taken up by Baker in 1874. — *W. T. S.*]

23. A. OREOPRASUM Schrenk in Bull. Sci. Acad. Sci. Petersb. x [1842] 354; Enum. Pl. Nov. ii [1842] 6; Ledeb., Fl. Ross. iv. [1852] 185; Regel, All. Monogr. [1875] 180.

Western Tibet; Zalung-Karpo Pass, alt. 10-17,000 ft., *Stoliczka* (Regel). Distrib. Soongaria, Eastern Turkestan.

Described from Turkestan specimens, I have seen no Indian.

[Description: see Vvedensky no. 35; HERBERTIA 11 (1944): 117. 1946.]

24. A. CLARKEI Hooker f.; leaves very many, sub-basal, erect, very narrowly linear or filiform, shorter than the slender scape; head lax-fld., pedicels much longer than the stellate white flowers, filaments hardly as long as the linear-oblong acuminate sepals, inner broadly oblong, obtusely-toothed below the middle.

Kashmir at Skardo, alt. 7-11,000 ft., *Clarke.*

Bulb small, ovoid, 1 in. [2.5 cm.], outer scales closely finely reticulated, pale. Leaves 4-8, 6-12 by 1/10-1/6 in. [15.2-30.5 cm. by 3-4 mm.], obtuse, flat. Scape 12-18 in. [30.5-45.7 cm.], terete; head 1-1½ in. [2.5-3.8 cm.] diam.; spathes 2, one or both as long as the pedicels or shorter; pedicels ½-2/3 in. [1.3-1.8 cm.]. Sepals ⅛ in. [3.2 mm.], acuminate; filaments inserted near their bases, anthers large. Ovary globose; style included. Capsule broadly obcordate, 1/6 in. [4 mm.] diam. Habit of *A. tuberosum.*

[Notes.—*A. Clarkei* is doubtfully distinct from *A. tuberosum.* —*W. T. S.*]

SECT. III. MOLIUM. Bulbs not seated on a rootstock. Leaves flat or keeled. Spathes shorter than the head.

25. A. ATROPURPUREUM Waldstein & Kitaibe, Pl. Rar. Hung. i [1802] 16, t. 17; Regel, All. Monogr. [1875] 247; Don, Monogr. All. [1827] 90; Kunth, Enum. iv [1843] 448; Boiss. Fl. Orient. v [1884] 757; Reichb., Ic. Fl. Germ. x [1848] t. 505. *A. robustum* Karel. & Kiril., Enum. Pl. All. [1841] n. 855; Kunth l. c. 446; Ledeb. Fl. Ross. iv [1852] 187; Baker in Journ. of Bot. 1874, 289.

[Description; see Boissier no. 130.]

Western Himalaya; from Kashmir, *Falconer,* to Kishtwar, alt. 8-10,000 ft., *Thomson.* Distrib. Westwards to Hungary, Turkestan, Siberia. Afghan specimens have leaves 2½ in. [6.4 cm.] broad.

[Notes.—*A. atropurpureum* Waldst. et Kit. of southeastern Europe and *A. robustum* Kar. et Kir. of the Dzungaro-Tarbagatai region of Cen-

tral Asia are considered distinct species of Vvedensky (1935). The Himalayan material probably belongs to neither —*W. T. S.*]

26. A. LORATUM Baker in Journ. of Bot. 1874, 290; leaves 3-5, linear-lanceolate, flat, flaccid, ciliolate, longer than the slender terete scape; head many and dense-fld., pedicels short but longer than the campanulate white perianth, filaments equaling the lanceolate acute sepals, inner subulate, outer linear with subulate tips.

Western Himalaya and Tibit; Kishtwar and Banahal, alt. 10-14,000 ft., *Thomson.*

Bulb small, ovoid, outer scales membranous, grey. Leaves 2-5, 6-9 by ½-1 in. [15.2-22.9 cm. by 1.3-2.5 cm.], narrowed from above the base. Scape 3-6 in. [7.6-15.2 cm.]; Head 30-50 fld.; spathes 2, navicular, acute; pedicels, ⅛-½ in. [8-1.3 mm.], tip thickened. Sepals 1/10-1/6 in. [3-4 mm.]; midrib brown; filaments inserted on their bases; ovary globosely triquetrous; style very short. Baker says that this, judging from the very imperfect specimens, closely resembles *A. narcissifolium* Linn., the handsomest of the European species. Near *A. atropurpureum*, but the leaves are broader, and the head globose, with much shorter pedicels and paler flowers.

27. A. MACRANTHUM Baker in Journ. of Bot. 1874, 293; leaves many, linear, gradually acuminate, keeled, scapes many grooved and ribbed, head lax-fld., pedicels much longer than the large campanulate dark purple flowers, filaments filiform, equaling the oblong, obtuse sepals. Regel, All. Monogr. [1875] 182; Bot. Mag. [1884] t. 6789.

Sikkim Himalaya; in the inner ranges alt. 12-13,000 ft., *J. D. H.; Elwes.*

Bulb narrow, coats membranous. Leaves 6-9, 18 by ¼-¾ in. [45.7 cm. by 6-19 mm.]. Scape robust, 1-2 ft. [30.5-61 cm.], pedicels 1-2 in. [2.5-5 cm.], stout. Sepals ¼-½ in. [8-1.3 mm.]; filaments inserted on their bases, dilated at the very base; anthers large; ovary deeply 2-lobed, stigma capitellate. A very beautiful species, resembling *A. narcissiflorum* Vill. Regel cites it in Sect. RHIZIRIDEUM, but it is not known to have a rootstock.

[Notes.—A. MACRANTHUM Baker, syn. *A. oviflorum* Regel in Gartenflora xxxii (1883) 321, t. 1134, Acta Horti Petrop. viii (1883) 659, *A. Simethis* Léveillé et Giraudias in Fedde, Repert. Sp. Nov. xii (1913) 288, occurs also in southern Tibet, Yunnan and Shensi; cf. Rendle in Journ. of Bot. xliv (1906) 44, Airy Shaw in Notes Roy. Bot. Gard. Edinburgh xvi (1931) 147. —*W. T. S.*]

28. A. CHITRALICUM Wang et Tang in Bull. Fan Memorial Inst. Biol. Peiping, Bot. Ser. vii (1927) 298.

Bulb globose-ovoid, 1.5 by 1.5 cm., 1.5 by 1 cm., 1 by 1 cm.; outer envelopes papery, grey-brown, the inner ones scarious, white. Stem terete, glabrous, 13-23 cm. high, bearing one leaf above the base. Leaf narrowly linear, channelled above, a little longer than the stem, 3-9 mm. wide. Spathe 2-valved; valves ovate, acuminate, pale rose, a little shorter than the pedicels. Umbel capsule-bearing, hemispherical, 1.5-2.5 cm. in diameter; pedicels equal in length, glabrous, 1½ to twice as long as the

perianth. Perianth almost stellate, pale rose, segments linear-lanceolate, bluntish, 4-5 mm. long, soon withering, reflexed, twisted. Filaments almost as long as to slightly shorter than the perianth-segments, fused at base into a ring, simple, abruptly awl-shaped from a more-or-less toothed square base. Ovary shortly stalked, papillose, obviate, 2 by 2.5 mm.; style longer than the ovary and stamens; stigma undivided.

An ally of *A. dasyphyllum* Vved. (Vvedensky no. 199; Fl. URSS iv. 264) but easily distinguished by its glabrous leaves and shoulder-based filaments toothed on each side.

Hab.: Chitral, alt. 8-11,000 ft. (3 June 1895; Harriss no. 16691a; type in Kew Herb.)

29. A. FASCICULATUM Regel in Journ. of Bot. xliv (1906) 42; A. GATEANUM W. W. Smith in Records Bot. Surv. India iv (1911) 247.

Plant glabrous, 12-36 cm. high. Bulb slender, obsolete, surrounded at base with coarse parallel fibres and bearing a tuft of fleshy subfusiform or cylindric roots about 2 cm. long; rootstock short, compressed. Stem surrounded below from ¼ to ⅓ or more of its length with colorless sheaths, fistular, smooth, somewhat compressed. Leaves 3-4, basal, flat, limp, many-nerved, scabridulous at the margin, most often longer than the stem, reaching about 20 mm. long, 3-4 cm. wide. Spathe broadly ovate, acutish, veined, shorter than the umbel, nearly 2 cm. long. Umbel spherical, densely many-flowered, without bulbils, 2.5 cm. or less in diameter; pedicels about 1½ times as long as the flowers. Perianth whitish, tubular at base, broadly campanulate above; segments lanceolate, acute, equal, 5 mm. long, barely 1.5 mm. wide. Filaments subulate, entire, adnate to the segments at base, barely equal to the segments; anthers cordate 0.5 mm. long. Ovary subglobose, conspicuously 3-furrowed, shortly stalked, 1 mm. long; style short, 2 mm. long. Capsule about 3 mm. long.

A well-marked species, perhaps nearest the North Asiatic *A. odorum* L. from which it is distinguished by its smaller flowers, the coarse persistent fibres of the obsolete bulb-scale, and the absence of an obliquely-jointed rootstock.

Hab.: Tibet; Phari (Dungboo, July); Teling (Dungboo, Aug. 1879); Kang-me, north of Phari (Dr. King's collector, Aug. 1882); Khambajong (Younghusband, in flower, no. 89, July 1903; Prain, in fruit, Sept. 1903); Gyangtse (Walton no. 68, July to Sept. 1904).

[Notes.—This description is taken from Rendle (1906); the original description of *A. Gageanum* agrees in all essentials and is based on specimens collected in the upper valleys of Llonakh, Sikkim, at 15-16,000 ft. (Smith & Cave, 2130; Ribu, 2771).]

30. A. GILGITICUM Wang et Tang in Bull. Fan Memorial Inst. Biol. Peiping, Bot. Ser. vii (1937) 294.

Bulbs elongate-cylindric; outer envelopes scarious; rhizome perpendicular. Stem terete, glabrous, 54-60 cm. high, longer than the leaves, with the leaves crowded about the base. Leaves 6, linear, drawn out towards the blunt tip, glabrous on both sides, glaucous below, 0.8-1.6 cm. wide. Spathe one-valved; valve broadly ovate, bilobed at the tip, slightly

rose, shorter than the pedicels. Umbel capsule-bearing, fasciculate, 20-30 flowered, 6-9 cm. wide; pedicels unequal, glabrous, 2-5.5 cm. long, naked at base. Perianth rose; segments erect-spreading, lanceolate, attenuate-acute at the tip, 10-12 mm. long. Filaments shorter than the perianth, linear awl-shaped, simple. Ovary globose, about 2 mm. in diameter, with small sacs at base; style longer than the ovary and about as long as the stamens; stigmas 3, recurved.

This species has resemblances to *A. rhynchogynum* Diels, which is characterized by a notably 3-beaked ovary topped by a simple stigma and from which *A. gilgiticum* differs in its non-beaked ovary, distinctly 3-lobed stigma, more-flowered umbel and unequal pedicels.

Hab.: Gilgit (1880; Tanner no. 166; type in Kew Herb.).

31. A. PHARIENSE Rendle in Journ. of Bot. xliv (1906) 42.

Plant glabrous, about 12 cm. high. Bulb solitary, narrowly ovoid, prolonged upwards into the sheathed base of the stem, about 2 cm. long, 1 cm. wide, mounted on a thick perpendicular rhizome; envelopes scarious, the inner reddish. Stem smooth, terete, compressed in the upper part, bearing leaves below the middle. Leaves 2-4, flat, narrowly linear, blunt, a little longer than the stem, the upper part recurved, to 8 cm. long, 2 mm. wide. Spathe one-valved, scarcely beaked, shorter than the umbel, 1 cm. long. Umbel spherical, densely many-flowered, 2 cm. in diameter; pedicels scarcely ½ as long as the flowers. Perianth open-campanulate, white, chaffy in a dried state; segments equal, narrowly obovate, blunt, 5 mm. long. Filaments simple, free, very narrowly subulate, inserted near the base of the segments, 8 mm. long. Ovary subglobose, with 2 ovules in each chamber, barely 2 mm. long; style slender, nearly 6 mm. long.

A well-marked species, perhaps most nearly allied to the Western Himalayan *A. blandum* Wall., but a much smaller plant and distinguished also by its very shortly pedicelled white flowers.

Hab.; Tibet; Po-tong-lo, 2 miles north of Pari (Dungboo, Aug. 16, 1878).

32. A. TIBETICUM Rendle in Journ. of Bot. xliv (1906) 41.

Plant glabrous, 10-16 cm. high, tufted. Bulb narrowly cylindric, mounted on an apparently ascending rhizome; envelopes membranous, pale brown, at length breaking up into parallel fibres. Stem almost terete. Leaves 2-3, sheathing the base of the stem, most often scarcely reaching to the umbel, linear, a little narrowed in the upper part, with the margins slightly scabrid and involute, 3 mm. wide when flattened. Spathe one-valved, broadly boat-shaped and shortly beaked, shorter than the umbel. Umbel densely few-flowered, 1-2 cm. in diameter; pedicels rarely more than ½ as long as the flowers. Perianth subglobose-campanulate, "deep blue," 5 mm. long; segments blunt, the inner broadly ovate-oblong, the outer a little shorter, ovate, concave. Filaments about ⅓ shorter than the perianth, the outer with the base narrowly triangu-

[ALLIUMS — INDIA, continued on page 174.]

ON THE ORIGIN OF TAPEINANTHUS HUMILIS HERB.

A. Fernandes and R. Fernandes
Institut Botanique de l'Université de Coimbra

[Translated from the French into English by Thomas W. Whitaker.]

INTRODUCTION

The sub-tribe *Narcissinae* Link of the tribe *Narcisseae* Endl. of the family *Amaryllidaceae* Lindley is composed of the genera *Cryptostephanus* Welw. ex Bak., *Tapeinanthus* Herb. and *Narcissus* L. While the last genus has been studied intensively from the point of view of cytology with the aim of illuminating its systematics (see Fernandes, 1931, 1934, 1937 *a*, *b*, 1940 and 1943), the cytology of the first two has not yet been the object of such work.

Having obtained truly encouraging results with the genus *Narcissus*, we have resolved to extend the research to all members of the sub-tribe, with aim of contributing to a clearing up of the relationship between the three genera. Unfortunately all of the arrangements made with the object of procuring material of the genus *Cryptostephanus* have failed, this occurred because of the fact it is a question of African plants, growing in distant localities and difficult of exploration. Meanwhile, we have succeeded in obtaining some bulbs of *Tapeinanthus humilis* Herb. from which we have made a study of the somatic chromosomes of this plant. This study has permitted us to decipher the relationship between this genus and the genus *Narcissus*, and to formulate a hypothesis of the probable origin of *Tapeinanthus humilis*. We are here presenting the results of our researches.

MATERIALS AND TECHNIQUE

The plants were received from Jerez de la Frontera, in the Spanish province of Andalousia.[1] The bulbs, cultivated in pots at the Botanical Garden of Coimbra, furnished the root meristems, the only material we have used in our observations. Unfortunately, we have not succeeded in obtaining floral buds which would permit a study of meiosis.

The root meristems (root tips) have been fixed in Navashin's fluid (Brunn's modification), La Cour 2BE and Flemming-Benda. For studying the number and morphology of the chromosomes we have used transverse sections, 20 microns in thickness. Staining was with gentian violet or iron-hematoxylin.

Longitudinal sections, of varying thickness between 15 and 20 microns, have been used particularly with the aim of determining the number of primary nucleoli. Staining of these sections has been accomplished by means of the safranin-light green technique, which gives good results.

[1] Our warm thanks are due M. Prof. P. Font Quer, to whom we are extremely obliged for obtaining the bulbs of *Tapeinanthus humilis* Herb.

OBSERVATIONS

Examination of numerous equatorial plates permits us to state that *Tapeinanthus humilis* possesses 28 somatic chromosomes (fig. 1*a*). Careful analysis of these plates has led us to establish the existence of the following chromosomes types (fig. 1*a*);

1.—Four chromosomes Lm, Having the arm L, beside a short arm indicated by the same symbol as in the other long types. The short arm has a secondary constriction, situated from the centromere a distance that is little more than equal to one-third the length of this same arm;

2.—Two pairs 'Lp$_1$,a short arm besides the long one similar to other chromosomes of the same type; the long arm presents a sub-median secondary constriction and is provided with a satellite at its distal extremity;

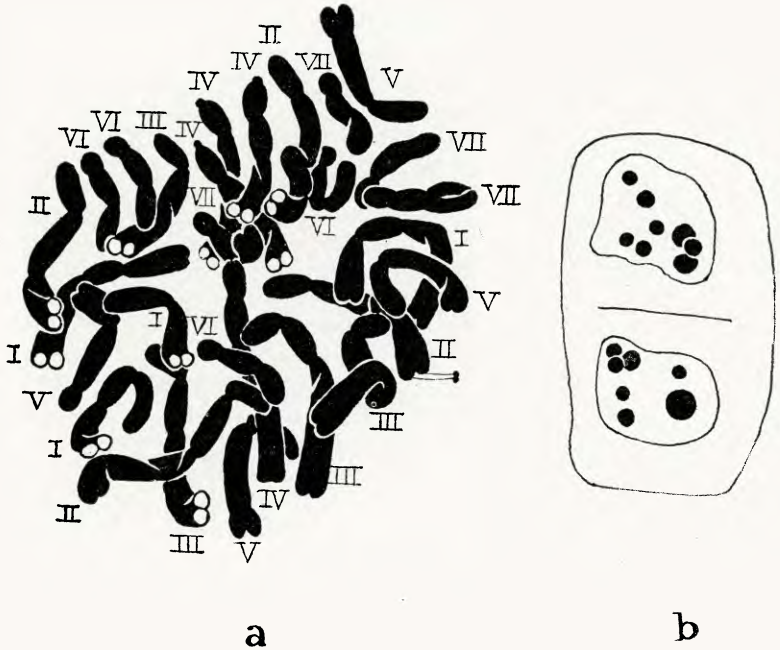


Fig. 1.—*Tapeinanthus humilis* Herb. *a*, Equatorial plate in a cell of the root tip. Explanation in the text. Navashin-gentian violet. X 3250. *B*, A stage a little in advance of telophase, showing 8 nucleoli in one half; the other half shows 7; resulting from the fusion of two of them. La Cour 2BE—safarnin-light green. X 2000.

3.—Four chromosomes Lp$_2$, the short arm is less long, than the short arm of type Lp$_1$; the long arm is provided with a secondary constriction, located about one-third the distance from the centromere;

4.—Two pairs of satellited chromosomes, Lp'$_3$, showing the same characteristics as the above type, but with the short arm a little less long and provided with satellites;

5.—Two pairs, li with the long arm l having a sub-terminal secondary constriction;

6.—Four short, almost isobrachial chromosomes Pp; the arm, P, is provided with a sub-terminal secondary constriction.

7.—Two pairs of cephalobrachial chromosomes P.

The determination of the primary number of nucleoli (Heitz, 1931) in the first stage of telophase has not been easy. Nevertheless, after careful observation we have succeeded in counting 8 in some figures, (figs. 1*b* and 2*a*). The maximum number of these bodies found in interphase nucleui has been 7 (fig. 2*b*), this also demonstrates that the primary number should be 8. Four of these elements are proximal and four are distal (fig. 2*a*). The first correspond to the four satellited

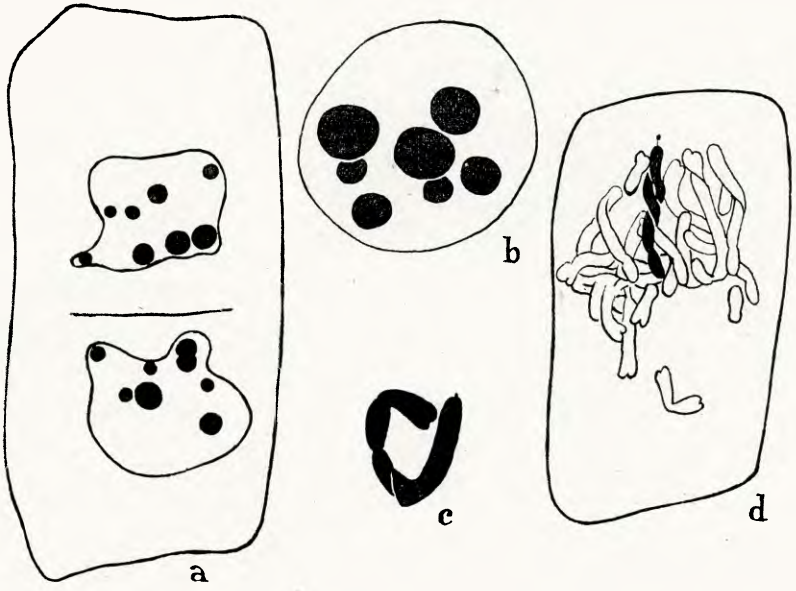


Fig. 2.—*Tapeinanthus humilis* Herb. *a.* One of the first stages of telophase, showing in a sufficiently clear fashion that 4 nucleoli are proximal and the other 4 are distal. La Cour 2BE-safranin-light green. X 2000. *b,* Interphase nucleus of a root tip meristem showing 7 nucleoli. *idem.* X 3250. *c,* Chromosome LP_1, showing a rather small satellite at the distal extremity of the long arm. Navashin-gentian violet. X 3250. *d,* a profile view of metaphase showing one satellite at the distal extremity of the long arm of chromosome LP_1. La Cour 2BE safranin-light green. X 2000.

chromosomes Lp's, while the distal ones correspond with the satellites situated at the extremities of the long arm of the four chromosomes Lp. An analysis of a great many figures has permitted us, in effect, to verify the existence of satellites occupying the expected position. However, from the fact that they are extremely small, they have been observed rather rarely, but we have found figures showing some of these elements

(figs. 1*a*, 2*c*, and 2*d*). In spite of this, it is very probable that four exist, and that we have not succeeded in identifying all four in the same figure because of their minute size.

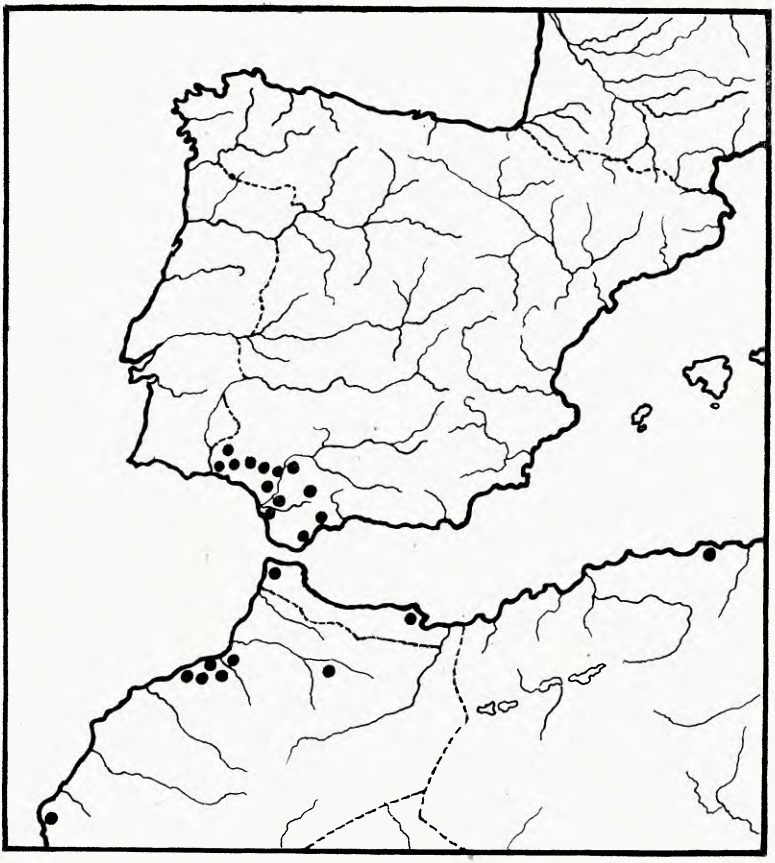


Fig. 3.—Map representing the geographic distribution of *Tapeinanthus humilis* Herb.

The figures where we have shown the satellites as being distal, with the exception of fig. 1*a*, are profile views of metaphase and anaphase, are inadequate as we know, to identify these types of chromosomes. The figs. 1*a*, 2*c* and 2*d*, however, permit us to state that the chromosome with the distal satellite belongs to the type Lp_1. We believe, therefore, in the existence of two pairs 'Lp1.

According to the description of the morphology of the chromosomes that we have given, the idiogram of *Tapeinanthus humilis* Herb. can be represented by the following formula: $2n=28=4:Lm+4:'Lp_1+4:Lp_2+4:Lp'_3+4:li+4:Pp+4:P$.

From the fact that there are 7 different types of chromosomes, and that each is found represented four times, the formula shows immediately that *Tapeinanthus humilis* Herb. is a tetraploid form with a n=7 ancestor.

GEOGRAPHIC DISTRIBUTION

Tapeinanthus humilis Herb. presents a geographic distribution comparable with that of some of the species of the genus *Narcissus*, as shown by the map of fig. 3, compiled from the following list of localities from which this plant has been collected:

Spain: Andalusia: All the region of Huelva (between Cartaya, Gibraleon and Huelva; the environs of Niebla, Vilarassa and Palma); Jerez de la Frontera; Puerto de Santa Maria; between Puerto de Santa Maria and Buena-Vista; Cadiz; the lower course of the Guadalquivir; the environs of Sanlucar la Mayor and Castilleja; the environs of Seville; Moron: Gibraltar. Grenade: Sierra del Hacho de Gaucin.

Spanish Morocco: the environs of Tangier; Melilla; the slopes of Mt. Gourougou.

French Morocco; at the seashore near Rabat; the valley of the Oued Korifla, near the N'Keila; Bouznike; all the valley of the Nefifik, on schist, on the side of Ben Nahet; the valley of the Oued Mellah at Sidi Larbi, in black clay on the road from Casablanca to Boulnaut: Cape Ghir; from Fès to Sefrou.

Algeria: at the foot of Chenoua, between Marengo and Tipaza.

DISCUSSION

Assuming that the flower of *Tapeinanthus humilis* possesses a short tube and a rudimentary corona one would expect this species to be a primitive form of the sub-tribe *Narcissinae*. The karyologic observations, however, show that the chromosome complement is composed of 7 different chromosome types, each of which is found repeated four times. *Tapeinanthus humilis* is therefore a tetraploid with a basic chromosome number of 7, and cannot be considered as primitive.

Since we are concerned with the systematic position of *Tapeinanthus humilis* Herb; the opinion of other writers is pertinent. Thus, Cavanilles (1794) placed it in *Pancratium* and in this opinion has been followed by Willdenow (1799), Persoon (1805), Ker-Gawler (1817), Sprengel (1825) and Schultz (1830)—for bibliographic references see Gay, 1858. Schousböe (1800) classed it among *Amaryllis*. Herbert (1821, 1837), Ker-Gawler (1822), Sprengel (1827), Schultz (1830). Roemer (1847), and Knuth (1850)—for bibliographic references see also Gay, 1858—have reported it in the section *Sternbergiae* of the tribe *Amaryllideae*. Boissier (1839-1845), who named the genus *Carregnoa,* said that it belonged on the tribe Amarylées rather than Narcisées (''devra se classer plutôt dans la tribu des Amarylees que dans celle des Narcisées''). Baker (citation of Baker, 1888) reports it in the genus *Lapiedra*. Gay, (1858), emphasizing the errors and confusion of these writers, expressed the opinion that *Tapeinanthus (Carregnoa) humilis* should be placed in the tribe Narcissées (the group which, in this

author's scheme, corresponds to the sub-tribe *Narcissinae* Link). This point of view has been followed by subsequent investigators (Baker, 1888; Pax and Hoffmann, 1930).

The observations of Fernandes (see especially 1943) have shown that the basic, primitive chromosome number of the genus *Narcissus* is 7. The existence of the same number in *Tapeinanthus* leads to the conclusion that these two genera present a close relationship. The same conclusion is confirmed by the fact that the chromosome types existing in *Tapeinanthus* resemble those of some of the species of *Narcissus.* Consequently, *Tapeinanthus* should have been included in the sub-tribe *Narcissinae,* in close association with the genus *Narcissus,* in accordance with the ideas of Gay (1858), Baker (1888), and Pax and Hoffmann (1930).

Comparison of the idiogram of *Tapeinanthus humilis* with the idiograms of some of the species of *Narcissus* permits us to establish the relationship existing between the two genera in a more precise fashion. In previous work, Fernandes (1939 *a,* 1939 *b*) it was ascertained that *Narcissus gaditanus* Boiss. and Reut. possessed 14 somatic chromosomes whose morphological characteristics could be represented by the following formula (fig. 4*a*) :

$$2n=14=2:Lm+2:Lp_1+2:Lp_2+2:Lp'_3+2:li+2:Pp+2:P.$$

Careful comparison of this idiogram with that of *T. humilis* shows that the last corresponds to a duplication of the first.

$$2n=28=4:Lm+4:'Lp_1+4:Lp_2+4:Lp'_3+4:li+4:Pp+4:P.$$

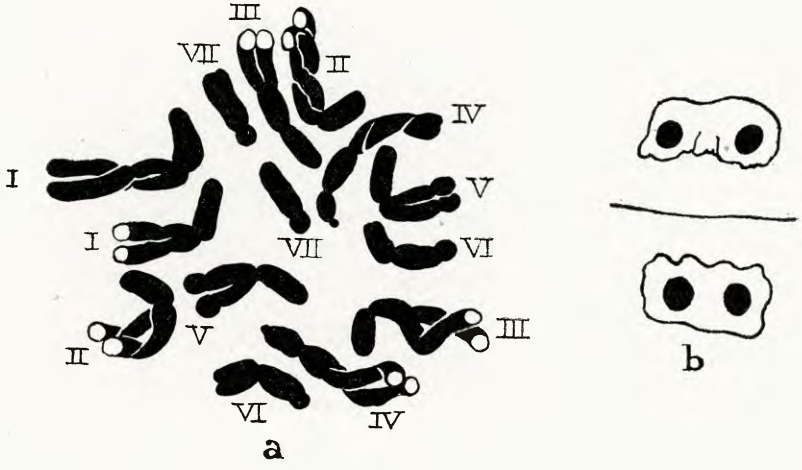


Fig. 4.—*Narcissus gaditanus* Boiss. and Reut. *a,* Equatorial plate in the cell of a root tip. Navashin-gentian violet. X 3250. *B,* The first stage of telophase in a root tip cell showing two nucleoli. La Cour 2BE-safranin light green. X 2200.

The only difference that we have found concerns the existence in *T. humilis* of satellites at the distal extremities of the arm of the chromo-

somes Lp_1, while in *N. gaditanus* these chromosomes are devoid of satellites. One cannot attribute importance to this difference, since some observations made with *N. Bulbocodium* L. (Fernandes and Neves, 1941) have shown that in this species there is great polymorphism from the point of view of the satellites (and consequently in the nucleoli) among the diploid population. In fact, diploid populations having the following constitution have been found: 2Pp' (two nucleoli), 2'Lp+2Pp' (four nucleoli), and 4'Lp (four nucleoli). As this phenomena occurs in *N. Bulbocodium* L., it would also occur in *N. gaditanus* or its ancestor, for this reason diploid populations provided with four satellites (two proximal and two distal) can be said to exist. The complement of *T. humilis*, therefore, corresponds to a duplication of another, possessing $2'Lp_1$ and $2Lp'_3$. It acts as a second case comparable with that reported for *N. Bulbocodium* L.

According to these facts, it seems that we can conclude that *T. humilis has been produced by chromosomal duplication in part from N. gaditanus, or more probably, as the facts of external morphology and geographic distribution indicate, in part from a common ancestor from which N. gaditanus also originated.*

Several external morphological characters seem to be in harmony with the idea of considering *T. humilis* as a tetraploid form of an ancestor that also produced *N. gaditanus*. Thus, the two species possess comparable bulbs, filiform leaves, floral scape-cylindrical, slender and flexuous, similar spathes, yellow odoriferous flowers and stamens arranged in two ranks.

However, the differences are sharp enough, as is shown by the following table:

N. gaditanus Boiss and Reut.	*T. humilis* Herb.
Spring flowering	Autumn flowering
Perianth tube long	Tube shorter
Corona long	Corona rudimentary
Divisions of the perianth oval-lanceolate, needle-like.	Divisions of the perianth oblong-lanceolate, obtuse.

The first difference cannot be considered as militating against our hypothesis, for the reason that there are several species of *Narcissus (N. elegans, N. viridiflorous* and *N. serotinus)* which, as *Tapeinanthus,* have autumnal flowering. This type of flowering can even be a consequence of tetraploidy. In fact, several investigators (see Müntzing, 1936) have stated that polyploid forms develop more slowly and flower later than their diploid ancestors. Ernst (1941) in studies of *Antirrhinum majus,* states that the diploid plants of a certain race are "tag-neutrales" (neutral day), while the tetraploids behave as long day plants. In this fashion, polyploidy can lead to physiologic conditions susceptible to altering the flowering cycle of plants, and tetraploidy has, in our case, probably been the cause of the conversion of the plant from spring flowering to an autumn flowering one. In support of this

point, we can cite the fact that all species of *Narcissus* blooming in autumn are polyploids: *N. elegans* (hypertriploid), *N. viridiflorous* (tetraploid) and *N. serotinus* (hypertetraploid).

The second difference concerns a very important character. An analysis of the species of the genus *Narcissus* show, however, that the flower of *N. Pseudo-Narcissus* is provided with a long tube, while there is considerable resemblance between it and *N. cyclamineus* from the point of view of morphology and karyology. The flower of the latter species has no tube or a very short one (3 mm. maximum). For this reason, the difference in the length of the tube cannot be considered as a decisive argument against the hypothesis. Moreover, it needs to be said that among the forms of *N. gaditanus* one finds *N. minutiflorus* Willk. whose flower is provided with a relatively short tube (8-10 mm.).

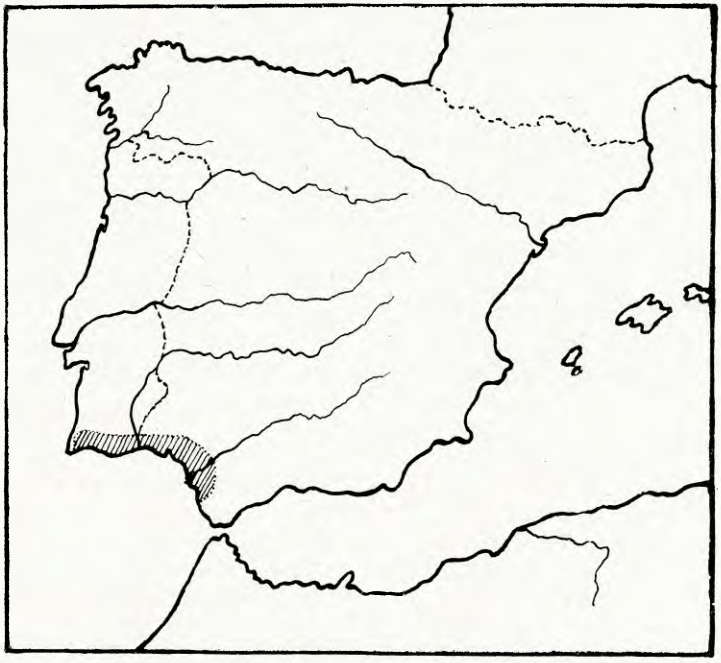


Fig. 5.—Geographic distribution of *N. gaditanus* Boiss and Reut.

The importance of the third difference is greatly diminished by the fact that we know that some species of *Narcissus* have almost no corona *(N. Broussonetii)* or little developed *(N. serotinus)*. It is quite probable that the ancestor of the genus *Narcissus*, had flowers with a rudimentary corona. In this manner we can infer that in some species of *Narcissus*, likewise in *T. humilis*, the primitive condition has been conserved. However, it should be stated that all species of the genus *Narcissus* where the corona is poorly developed are polyploids like *T. humilis*.

Concerning the divisions of the perianth, it can be said that they are sharply differentiated. However, it should be noted that *N. sero-*

tinus also has oblanceolate-obtuse divisions of the perianth, recalling those of *T. humilis*.

According to what we have shown, we believe it can be concluded that an analysis of the external morphological characters is not opposed to the idea of considering T. humilis as a tetraploid form, derived from a common ancestor of this species and *N. gaditanus*.

The maps of figs. 3 and 5 show the geographic distribution of *T. humilis* and *N. gaditanus* respectively. One notes that *N. gaditanus* occupies only the Atlantic region of the southern part of the Iberian peninsula, while *T. humilis* occupies a larger area comprising: 1) the region of southern Spain between Malaga and Huelva; 2) the coastal zone of the Mediterranean of North Africa from Tangier as far as Algeria; 3) the Atlantic region of Morocco from Tangier as far as Cape Ghir.

The data of geographic distribution are in harmony with the hypothesis we have suggested. The fact that the two species have over-lapping distributions in the region approximately between Gibraltar and Huelva supports the hypothesis.

According to the facts of geographic distribution we can retrace the probable history of *N. gaditanus* and *T. humilis* in the following manner:— At the entrance of the straits of Gibraltar, the ancestral form provided with 14 somatic chromosomes, arrived in the littoral region of southern Spain. In this region, it (the ancestral form) produced *N. gaditanus,* which made its way towards the west, following a route close to the sea and reaching almost to Cape Sao Vicente. In the same region the ancestral form produced a tetraploid, which because of tetraploidy became autumn flowering. This entity constituted the species *T. humilis*. From the fact that the new species was a more vigorous form and provided with a greater capacity for adaptation, (see Fernandes and Neves, 1941), it spread more rapidly than the diploid form, and advanced by its side, (the diploid) towards the West, at the same time it traversed the connection between Spain and Africa, and succeeded in establishing itself on the latter continent.

In southern Spain probably near the opening of the Straits of Gibraltar, *T. humilis* advanced toward the west and arrived at the frontiers of Portugal. In Africa, it advanced on one side toward the east, following the coastal Mediterranean zone to the vicinity of Algeria. In the other direction it progressed toward the south occupying the Atlantic region of Morocco as far as Cape Ghir. At the same time it also advanced toward the interior as is attested by its appearance between Fés and Sefrou.

The reason that *T. humilis* succeeded in occupying a larger area than *N. gaditanus* can be explained by the fact that the latter species, being a residual diploid, did not acquire the capacity for adaptation which would permit it to endure conditions of life in African regions.

On October 14, 1835, Perez Lara [2] collected a remarkable plant which he sent to Willkomm in 1880. After examining the flower, the

[2] Lara's description in Latin of the location of his find follows: "in pratis adjacentibus sanctuario dicto del Mimbral urbis Jere de la Frontera."

latter writer came to the conclusion that the plant belonged to the genus *Carregnoa* Boiss (—*Tapeinanthus* Herb.). In accordance with this opinion, Perez Lara described this new species later, in 1882, under the name *Carregnoa dubia.* Willkomm (1881-1885) gives a description of this plant emphasizing the differences existing between it and *Tapeinanthus (Carregnoa) humilis* and presenting a beautiful plate. Although, he considered it as new species of the genus *Carregnoa (Tapeinanthus),* he noticed that *Carregnoa dubia* was intermediate between *N. serotinus* and *T. humilis,* and for this reason, he asked if the new species could not be a hybrid of *N. serotinus* and *T. humilis.* However, after considering the characters of the floral scape, he was led to a rejection of this conclusion.

Janka (citation of Baker, 1888), Baker (1888) and Pax and Hoffmann (1930) believed that *Carregnoa dubia* was not a form of *N. serotinus.*

Placed with the articulation of the floral scape which he considered with reason to be the result of, "uneven shrinkage in drying," Bowles (1934) believed that *Carregnoa dubia* was a hybrid of *N. serotinus* and *T. humilis,* since, "certain of its characters are intermediate between the two genera, particularly the longer perianth tube and the stamens projecting less from the throat than in *Tapeinanthus,* also the whiter flower and rather larger coronal scales." (Bowles, 1934, p. 36). In his analysis of the plate of Willkomm (1881-1885) we share the opinion of Bowles, and we consider his opinion as probably the correct one. The genus *Tapeinanthus* is therefore monotypic, composed only of the species *T. humilis* Herb. The appearance of a hybrid of *N. serotinus* and *T. humilis* is further evidence of the close affinity existing between the two genera.

SUMMARY

1. Tapeinanthus humilis has an idiogram which can be represented by the following formula:

$$2n=28=4:Lm+4:'Lp_1+4:Lp_2+4:Lp'_3+4:li+4:Pp+4:P.$$

Given that the chromosome complement is composed of 7 different types, each of which is found repeated four times, this species is a tetraploid form, derived from an ancestor with the basic number 7.

2. From the fact that one finds in *Tapeinanthus* the same base number and the same chromosome types that are characteristic of some of the species of the genus *Narcissus, Tapeinanthus* should be considered as belonging to the tribe *Narcisseae* (sub-tribe *Narcissineae)* and not to the tribe *Amaryllideae.*

3. Comparison of the idiogram of *T. humilis* with that of *N. gaditanus* shows that the first corresponds to a duplication of the second. In accordance with this fact, it is suggested that *T. humilis* has been produced by chromosomal duplication in part from a common ancestor of this species and *N. gaditanus.* If this hypothesis is correct, we can say that tetraploidy, probably associated with alterations in the struc-

ture of the chromosomes, and with gene mutations, has been capable of producing a new genus.

4. The data of external morphology and of geographic distribution are in accord with this hypothesis.

5. On the basis of the data of geographic distribution, we have retraced the probable history of *T. humilis.*

6. The plant known under the name *Carregnoa dubia* Perez Lara, should, in accordance with the opinion of Bowles, be considered as a hybrid of *N. serotinus* and *Tapeinanthus humilis.* The appearance of this plant reinforces the idea that there exists a great affinity between the genera *Narcissus* and *Tapeinanthus.*

BIBLIOGRAPHY

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

Battandier et Trabut
1895 *Flore de l'Algerie,* Alger et Paris.

Boissier, E.
1839-1845 *Voyage botanique dans le midi de l'Espagne pendant l'année 1837, 2,* Paris.

Bowles, E. A.
1934 *A handbook of* Narcissus, London.

Cavanilles, A. J.
1794 *Icones et descriptiones plantarum, quae aut in Hispania crescunt, aut in hortis hospitantur, 3,* Matriti.

Ernst, H.
1941 Die photoperiodische Reaktion bei autotetraploidem *Antirrhinum majus* L. *Ber. d. Deutsch. Bot. Gesell., 59,* 351-355.

Fernandes, A.
1931 Estudos nos cromosomas das Liliáceas e Amarilidáceas. *Bol. Soc.* Broteriana, *7* (2. *a* série), 3-110.
1934 Nouvelles etudes caryologiques sur le genre *Narcissus L. Bol. Soc. Broteriana, 9* (2. *a* série), 3-195.
1937*a* Sur l'origine du *Narcissus dubius* Gouan. *Bol. Soc. Broteriana, 12* (2. *a* série), 93-118.
1937*b* Le problème de *Narcissus Tazetta* L. I. Les formes *à* 22 chromosomes somatiques. *Bol. Soc. Broteriana, 12* (2. *a* série), 159-219.
1939*a* Sur l'origine du *Narcissus jonquilloides* Willk. *Scientia Genetica, 1,* 16-61.
1939*b* Sur la caryo-systématique du groupe *Jonquilla* du genre *Narcissus* L. *Bol. Soc. Broteriana, 13* (2. *a* série), 487-544.
1940 Sur la position systématique et l'origine de *Narcissus Broussonetii* Lag. *Bol. Soc. Broteriana, 14* (2. *a* série), 53-66.
1943 Sur la caryo-systématique de la section *Autumnales* Gay du genre *Narcissus* L. *Bol. Soc. Broteriana, 17* (2. *a* série), 5-54.

Fernandes, A. et Neves, J. B.
1941 Sur l'origine des formes de *Narcissus Bulbocodium* L. *à* 26 chromosomes. *Bol. Soc. Broteriana, 15* (2. *a* série), 43-152.

Gay, J.
1858 Recherches sur la famille des Amaryllidacees. *Ann. Sc. Nat., 10* (4ème série), 75-109.
Heitz, E.
Die Ursache der gesetzmässigen Zahl, Lage, Form und Grösse pflanzlicher Nukleolen. *Planta, 12,* 776-844.
Herbert, W.
1837 *Amaryllidaceae* (citation de Gay, 1858).
Jahandiez, E. et Maire, R.
1931 *Catalogue des plantes du Maroc,* Alger.
Muntzing, A.
1936 The evolutionary significance of autopolyploidy. *Hereditas, 21,* 263-378.
Pax, F. et Hoffmann, K.
1930 *Amaryllidaceae* in *Die naturlichen Pflanzenfamilien, 15a,* 391-430.
Perez Lara, J. H.
1882 Plantarum novarum aliquarum descriptio ad floram gaditanam pertinentium. *Anal. Soc. Esp. Hist. Nat., 11,* 399-403.
Schousböe
1800 (Citation de Gay, 1858).
Willkomm, M.
1881-1885 *Illustrationes Florae Hispanicae insularumque Balearium, 1,* Stuttgart.
Willkomm, M. et Lange, J.
1861 *Prodromus Florae Hispanicae, 1,* Stuttgart.

REGISTRATION OF NEW AMARYLLID CLONES

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

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

HYBRID DAYLILY (HEMEROCALLIS) CLONES

TRIAL GARDENS. Cooperative daylily trial gardens have been established at (1) *Cornell University, Dept. of Floriculture, Ithaca, N. Y.;* (2) *University of Florida, Dept. of Horticulture, Gainesville, Fla.,* (3)

Southwestern Louisiana Institute, Dept. of Horticulture, Lafayette, La.; (4) *Whitnall Park Arboretum, Milwaukee City and County Park Board, Milwaukee, Wisc.;* (5) *Texas Agricultural Experiment Station, Dept. of Horticulture, College Station, Texas;* and (6) *Des Moines Park Board, Des Moines, Iowa.* [Complete addresses are given under *Officers and Committees,* below.]

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

Fig. 142. Plant of *Selina Foster* Daylily. Photo by Paul A. Kane

Introduced by Mr. & Mrs. Eugene A. Taylor, Sharon, Mass.

Ruby Taylor. (Cissy Guiseppi X orange seedling) 42″ high; 20 fls. per scape; flowers 4¼″ in diam., ruby red, slightly deeper eye-zone, light green throat; July 12 to Aug. 28.

Quaker Maid. (Sunny West X *Ruby Taylor)* 3½ ft. high; 38 fls. per scape; flowers 4″ in diam., petals lavender, sepals fulvous; fulvous eye-zone, yellow throat; mid-ribs light cream; pleasant fragrance; July 17 to Aug. 28.

Straw Bonnet. 39″ high; 17 fls. per scape; flowers 4½″ in diam., straw, veined red, eye-zone deep orange red, light green throat; pleasant fragrance; July 10 to Aug. 27.

Highland Lassie. 48″ high; 32 fls. per scape; flowers 5″ in diam., deep orange, veined red, faint orange red eye-zone, light green throat; July 22 to Sept. 26.

Introduced by Mrs. Paul A. Kane, San Antonio, Texas.

Selina Foster. (Mrs. A. H. Austin X *H. minor)* (Figs. 142 and 150). Up to 48 fls. per scape; flowers 4½″ in diam.; Sunflower (M & P, 9-L-4); up to 6 fls. open at one time; recurrent bloomer in Texas.

Introduced by Stanley E. Saxton, Saxton Gardens, *Mount Arab, N. Y.*

Ileen. Robust plant 38″ tall. Flower 5½″ to 6½″, petals 1½″ peach bronze with dusty-rose eye. Sepals 1″ slightly lighter with faint dusting at eye zone. Well branched, petals somewhat spatulate and ruffled. Intermediate bloomer, June and July.

Sugar Plum. Medium tall 30″. Large flower 5½″ to 6½″, plum purple self. Petals wide and pointed, somewhat trumpet shaped. Throat greenish yellow, small. There is a bluish sheen to the purple. Good branching, July and August.

Candy Stick. Medium tall 34″. Large Flower 5″ to 5½″. Petals 1⅜″ flag red, veined deeper, ruffled and slightly twisted. Sepals 1″ flushed lighter shade of the same red. Effect bi-tone. July and August.

Sweet Sue. A trim, symmetrical bicolor; petals bright pink, sepals frosted canary yellow; segments are pointed not recurved. Stems tall, flowers medium in size; throat golden and outlined with deep rose.

Blondie. A very light pastel flower in tones of light pink and yellow. Petals pink, ruffled and recurved gracefully. A deeper eye marking adds contrast. Sepals light yellow.

Introduced by James C. Stevens, Greenville, N. Y.

Normandie . Height 30 in.; flowers 18 to 20, approx. 4½ in. in diam.; Terra Cotta, flushed rose, lemon throat; late midseason.

Peter Pan. Bijou X *Baghdad.* Height 23 in.; bright red, orange throat, indistinct eye-zone; flowers small, 15 to 20 flowers per scape; fades slightly in late afternoon; midseason.

Zanzibar. Bijou X *Bagdad,* F-2. Height 30 in.; dark brown-red, orange-green throat, slight eye-zone; 15 to 20 flowers per scape; flowers 5 in. in diam., lasting well into the evening; late midseason.

Brigadier, Festival X Wolof. Height 30 in.; metallic red petals, orange, flushed red sepals, slight eye-zone; 18 to 20 flowers per scape; flowers nicely formed, 5 in. in diam.; late midseason.

Introduced by Mrs. Bright Taylor, Ocala, Florida.

Cluny Brown. Bicolor; Petals brown with yellow midrib; sepals yellow. Wide yellow throat. Form, full, regular; substance, heavy; texture, smooth. Scapes, many branched, stiffly erect, 30 inches. Ever-

green foliage. Early. Sun resistant. Extended blooming. Good seed parent. Showy garden type.

Prima Donna. Centric; semi two-toned. In habit of growth, rate of increase, evergreen foliage, flower form and size, the resemblance to H. aurantiaca major is marked. In color, the throat of the flower is near daffodill—(Maerz & Paul, A Dictionary of Color. Plate 10-J-6); the petals and sepals, near ember red (Plate 5-J-10); the midrib, near cornhusk (Plate 10-G-6). However, the throat color comes up on the petals

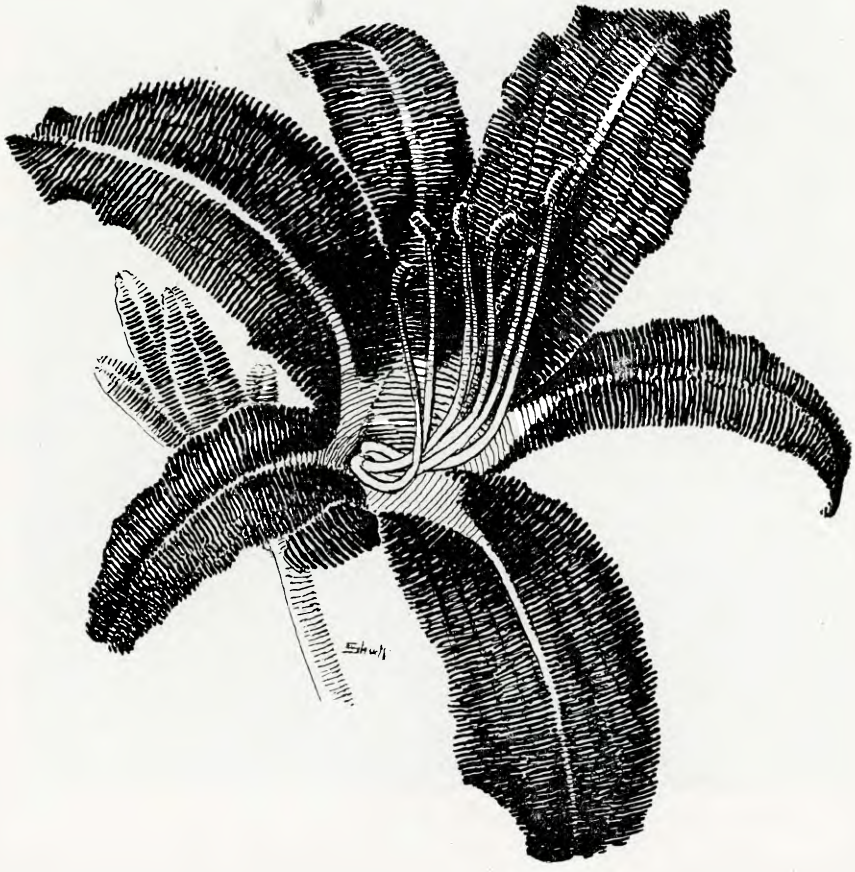


Fig. 143. Hybrid Daylily—*Color Guard.* Photo by J. Marion Shull.

and sepals in a convex arch, diffusing and diluting the colors, so that the garden effect is peach in a semi two toned design. The substance is excellent, texture rather smooth, height of scapes, which are many branching, 2½ to 3 feet; midseason bloomer. Good seed parent.

Introduced by J. Marion Shull, Chevy Chase, Maryland

Color Guard. (Figure 143). Practically a vermilion self, a red that does not fade or burn in the sun nor spot in rain. The general self effect is further enhanced by the smallness of the throat area, which is orange in close harmony rather than contrast with the surrounding red. Height about three feet. July bloomer at Washington.

Fig. 144. Hybrid Daylily—*Fluffy Ruffles.* Photo by J. Marion Shull.

Fluffy Ruffles. (Figure 144). Soft creamy light yellow with broad and very ruffled petals. Surface creped. Eye zone broad and diffused, warm russet. Sepals unmarked same color as petals with tips slightly recurved. Height three feet. July bloom.

Musette. (Figure 145). Description in Herbertia, Volume 7, page 132. Bright banana yellow. Very large. Distinctive star shape produced by oblanceolate petals.

Introduced by L. Ernest Plouf, Lawrence, Mass.

Tamarac Velvety bright red-maroon on all segments; deeper zone on outer; slight midrib; deeper veins; gold throat; fine triangular form; good substance.

Violet Purple 3ft. July-Aug. All segments very deep purple—deeper zone on inner; absolutely no midrib coloring; olive throat; long-tubed well open trumpet; round outline; inner segments embossed; suede finish; good substance; reverses deeply colored; purple buds; erect stem; keeps well very late; darkest of all in our planting.

Vipart 4ft. July-Aug. All segments bright pink-rose; no deeper zone; olive-yellow throat; inner segments well recurved with very pale midrib; outer segments stand erect; well open; keeps well.

Arabian Copper 4ft. July. All segments odd shade rich maroon copper; deep maroon zone; wide orange throat; full 4 inch flower; inner segments spatulate and crinkled at edges; outer segments embossed; chamois finish; round outline; well open; fine form; good erect stem; keeps well.

Desert Sunset 4ft. July-Aug. All segments rich bright deep crimson-red; orange throat; full inch flower; excellent form and substance; chamois finish; good stem; keeps until dark; bright from a distance.

Introduced by Vivian Christenson, Marcus, Iowa.

Raspberry Revel. Seedling x *F. rosea;* segments Yucatan with a star of brilliant De Medici purple that blends into the Yucatan coloring throat Chartreuse Yellow; 40″.

Chetkins. Ophir x *F. rosea;* flowers brilliant copper self produced by deep golden-glow yellow smoothly burnished rufous orange; tiny throat of deep golden-glow; 50″.

Rose Reverie. Soudan x *F. rosea;* a rose (pastel) self with thin cream line around segments; 5 ft.

Originated by Dr. A. B. Stout, New York Botanical Garden.

For descriptions of the following named clones, the reader is directed to the Journal of the New York Botanical Garden *47*:77-82.1946.—*August Orange, Blanche Hooker, Caprice, Fantasia, Fiftieth Anniversary, Firebrand, Georgia, Manchu, Rose Gem,* and *Viking.*

Introduced by Ralph W. Wheeler, Winter Park, Florida

Billie Burke. A bicolor with purple maroon frilled and creped petals while the sepals and throat are bright canary yellow. Also there are wide yellow bands through the midrib of the petals. The flower is large and well open on thirty inch stems. A semi-night bloomer.

Cellini. A specimen flower of great beauty of form. The color is sulphur yellow. Compact, shallow throat, very wide segments, well open but flaring to slightly recurved. The flower is large on three foot stems and opens in the evening, remaining open through the next day.

Haille Selassie. A very large, well open bicolor of deep, dull purple with orange throat and sepals, together with wide bands of orange along the midrib of the petals. The stems are three feet. The combination of orange and purple makes this a most striking Daylily.

Hazel Sawyer. This is a lavender pink Daylily of handsome form in rare coloring. The flowers are medium large to large on two foot stems, well open, petals frilled. It is vigorous, propagates freely, is a free bloomer and makes a beautiful garden subject. A recurrent bloomer in Florida.

Indian Maid. Rich and unusual coloring make this a striking and beautiful Daylily. It is very dark purple maroon with deepest purple eye zone. Surrounding the eye zone is a narrow orange halo which blends into the liquid green throat. The flower has roundly recurved segments, is medium large on three foot, multiflora stems which also carry proliferations. The first stem produced thirty-six flowers. It is remarkably resistant to full Florida sun, an unusual character in a dark colored Daylily.

Introduced by E. J. Kraus, Chicago, Illinois.

Felice. Height 40 inches. Leaves bright green, upright recurred. Scape erect, 3 to 5 branched, 25 to 35 flowered. Each flower regular, faces direct outward, wide spreading 6.5 inches, shed quickly, does not fade in sun. Petals 5 inches long 1.5 inches wide, pale cadmium, slightly lighter at edges with darker, slightly raised midvein. Margins waved, tips abruptly narrowed and recurred. Sepals 4.5 inches long, .75 inch wide, same coloring as petals, shading to picric yellow at base; two prominent longituducal furrows extending throughout its length. Odorless. Heavy substance, does not fade in sun. Third week in July to September 1. Seedling of *Golden West* x *Quaker.*

Mendota. Height 40 inches. Leaves erect, deep green. Scape erect 3 to 5 branched 25 to 40 flowered, rising 5 to 6 inches above foliage mass. Each flower pointed slightly upward, shed quickly. Flower regular, long tubular, widely flaring, diameter 5 inches. Petals 1.5 inches wide 4 inches long, lemon yellow, light yellow mid veins, slightly ruffled. Sepals, 1 inch wide 4 inches long same color as petals. Faint, pleasing odor. Does not wilt or fade in sun. Very free blooming. Season early July to mid August. Seedling *Cressida* x *Sunny West.*

Midnight. Height 36 inches. Leaves wide, dark green, 18 to 24 inches, recurred at tip. Scape upright, 3 to 4 branched, 25 to 35 flowered, flowers borne 8 to 10 inches above foliage mass. Flower slightly pointed upward, tubular reflexed, 5 inches in diameter, segments overlapping, quick shedding. Petals 3 inches long 1.25 inches wide, broadly oval, distal two thirds deep maroon shading to garnet brown, narrow band of Brazil red at edges, indistinct very broad eye zone of victoria lake toned mars violet, remainder deep chrome. Sepals 3.25 inches long .75 inches broad, oval, slightly ruffled, distal fourth oxblood red toned garnet and brazil red, deep chrome basal portion. Stamens orange toned brazil red. Reverse of flower deep orange heavily shaded

garnet. General effect in sun dark purple black. Retains color without wilting in sun. Season July 10 to mid-September, recurrent free bloomer. Vigorous. Seedling of *Dominion* x unnamed seedling.

Monona. Height 20 inches. Leaves dark green, erect spreading, making compact bush. Scape heavy, 36 inches, strong upright sweeping in graceful curve, total height attained 24 to 30 inches, so that flowers are borne just above or at pripheny of leaf mass, 3 to 4 branched, 25 to 40 flowers borne close together but well spaced. Flower tubular, full, widely flaring, 5.25 inches in diameter. Quick shedding. Petals 4 inches

Fig. 145. Hybrid Daylily—*Musette.* Photo by J. Marion Shull.

long 1.5 inches wide, pointed spatulate, pure deep orange, cadmium orange at base, brilliant, glistening. Sepals 3.5 inches long by 1 inch wide, same color as petals. Texture thick, waxy. Odorless. Does not fade in sun. Vigorous, free blooming. Season July 10 to August 20. Seedling of *Cressida* x *Rajah.*

Morello. Height 30 inches. Leaves erect, bright green, recurred at tips. Scape sturdy, 3 to 4 branched, 20 to 30 flowered rising slightly above foliage. Each flower 4.75 to 5 inches in diameter, tubular reflexed, segments overlapping, petals slightly folded back along midrib. Petals 3 inches long 1.25 inches wide. Distal half dark brazil red indistinctly veined garnet, broad garnet eye zone; remainder cadmium yellow, with cadmium mid vein brushed red toward outer portion. Sepals 3 inches long, .75 inches wide, distal two thirds brazil red over cadmium, remainder dark cadmium yellow. General effect bright glowing red in sun, color retained throughout the day. Odorless. Heavy texture. Season last week in July to September 1. Seedling of *Rajah* x unnamed red seedling.

Introduced by Hamilton P. Traub and J. S. Cooley.

Vivian Toole. Medium height; beautiful shade of Burnt Orange (RHS O-14/2) with reddish cast; flowers 5½ inches in diam.; midseason.

Orient Pink. Height 3½ ft.; 19 or more flowers per scape; flowers 4½ inches in diam.; petaline segments near Orient Pink (RHS 4-16), with narrow yellow stripe in center; sepaline segments yellow, flushed Orient Pink; yellow throat; midseason; sun-resistant. (No. 800)

Cadmium Orange. Height 3 ft.; flowers 5 inches in diameter; beautiful clear Cadmium Orange (RHS 8) self; midseason; sun-resistant. (No. 801)

HYBRID AMARYLLIS CLONES

Introduced by Carrie M. Armstrong, Joy, Illinois.

Rose Marie. Leopoldii Type B, 9 inches across face; color American Beauty (pink), white throat, with a white stripe in center of segments extending about half way.

Dorathy May. Leopoldii Type B, 9 inches across face; color white, heavily bordered pink.

Karen Marlys. Leopoldii Type A, 9 inches across face; color white with red pencilings in throat.

Rex. Leopoldii Type B, 9 inches across face; color dark red, small light green star in center.

Betty Jean. Leopoldii Type B, 10 inches face, color white with pink pencilings in throat (Diener seedling).

Introduced by Mr. Garnald D. Zeiner, Lost Springs, Kansas.

Salmon Supreme. Leopoldi type B. Salmon colored, 6¾ inches in diam. across face.

Salmon Streak. Reginae type B. Salmon with white stripe down center of each segment; flowers 6 inches in diameter; excellent form.

Spot. Leopoldi type B. Pure white except for a few pink spots; flowers 7 inches in diam; fair form.

Sunset. Reginae type B. Orange with white stripe down center of segments; good form.

Watermelon. Leopoldi type A. Rose-red self; flowers 9 inches in diam.; fair form.

3. CYTOLOGY, GENETICS AND BREEDING

NOTES ON PINK NARCISSUS SEEDLINGS

C. E. Bailey

[With the death of C. E. Bailey on April 25th of this year the American daffodil hybridizers have lost one of their outstanding colleagues. Charles E. Bailey was widely known in shipping circles as the Executive Secretary and General Manager of the Portland (Oregon) Commission of Public Docks. Less well known was the fact that he was one of the foremost contemporary daffodil breeders who, especially in the field of pink daffodils, had made great gains. Working alone and following his own theories he developed several strains of fine daffodils which, especially for breeding purposes, have definite merit. He also produced several excellent and early red and white Barrii and a number of pure white trumpet varieties.

To have seen Mr. Bailey at work in his small city garden, surrounded by a galaxy of magnificent pink and white daffodils, is something that will stay long in the memory of his friends and colleagues. Mr. Bailey died at the age of 59, just when his latest new seedlings were in flower. A few days before his death the first batch of seedlings from his favorite "pink" daffodil came into flower and from his bed he could see that definite success had crowned his long years of painstaking work.

During the past winter he had, at the request of our Secretary, jotted down some notes on his theories and methods. These notes, together with his "stud" books he bequeathed to me and from them I have selected the following paragraphs. Mr. Bailey expressed the desire that we carry on his work and in a few years I hope to be able to give a further report on the result of his work.—*Jan de Graaff, May 10, 1945.*]

Notes By C. E. Bailey—1880 to 1945

As a fascinating hobby, I have spent much effort, time and study in attempting to produce a strain of daffodils in which the pink genes would be definitely dominant and would carry on through successive progeny. There have been some small rewards . . . . . enough to lend encouragement, but not enough to permit over-enthusiastic conclusions. Flowering of the seedlings from the crossings of the last two or three years should prove—or discredit—many of my pet theories and my lines of procedure.

As for the source of "pink" . . . . . every man to his own guess. As one of the English hybridizers has expressed it—"Pink, like gold, is where you find it." Seriously however, there is enough similarity of pattern in the many unexpected breaks reported from all parts of the world and there is sufficient other data available upon which to base the general, rather broad, primary premise that latent potentialities for pink exist to some degree in any hybrid daffodil in which there is even the remotest trace of *Narcissus poeticus* blood. In such a daffodil the pink genes are recessive and can become dominant in time with careful,

selective breeding. I am also of the opinion that, with a definite color strain fixed, improvement in form and size can best be obtained by cross-pollenizing with the finer and larger whites in which "absence of color" has become established. This is borne out by the results Wilson recently obtained from the use of *Broughshane* and by the "pinks" in the progency of *Evening* as well as by the presence of pink in seedlings from pollen of *Carnlough*.

The potentialities for pink are apparently more dominant in the Leedsii and their borderline kin among the white Ajax, as evidenced by *Lord Kitchner, Mitylene* and *White Sentinel* in particular and by such others as *Gracious, Gertie Millar, Eskimo, Evening* and—from Wilson's recent reports—even *Broughshane*. So far as we know it is from these and possibly a few others of similar type that most of the known pinks have been derived either by cross pollenization or by selfing. I believe that the first pinks were obtained by chance or accident and not by design.

It should be noted that none of the above flowers in themselves give any visual evidence of pink with the exception possibly of *Eskimo,* which at times manifests a faint illusion of pink in the trumpet as it ages. It has been advanced with respect to several of the above varieties that their tendency to "throw" pink can be directly attributed to some specific ancestor such as *Weardale Perfection, Beacon* or *Princess Mary*. On the basis of my own experiments I feel that I cannot suscribe to these theories.

Laying aside for an instant all the science of genes, chromosomes, Mendelian laws and what have you—and laying myself wide open to the criticism of the learned—it has always seemed to me that the appearance of pink in daffodils could be likened to a simple formula of dilution. Just as the red in the fine new red-cupped hybrids has been brought up from the red of *N. poeticus* by mixing red with red and intensifying it—so has the red of *N. poeticus* been diluted, as it were, through many generations of crossing with whites until the red disappeared and pink—that is equal parts of red and white—appeared and finally became fixed.

In addition to this second premise, there is no doubt whatsoever in my own mind but what there must be many other varieties among the hundreds of existing Leedsii, which although undiscovered as yet, have equal or even more dominant potentialities for pink than the few varieties from which most of our present "pinks" are known to have been originated. It is my own observation that flowers which show no visual evidence of color often carry more dominant pink genes than those in which the color has become manifest. *Kenmare, Rose of Tralee* and *Dunloe* from *White Sentinel* selfed are illustrations.

This premise holds true, particularly, with selfed white off-spring from pink parents—my own finest pink being derived from the selfing of a fine white Leedsii without the faintest vestige of color, but the progeny of two pinks. I have discussed this with other hybridizers on a number of occasions and have, I believe, convinced them not to discard any whites of good form from known pink parentage. These should

be selfed or interbred back to either of the parents, preferably the pollen parent.

With the pink genes established or fixed as dominant, size, form and length of stem can, I believe, then best be obtained through crossing with the better whites of an established strain. In them, through years of breeding, absence of color has been obtained and has become fixed. Crossing these pure whites with pinks we restore a desired color.

My own experiments are unique, in that I had no known or available pinks to work with and that neither *Lord Kitchner* nor *Beacon*

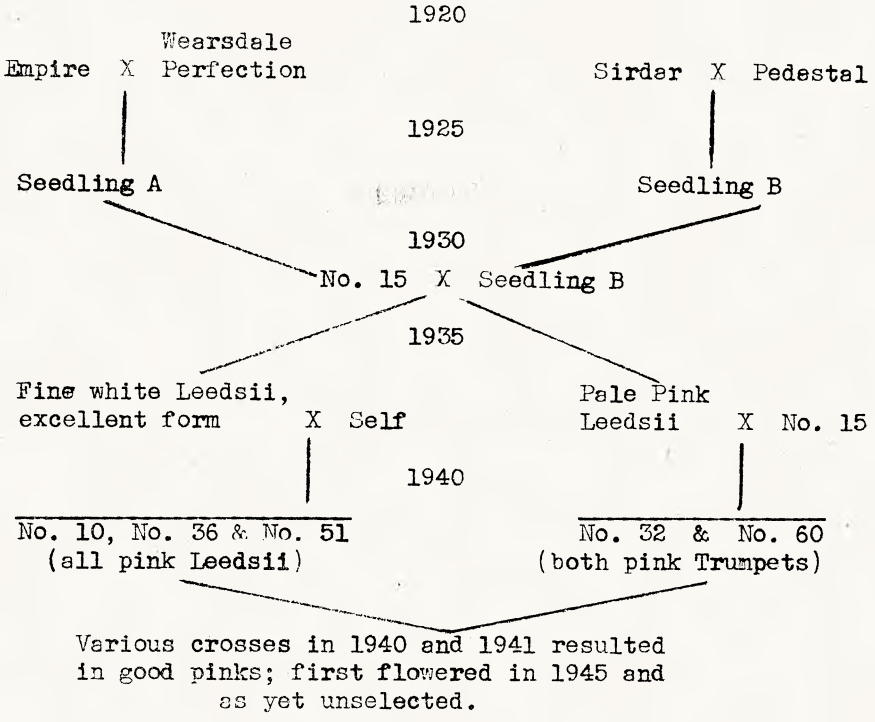


Fig. 146. Crosses resulting in pink *Narcissus*.

was utilized. Starting twenty-five years or so ago with random pollenizing, a seedling from the old Leedsii *Empire* x *Weardale Perfection* showed some illusive flush of pink in an amber-buff or fawn-colored trumpet. Another cross, *Sirdar* x *Pedestal* made with deliberate speculation because of the fact that an English catalog described *Pedestal* as having a red edge or rim—no color ever developed in mine, beyond an almost imaginary flush which definitely was not red—produced another Leedsii inferior but similar to *Fanny Curry*. Now decidedly intrigued, I made reciprocal crosses between these two seedlings, the two

proving fertile both as to pollen and seed parents. The result was a series of Leedsiis; one or two with a very pale pink trumpet; one an amber or coppery pink, similar to *Mrs. R. O. Backhouse* and another a deeper pink but very short-stemmed and both with atrocious perianths; and three with pink-edged cups similar again to *Fanny Curry* but in my estimation superior as to color, size and form.

Again following my own theory, from this same series a white Leedsii of good form was selected and selfed as was one of the pink edged of the "Curry" types. From this white selfed came a truly lovely flower designated only as P-40-10. The perianth is good, the medium-sized trumpet opens with a clear, deep rose pink coloring and the length of stem, habit and form leave little to be desired. This seedling, which flowered for the first time in 1940, was used extensively by me in further hybridization (Fig. 146). In 1941 I crossed it with *Hera, Mitylene, White Sentinel, Sublime, Mystic* and several other varieties. In 1942 I crossed it with *Carnlough, Evening, Eskimo, Pinkeen, Silver Plane, Slemish* and with several of my own unnamed hybrids and again in 1943 and 1944 I obtained some nice quantities of seed from various parents. The future will tell whether my preliminary conclusions will be substantiated by the results from these crosses.

NEW DAFFODILS

Frank Reinelt, *California*

It is very seldom that daffodils freshly imported from abroad show up well the first season after having been hot-water treated on the way, but some seem to be an exception to the rule. *Polindra* which I have been importing for several years is perhaps the best example as it gives beautiful flowers the first season. This year (1944) several new varieties did so well that I am passing judgement on their maiden blooms without fear that I shall have to eat my words later.

Among the yellow trumpets *Kingscourt,* raised by Mr. J. L. Richardson, sets a new high water-mark, and is easily the finest of its class that I have so far seen. Bred from *Royalis* x *Crocus,* it has inherited the best qualities of both. *Royalist,* even today, is one of the best show flowers of beautiful quality. *Crocus,* again, is one of the largest flowers of deepest gold with very wide perianth. Both are comparatively short stemmed under our conditions. *Kingscourt* is a shade taller than its parents and very vigorous with a strong stem and short neck. The flower is not as large as *Crocus* nor as deep a gold, but it is the largest and deepest flower of a really first class quality. The yellow trumpets lack, on an average, a sufficient breadth of perianth along with substance. *Kingscourt* fills the need, especially for breeding purposes.

Mr. Richardson's yellow flowers with red cups seem to be dominating the field of novelties. *Hong Kong,* bred from *Fortune* x *Penquite,* is a very promising advance. Its tall short-necked large yellow flower with an orange-red cup interests me greatly and is perhaps the best yellow and red seedling bred from *Fortune* so far.

Narvik combines the heavy substance of *Carbineer* with the highly colored cup of *Porthilly*. Tall, short-necked, its flowers are not very large, but of beautiful form and first-class quality, making it perhaps the best yellow-red flower yet introduced. I think it will have excellent possibilities as a show, garden, and cut flower, much superceding *Porthilly,* which lacks sufficient substance.

Another promising variety in this class is *Royal Mail,* with a strong color contrast of the frilled red cup against a light yellow perianth. This is quite a large flower, very smooth, of beautiful form, carried on tall stems.

Among the white flowers with red cups, those having snow-white perianths combined with good form and quality, are very few. *Limerick,* which I have grown now for three years, is excellent. Bred from *Folly* x *Hades,* it has an even deeper cherry-red cup than *Hades* itself. It also holds its color well. Even after the petals have dried up, the cup still remains red. *Lady Kesteven* is another snow-white flower of rather variable form. Unfortunately the red color in the cup burns very quickly in the sun. *Matapan,* bred from *Coronach* x *Forfar,* is a medium sized flower on a tall stem flowering earlier than the others of its class and is a welcome addition for breeding.

Two other flowers not new, but still scarce, which I value highly for breeding, are the Poet *Sea Green,* and the short-crowned Leedsii *Dreamlight.* Both have fine snow-white perianths of round form, very flat, carried on fairly tall stems with good necks. *Dreamlight* with a rim of salmon-orange and greenish center of the cup, is one of the most delightful things and perhaps the most perfect of the series introduced by Mr. Guy Wilson. *Sea Green,* which opens last, is tall and of perfect form and also has the greenest center of all.

My impression of *Green Island* as a new advance for breeding mounted, when it bloomed, as it kept expanding. Bred from *Gracious* x *Seraglio,* it is one of those milestone flowers opening entirely new possibilities for the development of large Barrii, "Incomps" and Leedsii. It is a very large flower with a perfectly symmetrical perianth of such a breadth that it almost forms a circle. The very large corona is flat, a porcelain white with chrome yellow edge, and has a greenish center. It has a good long stem and short neck and seems quite vigorous. As a flower, itself, it is perhaps too large and too stiff to be graceful, excepting for show purposes, but for breeding, it certainly is the answer to the breeder's prayer. Good perianths are hard to get. When one comes with such width, substance, and quality as *Green Island* has, it gives the breeder something with which to work.

Guy Wilson mentions in one of his letters having flowered seedlings from *White Sentinel* x *Green Island* with unusual salmon colored cups. Since *Gracious* is known to give pink in its seedlings, I believe we can get beautiful new shades of color from *Green Island,* especially by mating it to short-crowned Leedsii, Poets, and Barrii, besides bringing larger size with better substance in those classes.

The Leedsii with pink or coppery-pink cups are the most recent developments, and the Australian breeders are leading the parade.

Dawnglow is a very large flower of trumpet proportions, bred from *Rosary* x *Pink-O-Dawn*. It is comparatively short stemmed, of nice form with a good cream-white perianth and a deep coppery-pink trumpet. This is the largest of the pinks I have seen and quite promising for breeding.

Among the white flowers, there are several promising novelties. *Broughshane* has not bloomed for me yet. *Cameronian* after two years of sulking, produced magnificent blooms this year. It is quite white both in perianth and trumpet, very large and of beautiful form and has sufficient stem.

The majority of the earlier White Trumpets have too short stems under California conditions, so *White House* is a welcome addition. Bred from *Nissa* x *Tenedos*, it inherited earliness and a tall stem besides being a large fine flower of good form. It does not seem to be appreciated in England, but is very much recommended in Australia and California, both climates being warm which seem to suit it well.

Zero is the whitest Leedsii of the large type I have bloomed so far and undoubtedly will have a great influence on further development of whiter flowers. It is one of the earliest to bloom, is very large and of good form. It lacks only a taller stem and more refinement to be perfect.

THE GREATEST GARDEN THRILL: SUGGESTIONS TO THE AMATEUR BREEDER

J. Marion Shull, *Maryland*

There is no greater garden thrill than comes with the first sight of a new bloom for which you have assumed complete responsibility as to its origin, have predetermined its ancestral background, particularly if the newborn is genuinely fair and full of promise. And there is no reason why you, the Average Gardener, should not enjoy this thrill. You do not have to be a geneticist, nor the possessor of a University degree to attest that you know all the rules that apply and all the many exceptions to the rules as applied to the multitude of species that inhabit the earth, to carry on respectably and enjoy this keenest of all garden satisfactions. Of course, the more you know of the underlying principles the keener will be your pleasure; but there is no hocus-pocus, no deep dark mystery or secrets reserved exclusively for the 33rd Degree initiates, involved in the primary problems of plant breeding.

The Amateur may well ask for a definition of plant breeding. Is it merely the growing of plants from seed? By no means. True, many a highly prized variety that graces our gardens today has been derived in just that way—its parents, its grandparents, completely unknown. Its survival is due to selection and preservation because of its desirable qualities—but this is not breeding in any proper sense of the word. To merit the name of breeding there must be the conscious bringing together of specific parents, preferably of known ancestral strains, an act usually based upon the idea of uniting in the resulting offspring desirable qualities from both parents.

The basic mechanism that makes such a combination possible is of course the pollen grain or male element and the egg-cell or ovule, the female counterpart. Since these primordial cells carry only half the necessary makings for a complete individual it should be obvious that a single male cell (pollen grain) must unite with one female cell (ovule) to jointly provide the growth material and potentialities required to develop into a seed. The seed in turn will germinate and grow ultimately into a new plant, but it is essential to understanding to bear in mind that throughout its existence it has half of its being derived from one parent and half from the other with all the hereditary possibilities that implies.

In Nature, bees or other insects do most of the carrying and depositing of pollen from anthers to stigmas and as the insect visits many flowers the load of pollen becomes very much mixed, may represent the product of dozens of different males, but only one pollen grain is ever involved in the fertilization of any egg cell so that quite possibly no two seeds in a full pod are derived from the same father. All plants arising from this pod may be only half-sisters at best, the male parent being totally unknown.

But by choosing your source of pollen and placing it upon visibly clean stigmas of the chosen seed-bearing plant you have performed the first act of deliberate plant breeding. The resulting seed is a combination for which you are entirely responsible. You have intervened, have joined with the forces of nature in setting up a reaction that may eventuate in a wonderful new "creation" for which you are entitled to claim at least some credit. Or on the other hand it may turn out a monstrosity for which you must accept part of the blame. It is always something of a gamble with sometimes joy and sometimes disappointment as the payoff. But in any case you still possess the power to destroy or to preserve as you see fit.

The idea that there is something occult and mysterious in the production of new varieties, some great and rare gift of knowledge and foresight that the plant breeder must be possessed of, has sometimes been fostered by practitioners of the art. The way to fine progeny is to use nothing but outstanding quality in the ancestral lines. It is true that a poor cow may have a good calf, or a good cow have a poor one, but the cattle breeder who depended on these probabilities as his main stand-by would quickly go broke.

Whether you wish to breed new *Hemerocallis, Iris,* or any other flower that appeals to you, choose good ancestry not only for the immediate generation but for as many generations back as may be possible, and unless you have unlimited time, space and human energy, keep clear of the shot-gun method with the bees as your chief assistants. Select your breeding stock with the utmost consideration, and if you desire a wide variation in the offspring, select for parents individuals with very divergent characters in color, form, etc. but always of the best in their class.

One final word. Remember that every fond parent tends to be but a poor judge of his own flock. Allow several years of observation for even the most promising child before launching it officially into the horticultural world. It may be a winner, but in any case you will have had your thrill of seeing a new life come into existence.

DAYLILY BREEDING AS A HOBBY

Mr. and Mrs. Eugene A. Taylor, *Massachusetts*

In the fall of 1927, my wife and I decided to purchase a permanent home in the country, where we could live the year around, instead of moving to the country each spring and back to the city again in the fall as we had been doing. We found a little, old farmhouse with a barn and four acres of land in a small, eastern Massachusetts town. The house, over one hundred years old and shaded by large elm, ash and maple trees, was within ten minutes walk of the stories and the post office. *Hemerocallis fulva* and *flava* grew all over the place by the thousands. It was not until nearly ten years later, however, that we read an interesting article about daylilies in a garden magazine. This gave us the idea to begin hybridizing.

Most of our early crossings produced only yellow and orange lilies, but a crossing of *Mikado* with one of our own deep orange seedlings gave us, at least, two seedlings in a good red self, almost exactly alike, except in size. This was really the beginning of our career as amateur hybridizers. We then collected a number of new outstanding varieties from some leading producers. In July of 1942, we transplanted from our seed bed to permanent positions, about 3500 seedlings. We have raised about the same number each year since then. Now we have many colored seedlings on trial that hold great promise for the near future.

Our experience, here, in this locality has been that seeds planted in October and transplanted to permanent beds the following July, will, if lightly mulched after the ground freezes, give a good percentage of bloom the following summer.

We have had some trouble with thrips, but we have been able to control them quite well with rotenone dust, applied after the dew has fallen.

From the beginning, we decided to breed for strong, well-branched plants, as we believe that these are one of the most important features in successful daylily breeding.

THE CHARACTER AND GENETICS OF DOUBLENESS IN THE FLOWERS OF DAYLILIES: THE PARA-DOUBLE CLASS

A. B. Stout,
New York Botanical Garden

Features of Doubleness: Types of Flowers; Classes of Individuals and Clones.

The fundamental features in the doubleness of flowers of daylilies are (a) petalody of stamens, (b) reduplication or multiplication in the number of whorls of petals and petaloid stamens, (c) abortion of stamens and (d) either complete abortion of pistils or their reduction and sterilization.

Types of flowers. In respect to the extent to which one or more of these features may be developed, the individual flowers of daylilies may be recognized and designated as follows:—

1. *Super-double.* Having no functional stamens or pistils; usually with completely sterile petaloid stamens and duplication of petals or of petaloid stamens. Such a flower is fully sterile.

2. *Para-double.* Having at least some well-formed stamens or petaloids with some traces of anthers. Usually there is duplication of petals or petaloid stamens. There is abortion or sterilization of the pistil. Such a flower is sterile as a seed parent.

3. *Semi-double.* Having only petalody of some stamens or occasionally of all stamens. Usually the pistil is normal. Nearly all flowers of this class are potentially fertile in respect to some stamens and the pistil.

4. *Pseudo-double.* Occasionally some flowers of daylilies have more than the normal number of parts within each whorl in the flower. When such a flower has four petals there are usually also four sepals, four stamens in each of the two whorls and four carpels in the pistil. There is further increase in the number of parts until it is obvious that there is fusion and fasciation involving two somewhat distinct flowers. In such flowers there are apparently sporadic and incidental irregularities in development and growth that are of doubtful or incomplete genetic value.

Classes of individuals or clones. No entire plant or group of ramets of a clone of the daylilies now known is to be classed as super-double, for in no case are *all* of the flowers super-double. The para-double class at the present time consists of only two cultivated clones. These have few super-double flowers, numerous para-double but no semi-double flowers (to the author's present knowledge), and no normal single flowers. The semi-double class is known to the writer only in seedlings which have been grown at The New York Botanical Garden. The first of these appears to be spontaneous mutations.

It should be noted that in no case is petalody of stamens complete in all the stamens of all the flowers produced by either of the two clones of

para-double daylilies, or by any one of the seedlings thus far obtained of the semi-double class.

This present paper will deal only with the para-double class of daylilies. It is the plan to report later on the semi-double class.

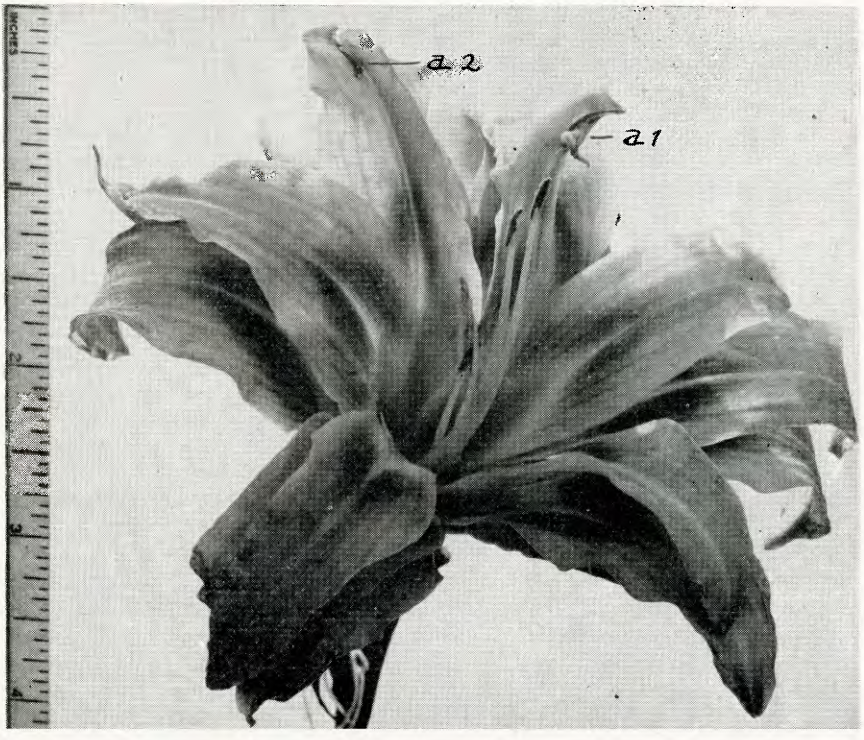


Figure 147. Flower of the **Flore Pleno** Daylily. There are 13 petals and two petaloids which have traces of anthers (at a-1 and a-2). One petaloid is a half-stamen (a-1). The 15 petals and petaloids together with the three sepals are in six whorls of three each and they are in six ranks of three each. Thus each sepal has two petals directly above it and each of the primary petals has two petals or petaloids above it. There are five well-formed stamens of different lengths, but no trace of a pistil and no rudimentary, aborted, and sterile stamens.

The Two Para-double Clones in Cultivation

History and Identity. In 1860 and 1864 two fulvous daylilies which are to be classed as para-double were described of living plants that had been introduced into cultivation in England. In the early descriptions (see discussion by Stout *6, 8)* these two clones of horticultural daylilies were assigned to different species but it is now evident that both are closely related to the *Europa* Daylily which is the Linnaean type of the species *Hemerocallis fulva* and that the most satisfactory names for them are *Hemorcallis fulva* clone *Flore Pleno* and *H. fulva* clone *Variegated Kwanso.*

In the foliage of plants of the *Variegated Kwanso* there is a chimeral association of green cells and white cells and in the formation of vegetative buds there are frequent segregations of green cells which form branches that continue as a *Green Kwanso.* But the flowers of the *Variegated Kwanso* and the derived *Green Kwanso* are alike in character and hence the flowers of the two clones may collectively be discussed under the name *Kwanso.*

There has been confusion, especially in horticultural literature of daylilies, in the application of the names *Flore Pleno* and *Kwanso.* The flowers of both are to be classed as para-double, but there are distinctive though rather minor differences readily to be recognized in the degree to which the features of doubleness are developed (see figures 1 and 2) and in the range of the variations in the flowers of each clone. Also the new leaves of ramets of *Flore Pleno* appear somewhat earlier in spring than do the leaves of *Kwanso* and they are more bluish green in color. Both clones are triploid (3n=33) as is the *Europa Daylily(7).* Of the entire genus *Hemerocallis,* including wild species, horticultural clones, and seedlings known at the present time, the clones *Flore Pleno* and *Kwanso (Green* and *Variegated)* are the only ones that have predominately para-double flowers, few super-double flowers and no normal flowers.

Petalody of stamens is recognized as the most fundamental and characteristic feature in many cases of doubleness in flowers. In the para-double daylilies there are various degrees in the expression of petalody. The colorful, bladed, petaloid structures are usually placed between a whorl of petals which is in the position of the petals of a normal flower (see Figures 147 and 148) and the stamens that may be present but frequently the two are somewhat intermingled. As a rule, at least some of the petaloid stamens are bladed structures that bear some traces of anthers or pollen sacs. The transition from rather normal stamens to fully sterile, colorful, normal petals is somewhat continuous but may be discontinuous.

In referring to these *petaloid stamens* of daylilies the term *petaloid* may be applied as a substantive with the understanding that here the petaloids are all modified stamens and not carpels. The term staminode is scarcely applicable to them for it refers to a sterile and aborted stamen of the type often seen as a rather constant feature in flowers that exhibit no petalody.

In daylilies the petalody of stamens involves variations in the number of petal-blades, petal-wings, or lamellae that are of special interest and significance.

(a) There are what may be called half-petals or uni-lamellate petals one side of which is a well-formed petal-wing while the other side is a half-stamen (see 4 in figure 149).

(b) There are grades of petalody that appear quite like normal petals except that there may be portions of anther sacs near the apex and often on or near the midrib (see 2 in figure 149). It may be considered that in these there is a lamella or wing on each side of the midrib. As in normal petals there is a very uniform dorsiventral differentiation

in the coloration. In respect to further developments in petaloids these two wings may be called primary wings.

(c) A tri-lamellate petaloid is produced when there is another wing in addition to two primary ones.

(d) The development of two secondary and two primary wings forms a four-bladed petaloid (see 3 in Figure 149).

These secondary lamellae unite with the primary ones along a common midrib. Each secondary lamella has *only one side* that is strongly colored like the face of a normal petal and its other side is like the back of a petal. When there are two secondary wings the colored side of each meets, and is continuous with, the strongly colored face of the primary lamella that is adjacent. The secondary lamellae are usually much less in width than are the primary lamellae.

The bilateral symmetry and the relations and developments of the parts of a quadri-lamellate petaloid very definitely suggest that the structural elements correspond to those of the sterile tissues of the outer walls of an anther. The strongly colored surfaces of the petaloid correspond to the zone where sporogenous tissue meets the sterile tissue in an anther.

In many of these petaloids the three or the four lamellae extend from the very base to, or almost to, the apex and there is no evidence of a basal section that can be called a remnant of a stamen filament (see 3 in figure 149). But in a half-petaloid one side of the structure is like a filament of a stamen in appearance and it usually terminates in a portion of an anther (see 4 in figure 149).

Wing-like processes in petaloid stamens have been described by Masters *(5)* in the flowers of species of *Rhodedendron, Azalea, Crocus* and *Viola.* Masters recognized that the relations and developments of the four-winged petaloid very definitely suggest that the structural elements correspond to those of the sterile tissues of an anther and that "the two wings on each side of the central vascular cord represent the front and back walls of another lobe" (*5,* p. 289). Masters illustrates *(5,* fig. 155) petaloids of *Rhodedendron* in which the four wings are at the base above which there is a rather normal filament and two pollen-sacs or "quarter-anthers." It seems that little attention has been given to the presence of wing-petaloids in most recent studies of doubleness. But evidently there are other types which involve "proliferations" of petals and stamens.

Reduplication or multiplication of petals, of petaloids or of stamens, or of all three is a feature characteristic of the para-double flowers of daylilies. This is especially evident when there are more than six stamens (figure 148), or more than six stamens and petaloids, and when the total of petals, petaloids, and stamens is more than nine. In the flowers of both para-doubles and semi-doubles the first whorl of three sepals and the next whorl of three petals are, as a rule, normal in number and character. The reduplications occur above the whorl of primary petals and are on a somewhat extended central axis (see figures 147 and 148) formed in the region below the position of the ovary.

Abortions of stamens and petaloids. There are often some stamens that are fully normal in the size and the appearance of both filament and anther. But in flowers of the para-double class there are also graduations to structures that are of small size and that are composed of sterile tissue only. Some of these retain the form of stamens. Others are somewhat bladed. These occur especially toward the apex of the central axis and are often above the fully formed stamens that may be present.

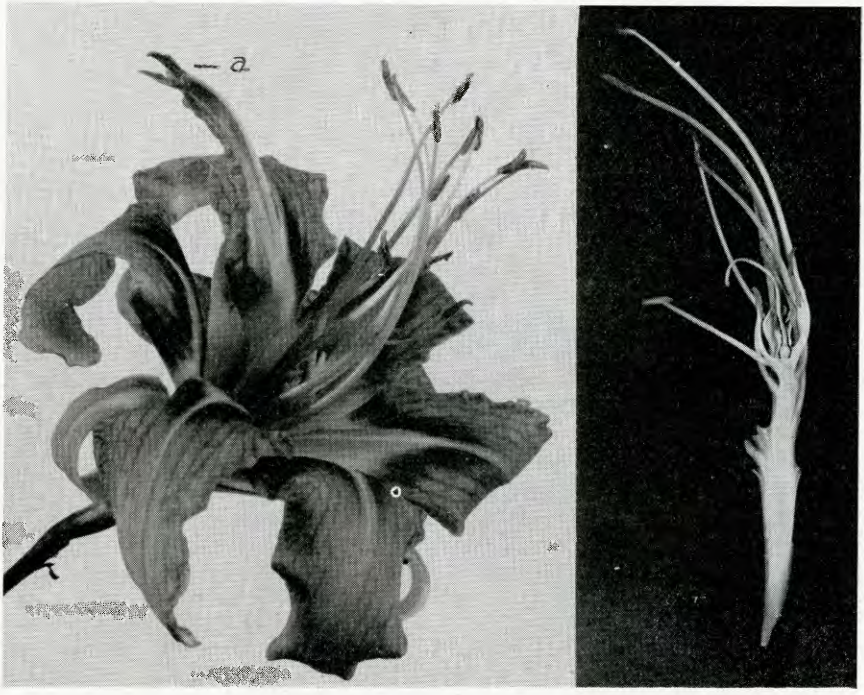


Figure 148. At left: flower of the **Kwanso** Daylily. There are nine well-formed petals, one half-petaloid (a), 13 stamens and a much-reduced pistil not visible in the photo.

At the right: the central column of a flower with sepals and petals removed. There are thirteen stamens of various lengths; the pistil is reduced to a single carpel with slender twisted style and a small ovary.

Individual super-double flowers, that are fully sterile and which have no stamens and no traces of anther sacs on the petaloids are occasionally present among the numerous flowers of the *Flore Pleno* clone. But at the present time no individual plant of *Hemerocallis* can be classed as super-double. This condition of complete sterility, called "petalomany" by De Vries *(2)*, is characteristic of the flowers of individual plants of certain other genera.

Abortion and malformation of the pistil. In no flower of either the *Flore Pleno* clone or of the *Kwanso* clone has a normal pistil been observed. In the extreme abortions, characteristic in flowers of *Flore*

Pleno, there is to the eye no trace of a pistil and often the last structure visible is definitely a rudementary stamen. Yet it may be that in some flowers, especially of *Kwanso,* there is some petalody of the carpels of a pistil and even also reduplications of them which, however, are of relatively small size.

In some flowers of the *Kwanso Daylily* the pistil may be present but it is much reduced in size and often it is more or less separated into slender styles (see figure 148). One or more of the carpels may be fully separated to the base of the ovary in which case the basal portion is greatly reduced in size in comparison with a normal ovary.

No seeds have been produced in any of the many flowers that have been observed on ramets of *Flore Pleno* and *Kwanso,* and no seeds or even enlargements of the base of the pistil have been obtained when hand pollinations have been made.

A comparison of the flowers of the two clones, Flora Pleno and *Kwanso.* The flowers of the *Flore Pleno Daylily* (see figure 147) in comparison with those of *Kwanso* (figure 148) have a greater number of well-formed petals, the number of stamens and aborted stamens per flower is less, and the pistil is more frequently fully aborted or not in evidence. The central column of the flower is shorter and the flower is more compact. The number of fully formed petals in flowers of *Flore Pleno* usually ranges from 8 to 14 and the number of well-formed stamens usually ranges from 6 to 0.

The flowers of the *Kwanso* type (figure 148) show wide variation in the relative numbers of petals and stamens. Frequently the only well-formed petals are those of the primary or first whorl in which case the number of poorly developed petaloids and normal and abortive stamens is high. Decrease in the number of bladed petaloids is accompanied by increase in the number of stamens (see figure 148). Often in the flowers of *Kwanso* the petals and petaloids are much twisted and curled.

Data on the Genetics of Para-doubleness

Breeding results. Some of the pollen produced by the triploid female-sterile clones *Flore Pleno* and *Kranso* is viable which is also true of the triploid *Europa* Clone *(1).* Beginning in 1925 and continuing to date * numerous cross-pollinations have been made using the pollen of these clones on pistils of single-flowered plants (a) of several species, (b) of other members of the *H. fulva* group including triploids, (c) of seedlings of the semi-double class and (d) of selection hybrids that would contribute new coloring to any para-doubles that might appear. Many of these cross-combinations did not yield seeds; many of the seedlings obtained were weak and either died or did not flower.

In a first generation of *Flore Pleno* as a pollen parent there were 14 different progenies of which 120 plants flowered. Of the Kwanso parentage there were 11 progenies of which 71 flowered. Every one of

* During July of 1936 and 1937 some of these pollinations were made by Professor John V. Watkins under scholarship grants.

these seedlings had flowers in which there was no trace of any of the features of para- or semi-doubleness.

Pollinations were made which involved single-flowered triploids as the female parent (3n single x 3n para-double). Most of these did not yield seeds, but 21 seeds were obtained from which five seedlings were flowered. All of these were single-flowered; two were triploids of very weak constitution. There were no tetraploids.

A report has been made (Stout, *7)* regarding the chromosome complement in various of the seedlings which have *Flore Pleno*, *Kwanso* and the *Europa* clones in their parentage. These studies indicate that the majority of such seedlings are diploid (2n-22), some are aneuploid, some have mixiploidy and a few are triploids. The chromosome numbers of various plants that were weak and which soon died were not determined.

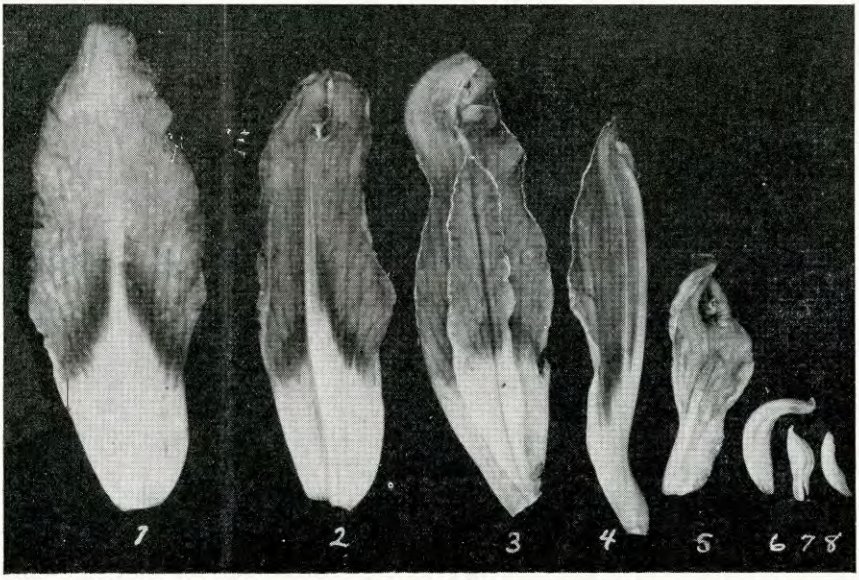


Figure 149. Several gradations of petals and petaloids from flowers of the **Kwanso** Daylily. From left to right; a primary petal, a two-bladed petaloid, a four-bladed petaloid, a one-bladed or half-petaloid, a petaloid of reduced size but with two blades, and 3 much reduced and almost colorless petaloids which show no trace of anther sacs.

For F_2 and later generations. Certain first generation plants noted above were used (a) in self-pollinations, (b) in intra- and cross-pollinations and also (c) in back cross-pollinations with *Flore Pleno* and *Kwanso.* Some lines of this breeding have been continued into a fourth generation.

Of the progenies of parentage derived exclusively from first generation seedlings of either *Flore Pleno* or *Kwanso* parentage there were 53 series of seedlings and a total of 465 plants. Of these seedlings only *one* has had any feature of doubleness and of its flowers only a few have had either one or two (and no more) petaloid stamens. But there was no reduplication of either petals or stamens and the pistils were normal and hence these flowers were definitely of the semi-double class rather than of the para-double class.

Some of the best of the first generation and also of later generations of the single-flowered seedlings of these generations were used in certain lines of selective breeding in which the other parents had no para-doubleness. In none of the offspring has there been any features of doubleness.

The matter of somatic segregation. No somatic segregation for different degrees of doubleness has been observed in the propagation of any ramet of either the *Flore Pleno* or the *Kwanso* clones. There is considerable fluctuating variation among the para-double flowers of the *Kwanso* type in respect to the number of well-formed petals and stamens. There is less variation among flowers of *Flore Pleno.* But in no flower of these two clones has the variation given a perfect flower with three sepals, three petals, six stamens and a normal pistil. But in no instance in any ramet of the para-doubles has there been bud sporting or somatic segregation that results in branches which continue as subclones whose flowers are noticeably different in the type of doubleness or in the range of variation of any aspect or degree of doubleness.

Reports have been received by the writer, in letters and verbal reports, from persons who stated that they had observed double flowered fulvous daylilies among daylilies where there had previously been only single-flowered plants. All such plants of which the writer has seen flowers proved to be either *Flore Pleno* or *Kwanso,* and in all cases that could be traced to immediate sources the plants were propagations of these clones.

In a few cases persons have stated that they believed that double-flowered daylilies had arisen as seedlings, but in only one case was further information given. This correspondent stated that (a) seed of daylilies were obtained from a nursery, (b) that four seedlings were grown for a time in a window box and then planted in the garden of a relative, and (c) that a few years later all four produced double flowers. A division of each was obtained and grown at The New York Botanical Garden. The flowers produced by all four of these ramets are identical to those of the *Kwanso clone* in color and character of doubleness, and these plants are also like those of the *Kwanso* clone in time of flowering and habits of growth.

The writer has been expecting that some reports or inquiries would be received which refer to seedlings of the semi-double class like those that have appeared among seedlings grown at The New York Botanical Garden. No doubt such seedlings have also appeared elsewhere. Thus far the reports of "new doubles" that have come to the writer have been

concerned only with para-doubles and the evidence is that these are merely one or the other of the old clones *Flore Pleno* and *Kwanso*.

Further Breeding for Doubleness in Daylilies

Certain lines of further breeding for para-doubleness in daylilies may be suggested for those who may wish to attempt such breeding.

(1) A large number of both F_1 and F_2 progenies of the single x para-double combination would increase the chances for the segregation and recombination of all the genes that may be necessary for the expression of doubleness, or of one or more of its features.

(2) Special attention can be given to the breeding of triploids of the F_1 in which there are, presumably, two genomes from the para-double parent. In the inter-breeding of these triploids there is possibility of increasing the proportion of chromosomes of para-double origin in both 2n and 3n seedlings and perhaps also in any 4n seedlings that may arise.

Thus far the writer has grown to flowering age only four seedlings which had both parents triploid. All were single-flowered; three were diploid; one was triploid and of very weak growth.

It may be possible to continue the three genomes of chromosomes present in *Flore Pleno* and *Kwanso* with their complete determination of doubleness provided functional spores are sometimes formed without reduction. Counts of the distribution of all chromosomes in all four microspores formed from each of 15 pollen-mother-cells of the triploid Europa gave numbers ranging from 10 to 21 (Chandler, *1*, Table 5). The highest number of chromosomes in seedlings which has one parent or both parents triploid was 33 or 3n (Stout, 7).

There is at present no evidence that viable 3n pollen grains are formed by triploid daylilies or are functional if occasionally produced. In the triploid bananas it is reported (Dodds, *3)* that functional 3n gametes are formed only in ovules and not in pollen. Should such a special condition operate in the para-doubles of daylilies 3n pollen grains would not be formed.

Discussion and Conclusion

The para-double type of doubleness occurs infrequently in *Hemerocallis*, for it is known in only two clones of this genus, the *Flore Pleno* and the *Kwanso Daylilies*. Both are triploid ($3n=33$) and both are closely related to the triploid single-flowered clone *Europa*. The clones *Flore Pleno* and *Kwanso* differ somewhat in the degrees to which the main features of (a) petalody, (b) multiplication of parts, and (c) abortion of stamens and pistils are expressed in their flowers. Hence it must be assumed that there are some differences in the genetic constitution of these two clones. Either of these clones may have arisen from the other by somatic mutation; there may have been the independent origin of each; the present condition of para-doubleness may have involved more than one mutation and an accumulation of modifying factors necessary for the different features of para-doubleness.

The para-double character exhibits considerable somatic variation, but the ranges of variation are remarkably constant over a period of years in the ramets of each clone, for in no flower has a functional pistil been observed, and a normal single-flower has not been found. There is no evidence of somatic segregation for the variations in the degrees of doubleness in either of these clones. The genetic constitution of each clone has continued, as has that of the single-flowered *Europa* clone, throughout long-continued and numerous propagations and wide geographic distribution without any definitely known further effective somatic mutations and segregation.

Hereditary values of para-doubleness in Hemerocallis. The rather large number of seedlings of the F_1 obtained of *single* x *para-double* all had single flowers only. Also in the F_2 progenies that were grown there were no para-double flowers. If any feature of the doubleness is determined in these plants by a single genetic factor such a factor must be recessive. If this is the case then the *Flore Pleno* and the *Kwanso* clones should be homozygous for this factor. But the results thus far obtained in F_2 and later generations indicate that there were no recombinations which were effective in the transmission and expression of any one feature of para-doubleness. This suggests that there is either (a) polygenic and heteroallelic determination with complexity of modifying interactions, or (b) the elimination in sporogenesis or in embryo abortion of one or more factors essential for the transmission of doubleness.

There were two seedlings in the F_1 progeny of the para-doubles which were triploids. Presumably each of these had two genomes from the triploid para-double parent. Both seedlings had only single-flowers, hence it would seem that two of the three genomes in the para-double plants are not always sufficient to provide transmission and expression of any feature of the doubleness, at least when there is also present a genome of a single-flowered plant.

The genetical status of petalody in daylilies. It may here be stated that in the semi-double type of flower petalody of stamens exists independently of any other feature of para-doubleness, but these cases of petalody evidently first arose as independent mutations and not as segregates in the progeny of para-doubles.

No attempt is here made to present or discuss the evidence bearing on the role of petalody in the evolution of flowers or on the available data on the genetics of doubleness in genera other than *Hemerocallis*. There are some relatively simple cases of heredity both for dominance and for recessiveness of the doubleness. But there are other cases of greater complexity, of incomplete and indefinite segregation, and also some cases of highly specialized heredity.

The results reported in this paper seem to indicate that it will not be an easy and simple procedure to obtain seedlings of *Hemerocallis* that bear para-double flowers either among the progeny or para-doubles or as new mutations.

BIBLIOGRAPHY

(1) Chandler, Clyde. 1940. Microsporogenesis in triploid and diploid plants of *Hemerocallis fulva*. Bulletin Torrey Bot. Club. *67:* 649-672.

(2) deVries, Hugo. 1912. Species and Varieties. Third Edition. Chicago.

(3) Dodds, K. S. 1943. The genetic system of banana varieties in relation to banana breeding. Empire Journal Exp. Agriculture. *11:* 89-98.

(4) Klein, Gustav and Pollauf, Gertrud. 1929. Der Michrochemische Nachweis der Alkaloide in der Pflanze. XII. Der Nachweis der Colchicims. Ostereichische Botanische Zeitschrift. *78:* 251-256.

(5) Masters, M. T. 1869. Vegetable Teratology. London.

(6) Stout, A. B. 1929. The Fulvous Daylilies—I. Journal N. Y. Botanical Garden. *30:* 129-136.

(7) —— 1932. Chromosome numbers in *Hemerocallis*. Cytologia. *3:* 250-259.

(8) —— 1934. Daylilies. The Macmillan Co., New York.

4. PHYSIOLOGY OF REPRODUCTION

HOT WATER TREATMENT FOR REJUVENATION OF AMARYLLIS BULBS

IDA LUYTEN

In my researches on vegetative propagation, I often had small hybrid *Amaryllis* (syn. *Hippeastrum*) bulbs (circumference less than 10 cm., and 10-16 cm.) which stayed behind the others. They did not increase in size although for the rest they seemed quite healthy. Mr. Th. M. Hoog, member of the firm C. G. van Tubergen, Jr., at Haarlem, advised me in 1927 to try a hot water treatment. As these bulbs were kept growing on in consequence of their small size, Mr. Hoog advised me to give them a bath at the end of December or the beginning of January. He also told me to cut off the roots after the treatment before repotting. This manipulation should further speedy rooting, while the presence of the old roots would give chances for rotting.

We chose 43½°C. for the hot water treatment, the same temperature that was used for combating eelworms in hyacinths and daffodils (van Slogteren 1920) :—

Bulbs with circum. less than 10 cm. were treated 2½ hours.
Bulbs with circum. from 10.1 to 16 cm. were treated 3 hours.
Bulbs with circum. more than 16 cm. were treated 3½ hours.

To keep the water constantly on 43½°C., we used our automatic mercury-regulator (for description see Versluys 1927 page 14) which was placed (hung) in the water of a zinc tank with its whole u-shaped part

as far as the screw. By means of this screw the regulator can be accurately adjusted to 43½°C; the regulator switches off and on the current for two round-shaped electric-stove elements, placed under the tank. The bulbs are brought into the water in small labelled sacks, using a basin tray with a bottom of gauze. This tray protects the sacks from sinking to the bottom of the tank which is heated directly and therefore has a much higher temperature. The gauze makes possible good circulation of water.

After this treatment the bulbs soon formed roots and leaves. After 1928 the hot water treatment was put into practice every year. We also treated larger bulbs measuring 16-18 cm. Encouraged by the favorable results we later also treated bulbs destined for forcing (circum. 18-20 cm.) or bulbs which were clearly decreasing in size. Depending on the time we started the storage treatments, the hot water treatments were given in the 2nd and 3rd week of September—in later years always in the first week.

The leaves were cut off but, it was not necessary to remove the roots of the larger bulbs. After the treatment the bulbs were planted at once, and the roots soon formed new laterals.

Some figures showing the effect of the treatments on bulb circumference are given below. It is known, that the hot water treatment has also a good influence on the growth of Hyacinths and Narcissus (van Slogteren 1931). It is interesting to note that *Amaryllis* bulbs with a relatively smaller bulb circumference flower after the hot water treatment:—No. 20, 78 and 25 have 2 flower-stalks (scapes) with a bulb-size of resp. of 17.0, 16.9 and 17.4 cm.

Table 1.

No.	circum. Sept. '35 cm.	number, flower scapes	circum. Sept. '36 cm.	number, flower scapes	circum. Sept. '37 cm.	number, flower scapes	circum. Sept. '38 cm.	number. flower scapes
20	19.4	0	17.0(W)	2	27.1	3		
23	21.7	0	19.0(W)	0	26.4	2	33.1	1
78	15.05	0	16.9(W)	2	22.4			
90			18.6(W)	2	27.5			
92	18.4	0	18.0(W)	0	30.9	2	38.15	2
	17.4	0	18.3(W)	0	22.15	1	28.2	1
125	15.3(W)	0	23.6	1	23.5	0	24.5	2
	17.9(W)	0	27.1	3	28.4	2	27.1	1
	18.7	0	18.0(W)		18.4(W)		27.2	2
25	15.3(W)	0	17.4(W)	2	22.1	1	28.85	1
	17.4(W)	0	16.5(W)		22.1	1	24.8	1

Table 1 shows that without hot water treatment several bulbs kept the same circumference for some years in succession (No. 78, 92, 125, 125) or decreased (No. 20, 23). After the treatment (indicated by W) they increased in thickness, often very rapidly (see for instance nos. 20, 90, 125). These bulbs maintain mostly a good circumference. Sometimes one has to repeat a treatment after several years. Also one hot water treatment may not be sufficient (25 and 125). If one repeats the treatment the following year, the bulbs will surely increase thereafter. Once

in a while it occurs that a bulb dies after the treatment. If this happens, it was always evident by cutting, that the bulb had been diseased. This was the cause of the decaying in growth; the hot water treatment made it worse and the death was the result. We can advise this hot water treatment with the utmost confidence. The cultivation of Amaryllis bulbs will be facilitated by it. It will also be possible to rejuvenate rare and expensive bulbs, that are declining, into good large flowering ones again.

November 1945 *Laboratorium voor Plantenphysiologisch, Onderzoek, Wageningen, Holland.*

LITERATURE CITED

Plantenziektenkundige Dienst 1941. Verslag over de werkzaamheden van den Plantenziektenkundige dienst te Wageningen in het jaar 1940.

Slogteren, E. van 1920. De bestrijding van de aaltjes-zeikten in Narcissen en Hyacinthen door middel van warm water. Weekblad voor Bloembollencult. 28 Mei en 1 Juni 1920.

Slogteren, E. van 1931. Warmwaterbehandeling van Narcissen en bolrot. Weekblad v. bloembollencult. J. 42, 1931.

Springer, J. 1937. Amaryllis nutrition problems—Herbertia 1937 p. 243.

Versluys, M. C. 1927. Aanleg en groei der wortels van Hyacinthus orientalis. Med. No. 25, van het Laboratorium voor Plantenphysiologisch Onderzoek te Wageningen en Verh. Kon. Akad. v. Wet. Afd. Nat. 2e Sect. Dl. 25, No. 4.

CHROMOSOME NUMBERS IN SOME SPECIES OF THE GENUS ALLIUM

A. G. ARARATIAN AND C. R. TONIAN
Institut Genetiki Bastenii, Akademii Nauk Armen. S. S. R., Erevan, Armenian S. S. R., U. S. S. R.

We have investigated nine species of the genus *Allium*. One of them, *A. vineale* L., has 2n=32 chromosomes. Seven species, *A. atroviolaceum* Boiss., *A. fuscoviolaceum* Fom., *A. Cepa* L., *A. callidictyon* C. A. M., *A. paniculatum* L., *A. Kunthianum* Vved., and *A. materculae* E. Bordz., have 2n=16 chromosomes. *A. pseudo-flavum* Vved. has 2n=18 chromosomes.

(The above summary is extracted from a Soviet journal, *Proc. Acad. Sci., Armenian S. S. R. (Erevan)* II. 141-143. 1945. —*W. T. Stearn)*

5. AMARYLLID CULTURE

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

AMARYLLIDS IN SAN ANTONIO, TEXAS

MARGARET FOSTER KANE, *Texas*

The soil and climate in this part of Texas are definitely on the side of the would-be grower of the *Amaryllidaceae*. The soil, although heavy clay in some sections and light leaf-mold in others, needs little additional fertilizer except where the needs of some special plant are indicated. The annual rainfall is 27.05 inches, the average minimum temperature is 57.2°F. and the average maximum temperature is 78.5°. The coldest weather ever recorded was 4°F. above zero in 1899, and the hottest was 107° in 1909. The rainfall is scattered throughout the year with the greatest part coming in the late fall and early spring when it is most needed. Although sudden cold or hot spells occur they rarely do any damage to amaryllids.

Narcissus flourish as they do all over Texas, the large bulbs as shipped by the growers split up it is true, but the flowers continue to come. They are not as large and magnificent in after years as at first but unless the gardener wants size alone they are quite satisfactory. *Lovenest* has been an attractive bloomer for three years and so has *John Evelyn* but the blooms are not large. They last well sometimes as long as eleven days per bloom if the weather is favorable. *Mrs. R. O. Blackhouse* has not proved permanent in some gardens but this may have been due to some fault in culture. The exceptions are made up for by the lovely drifts of *Early Virginia* daffodils and campernelle jonquils both increasing from year to year. Bulbs of all narcissus whether hybrids or species are left in the ground all year as exposure to the hot air would do more harm than good.

The paperwhites and their yellow relatives (Tazettas) sold for growing in water multiply rapidly and are among the first to bloom. The old fashioned double called "butter-and-eggs" is at its best in the moist, early spring weather typical of this section. They closely resemble a pale yellow rose.

Leucojum vernum is a favorite substitute for the difficult lily-of-the-valley, each bulb bears several spikes of flowers and blooms over a long period of time. It has proved its worth in many gardens.

Hybrid *Amaryllis* make a vivid spot of color in many a garden, being perfectly hardy out doors without special care. Seed is set freely and without special attention to pollination by hand. The hybrid *Johnsonii* is seen everywhere, it multiplies rapidly and never fails to bloom. The *Amaryllis* is very popular and will become more so when a wider range of color and variety is available from local distributors.

Not quite so easily grown is *Amaryllis belladonna* (syn. *Hippeastrum equestre)* but in one spot at least it is grown to perfection. Here

the soil is gravelly, drainage is perfect and no fertilizer has been used, other than bonemeal. It sets seed freely and offsets are abundant. In many situations with better soil it is a disappointment for it sulks and refuses to bloom.

Crinums grow and bloom well, the bulbs as a rule send up so much foliage that only the large garden can afford the space. *Cecil Houdyshel* is a favorite, also *Ellen Bosanquet*. Both of these are moderate in the foliage increase and generous with blossoms. The fact that *Ellen Bosanquet* flowers on a shorter stem with more open flowers is a good point with all who see it. The flowers of *C. Kirkii, J. C. Harvey, C. Powellii,* appear to the average spectator, out of proportion with reference to the amount of stem and foliage, and it is to be doubted that they will ever become popular garden subjects. Many other crinums flourish in San Antonio, at least half a dozen different ones going under the name of "Milk and Wine Lily."

Nerines refuse to flower more than one season and sometimes not even that, the fault being that the foliage is too tender even for this mild climate.

Lycoris however, are one of the finest of the fall-blooming bulbs. *L. radiata* blooms early in September, great clusters of coral beauty, perfectly hardy and permanent. In beds planted with white petunias and shielded from the hot afternoon sun they make a really beautiful picture. They bloom at a time when the gardens are at an "in-between" stage, other flowers have passed their peak bloom and the fall flowers have not yet begun. Fertilized with barnyard manure in liquid form while the leaves are growing they respond with two or three spikes of bloom from each bulb. *L. radiata* should be planted at least three inches deep and care taken not to disturb the bulb while dormant. Bulbs that are moved often refuse to bloom the first season. While offsets are freely produced, seed is unknown, at least not to mature.

L. aurea is not as well known but it will grow and bloom if slight protection is given the foliage either by covering when heavy frosts are expected or by planting it on the sheltered side of a building. The blossoms are larger than *L. radiata* and not borne in such a definite circle. The color is a most attractive yellow and a clump presents a definitely satisfactory picture. *L. squamigera* and *purpurea* bloom but do not give increase, other species are unknown here.

Brunsvigia rosea grows and puts out foliage but never a bloom. The bulbs are permanent but the foliage is winter-killed. The winter of '44-'45 having passed without a freeze killing the foliage may give this a chance to bloom but that is yet to be seen.

Hymenocallis galvestonensis grows and flowers in moist or dry soil, under trees or out in the open. The glossy leaves and spidery white flowers are worthy of consideration for garden culture although a well-grown subject takes as much room as a crinum.

Ismene is not satisfactory unless the bulbs are taken up each year. If left in the ground the bulbs split up and do not flower. The hybrid yellow *Sulphur Queen* may be more satisfactory but it has yet to be tried out.

Amaryllis advena known as the Ox-blood Lily flourishes and multiplies rapidly. Blooming in late August the flowers eke out a flower border where the sun has proven too much for all except the zinnias and marigolds. The bulbs should be planted in groups of not less than six, the flowers are small but colorful, especially when planted where the sun can shine through the blossoms. No amount of watering harms the dormant bulb and it may well be planted in the foreground of the mixed border for a splash of color in the late summer. The variety of *A. advena* that has pink flowers is just as hardy and satisfactory but needs planting in semi-shade to protect the delicate color. The leaves of either are a nuisance when gardening in the late spring so when nearing maturity they may be braided and tucked out of sight or folded over into a clump and tied with the leaves of nearby *Hemerocallis,* these leaves are tough and inconspicuous. The red does not set seed here but the pink will do so.

Zephyranthes are becoming better known garden subjects especially among Garden Club members. *Z. grandiflora* is in bloom after every rain beginning in May and continuing until December often blossoming on Christmas Day. The flowers open a deep rosy pink and fade gracefully over a period of several days. Blooms are large and borne freely, one bulb will sometimes bloom three times in succession and then rest to bloom again the following month. It is worthy of note that no matter how long the drouth no amount of hydrant water will force them to bloom. An effort has been made to have them bloom at will by withholding moisture and then freely watering. To no avail however, no blooms will appear until natural rainfall comes. When the rain comes the buds will appear as if by magic. The city-supplied water is very alkaline and full of minerals and it may be that it lacks the necessary stimulant to force flowers to appear.

The white crocus-like flowers of *Z, candida* appear during September. The bulbs multiply readily and set seed freely. The foliage does not remain in good condition under the summer sun but where grown in semi-shade it is more satisfactory. The flowers appear but once. More satisfactory if once established is *Z. atamasco* with much larger flowers. It has been grown here for but one season but appears to be prepared to grow and flourish.

Z. texanus is a native bulb, the flowers are yellow, with copper reverses and some varieties show purple veining in the flowers. Other native zephyr lilies are not particularly showy unless grown in sufficient mass. They often make a vivid showing after a late summer rain, being all the more welcome because nothing else is blooming in the vacant lots and outskirts of town. By far the most satisfactory of the yellow zephyranthes tried out thus far is *Z. citrina.* Blooms appear in August and continue until September is nearly gone. The color is a vivid yellow that positively sparkles, and the flowers are so numerous that a dozen bulbs will make a noticeable spot of color. No sooner has the first set of flowers faded than the second and third open, seed is set freely and germinates quickly. The zephyranthes have a real future here.

Allium Neopolitanum blooms in February providing pretty heads of loose white flowers good for cutting or in the garden. Its worst fault is

lack of stamina in the flower stem. Other *Alliums* flower later but are usually in the white varieties, the colored types are rarely grown.

The only alstroemeria that really establishes itself here is *A. pulchella,* more exotic than beautiful. It spreads both by seed and root, appears quite hardy. When shipping conditions are improved other species will be tried, at present it has proven impossible to get the roots intact through the mail.

Fig. 150. Flowers of Selina Foster Daylily.
Photo by Paul A. Kane.

Agapanthus grows well but flowers rarely. Occasionally one comes into bloom but they are not reliable as to bloom.

Chlidanthus fragrans is chary of flower, the bulbs persist but rarely flower after the first season. The bulbs split up so much it is likely that the flower has no chance to form.

Sprekelia formosissima gives one exquisite blossom to the bulb, beautiful enough to pay for its years use of the garden space. It never sets seed but has made offsets.

Cooperia pedunculata and *C. drummondii* are on their native sod, they bloom after every rain from early spring until frost. The flowers are white, tinged with pink as they age, and the fragrance is such that

these should be grown in every garden. In the fields the bulbs are sometimes more than fifteen inches underground.

About the most popular of the *Amaryllis* family are *Hemerocallis.* The gardeners of the vicinity are beginning to try out some that are but distantly related to *H. fulva* and *H. flava.* Even now visitors stop to ask the identity of *Vulcan* and marvel that it is a daylily. The long growing season gives many a daylily a chance to send up another set of bloom stalks. Even a newly set plant may do this. Beginning with *Gold Dust* and *Gracilis* in early February, the daylilies bloom the entire year ending with *Gold Dust* and *minor* repeating until after Christmas.

Among the favorites in this garden are *Mrs. A. H. Austin,* with very large golden flowers, and attractive *Serenade* with pastel shadings. Two-toned beauties such as *George Yeld, Boutonniere* come in for appreciation.

Vulcan, Theron, Indianola, and *Stampede,* are good reds for this section although all of them do best grown in partial shade to avoid baking out the color pigments. *Blazing Star* has good color but the form is indifferent.

The best yellows tried out so far have been *Dauntless, Modesty, Starlight* and *Patricia* with some local seedlings bearing real promise.

H. fulva rosea and the clone *Rosalind* while not yet established will be found satisfactory because the color and form are both good. It was discovered (though probably known elsewhere) that planting the pink daylilies near cream or very pale yellow flowers showed off the pink coloration to distinct advantage.

Calypso is the finest of the evening bloomers tried out, the blossoms keep open well into the next morning. Another that will bear watching is *Citron Bell* by Eddie Fanick, local iris grower and daylily breeder. George Allen and Harry French have other good seedlings.

It is certainly noticeable that the orange and fulvous colored daylilies are definitely not in favor in San Antonio and vicinity. However, there are fashions in flowers as in other articles and the pendulum will swing back again. Certainly a splash of tawny orange can do much for the fall garden. *Dawn Play, Chengtu Vesta, Bardeley, Margaret Perry* are definitely on the wrong side of the fence. Even some of the near reds go more orange, perhaps because of the sun. The good point of many yellows is that the fading caused by the sun is not unattractive.

Mikado is the most widely planted hybrid, with *Calypso, Ophir,* and *Hyperion* in that order as nearly as can be determined.

A bright red daylily that will keep its color under Texas sun would really be an achievement, and one that would do much to bring the daylily into every garden.

In Figure 150, flowers of the *Selina Foster* Daylily are shown. This is described under Registration of Daylily Clones in the present issue of Herbertia.

EXPERIENCES WITH AMARYLLIDS ON THE TEXAS PLAINS

Willie May Kell, *Texas*

It is easy to grow many amaryllids here in North Central Texas if one can spend the time and effort necessary to mature the bulbs properly by supplying moisture in those seasons when the rainfall does not come at the right time. The ones too tender to live through the winter are easily potted and cared for until danger of frost is over, for spring comes early and winter very late, making the time short for indoor care. Amaryllids are easy to care for by burying the pots containing them in the garden in the summer. The bulbs cultivated here are grown under conditions much less favorable than most locations in this community—a small city lot at the top of a clay hill, where the air drainage is extreme when a "blue norther hits." When a "pocket handerkerchief garden" has four large hackberry trees, fifteen pecan trees, two jujubes, several albizzias, other small flowering trees, a large Amur River privet hedge; not to mention clumps of bamboo, intersecting hedges of thirty year old crepe myrtle and pomegranate, as well as such shrubs as vitex which grow to tree size, the competition is quite keen as an old colored man expressed it. A florist, who has a greenhouse just a few blocks west of here, facing south, gives but little care and attention to his plants and yet they survive when the same varieties are frozen at this location. Our irrigation system has been ruined by many abandoned salt water wells which are another handicap at the present time. The annual rainfall for 1943 was 14.45 inches and very little of that came during the growing season and for 1944 it was 15.57 inches of which only 11.65 fell before the middle of September. There was a good fall season this year, and now the new year starts with a sufficient moisture content of the soil. And there is a promise of a new irrigation system free from salt before the year is out. Spring may bring a burst of bloom from many bulbs to repay all the time and effort spent on them.

My successes and failures with amaryllids on the north central Texas Plains are briefly summarized below.

ALSTROEMERIAS. *A. pulchella* does well without protection, provided that it is planted in a semi-shady location. It even had a few blooms this fall when rains came early. Other species have been tried without success but are being tried again this season, both plants and seeds.

AMARYLLIS. *Amaryllis advena* is an iron clad plant here. It blooms and multiplies along a cement driveway where the intense heat of the Texas sun beams all day. Then it brings in the month of September with its brilliant red flowers, regardless of the severity of the summer heat and drought. The pink variety of *A. advena* promises to perform as well, but starting with four of these in comparison with one hundred of the ox-blood red variety, it will take some time to make a comparable show. *Amaryllis belladonna* Linn., is represented by two

species in this collection. These are very different in hardiness, color of flower and in leaf growth. The tender one comes from very old stock and has always been treated as a pot plant even in much warmer parts of the South. It is kept growing without any rest period. The flower is a salmon with the characteristic green star in the throat. It seeds readily. The seeds are very easy to germinate and grow to flowering bulbs quickly. The other is a hardy, strong growing species. It was purchased and planted in October of 1940 and has flowered each spring and multiplied in a bed where one dozen fine hybrids died the summer of 1944 for lack of moisture after blooming. The color is red with a tone of yellow. It also forms seeds easily and they should be true as there is no other *Amaryllis* in bloom that early in the season.

The hybrid *Amaryllis Johnsoni* is a common and hardy variety throughout the South. Once planted and left alone it establishes itself and multiplies by forming offsets although it does not form seeds.

Amaryllis solandriflora conspicua does well here. It seeds readily as do also the hybrids of *A. ambigua.* It was planted outside and lived for three winters but the summers of 1943 and 1944 were so severe in heat and with no rains after blooming, and no power was available to water enough to mature the bulbs, that it was not making good leaf growth this fall (1945). It was potted and will be fed this spring, once it starts to grow. The hybrids were left outside and so this winter should show what they will do. There are also a variety of other *Amaryllis* hybrids in the collection, including representatives from the Royal Dutch, Hermon Brown, Mead, Rice and Howard & Smith strains, besides others bought in pots when in flower, but not identified as to strain. In the fall of 1944, some of these were potted after the first killing frost and grown in pots. When spring came they were fed and watered well after flowering, then the pots buried in the ground all summer. After killing frost this fall they were lifted but had to be repotted as they had grown in size and formed such long roots that larger pots were required. December brought some heavy freezes that do not usually occur until January or February. Therefore "winter overcoats" were put on the choice bulbs. The method used for hybrid *Amaryllis* was to cut both ends out of three pound coffee cans, place these over the bulbs and then fill with propagating sand. The potted plants were all put down in a cellar. This method saved many in one winter when there was a sixty degree drop in a few hours. Three hybrids, the first tried, planted in the spring of 1936 were apparently placed in the right location for they have done well even though they receive no more attention than the rest in a closely planted bed. They have not increased for in each year the flowers have been cut for some admiring friend. The three hybrids produce large brilliant red flowers, superior in form and color to some obtained later. As yet there are no whites or even near whites. A refund has always been made on plants purchased as whites or near whites for they always turn out untrue to the descriptions. One even proved to be a seedling *Crinum.*

BRUNSVIGIEAE. Brunsvigia alba was planted in September 1945, and the bloom stalk soon appeared. When cut and placed in water

it opened well and lasted a long time. *Brunsvigia rosea,* varieties *major* and *minor,* never flowered, except the first year of planting. The hybrids, *Brunsdonna Multiflora, Hathor and Parkeri* have lived but have never flowered except the first year after planting. After reading in HERBERTIA that Brunsvigias and Brunsdonnas need to make a winter growth of leaves, a new method is being tried. *Crinodonna Howardii* was obtained at three different times but none flowered. The last obtained have been potted and are now making good leaf growth. The others have lived out-doors, made leaf growth through the summer until killing frost, but have not flowered.

Several species of *Nerine* added to the collection from time to time, are still living after three or four years but none have ever bloomed.

The collection originally included *Crinum amabile, C. americanum, C. augustum, C. bulbispermum, C. campanulatum, C. erubescens, C. giganteum, C. Kirkii, C. kunthianum, C. Moorei* var. *alba, C. scabrum, C. zeylanicum, C. pratense, C. fimbriatulum, C. virginicum.* The ones that did not survive are *C. pratense, amabile, fimbriatulum* and *giganteum.* Their disappearence may be due to lack of care before they were established. *C. zeylanicum* was the only one that froze. The form of *C. bulbiferum* in the collection has no ornamental value but it does seed easily and will make it possible to carry on *Crinum* breeding. *C. Moorei* is the most ornamental in the group. Some have not been established long enough nor have they flowered long enough so that they may be evaluated. The hybrids represented here include *Crinum Cecil Houdyshel, Ellen Bosanquet, J. C. Harvey, Krelagei, Louis Bosanquet, Peachblow, Powelli Alba* and *Rosea, Sophia Nehrling, Virginia Lee, White Queen,* and *Frank Leach.* These are all choice ornamental plants, and all have flowered except three that have been newly planted, including *Sophia Nehrling* which may be worth the wait. There are also nine unidentified Crinums that were purchased under many different names, from "Lily," "Amaryllis," "Brunsvigia," etc. One is a large "Milk-and-Wine-Lily" type, which shows its first blooms along with Regale liliums, and makes a lovely flower arrangement with some pale yellow day-lilies *(Hemerocallis).* This blooms through the summer, forms large clumps and is iron clad. Another is much smaller growing, has a more refined flower and is a good bloomer. It often has the fourth recurrent flowering period by the middle of July. The only fall-blooming one among them is called "Angel Lily," and has a lovely fragrant flower. *White Queen* flowers early with many flower scapes, that appear in rapid succession. So far *Peachblow* has had only two flower scapes in a season but the flowers are so beautiful that they are worth waiting for. Crinums do well and flower regardless of conditions here. There is such a wide range in color and type that they make a great display.

PANCRATIEAE. Eucharis grandiflora has been treated as a pot plant, but its flower is so choice and comes at a time when there are no other bulbs in bloom, and one is therefore well rewarded for the extra work. *Elisena longipetala* was added this fall and has not as yet flowered. *Pancratium maritimum* also has to be treated as a pot plant to flower here. When planted out of doors, the warm open winters induce

it to sprout and then the March freezes catch it too far advanced. The native American *Hymenocallis* are so badly mixed up as to names as a rule that it is difficult to report concerning them. *H. caribaea* will not live here. *H. occidentalis* is being tried for the first time this year. However, there are some hardy ones in this group that seem to be as easy and robust as crinums. Some are quite large, some quite small. As they bloom off and on all summer, they are a real addition to the garden. If the flower is cut before the heat of the day when the first flower of the scape is ready to open, it will last well, and the remainder of the flowers will open up. *Ismene calathina* did well for several years with beautiful flowers but after our sixty degree drop in temperature failed to bloom and some died. The hybrid, *Sulphur Queen* has flowered only in one year, and the hybrids *Advance* and *Festalis* did not live. This apparently was due to planting in winter during severe weather.

GALANTHUS. These are not worth growing here. *Galanthus Elwesii* and *nivalis* have been tried, but they are always stunted by spring freezes so that they bloom with such very short stems. There are many other spring-flowering bulbs that do so much better under the conditions here that *Gananthus* suffer by comparison. On the other hand, the related *Leucojum* are lovely spring flowers and are iron clad subjects here. *Leucojum aestivum* and *vernum,* though obtained under these names are apparently the same. There is a very different form (Gravetye Giant) that came to me from California where it is quite common. This has a very much larger flower and the leaf is quite flabby and a bluish green, nearer the color of the *Narcissus* leaf.

IXIOLIRION. *Ixiolirion tataricum* is a small and pale colored flower as it grows here, and does not live up to the descriptions as grown farther north.

ZEPHYRANTHEAE. The native Texas *Cooperia Drummondii* and *C. pedunculata* do well here although they are not native in this region of the State. They bloom off and on all summer. *C. pedunculata* is far superior in every way to *C. Drummondii.* The others *C. kansensis, C. Traubii, C. albicans,* and the yellow-flowered, *C. Smallii* have not as yet been tried.

The collection includes *Zephyranthes atamasco, citrina, grandiflora* and *tubispatha. Z. candida* was dug and given away as it is too invasive with a dirty white flower that had no cut flower value. There may however be better forms of this available. *Z. atamasco* has just been planted. *Z. citrina* is small and less desirable than *Habranthus texanus. Z. grandiflora* and *Z. tubispatha* are lovely little flowers that bloom during a very long season. There is another species of *Zephyranthes* that was collected for me but it has never bloomed. It was recently transplanted and found astonishingly deeply placed in the soil.

Sternbergia lutea major has a large flower that opens out wide although the scape is short. *S. lutea,* the type, has a longer scape but the flower is smaller and does not open wide. They are quite hardy and form good clumps which make a showy border, even though the leaves are lacking.

All the *Habranthus* species tried do well here. *H. robustus* is a

beautiful little flower, *H. brachyandrus* is a more robust grower and seeds readily. *H. Andersonii* and *H. texanus* are good in color but are so tiny.

Sprekelia formosissima has never flowered except the first year. This fall they made good strong growth before the freeze came so that perhaps they may bloom this spring.

HAEMANTHEAE. *Haemanthus Katherinae* is the only one that has flowered here. What a thrill when one sees for the first time this large and brilliant flower. These subjects are not hardy here and have to be treated as pot plants as was learned by sad experience. *H. albiflos* and *coccineus* are also under trial. The first purchased was a very strong and choice bulb with a bloom large in size and beautiful in color. It was planted on March 1st, flowered for the first time July 2nd of the same year. There were two mild winters so it lived and bloomed and did well until January of the third year when a low of 2 degrees above zero Fahrenheit hit. It was covered but was not sufficiently protected for such a hard freeze. The bulb was taken up immediately and potted but it looked very bad as it was in leaf when frozen. In January of the following year it was repotted after being treated with hormone powder, in a potting mixture of sand, peat and manure. This January it is beginning to leaf out and looks vigorous once more. The other two species have only recently been obtained.

Clivia miniata hybrids and the hybrid *Clivia Zimmeramanni* are grown as pot plants, buried outside for all summer. They flowered well until 1944 and 1945 when so many amaryllids failed to bloom.

LYCORIS. These flower in the fall when most of the other plants are either through blooming or have not as yet flowered. They seem to suffer from drought and not from freeze. *L. aurea* is a brilliant flower to cut and arrange with other flowers. *L. radiata* (type) is a brilliant show when in bloom in the border. *L. radiata* var. *alba* and "*L. incarnata*" as obtained from a firm are identical. The latter is apparently not the true *L. incarnata* for Col. Grey describes it as being very different in color, and observes that it is reported as "so brilliant as to defy the skill of any artist." *L. radiata var. alba.*, now available commercially, is a lovely greenish cream flower with a touch of red on the edge of the segments, but could not be described as brilliant. *L. squamigera* is temperamental here—sometimes it blooms, sometimes not. *L. purpurea* has never flowered here but a bulb of it recently acquired was potted and is now making good leaf growth.

CHLIDANTHUS. *Chlidanthus fragrans* is a hardy bulb here. Its fragrant and lovely yellow flowers are a worth while addition to any garden.

NARCISSUS. The collection includes the hybrids *Diotima, Ben Hur, Mrs. Krelage, Mrs. Backhouse, Thalia, Acatea, King Alfred, Diana Kasner, Glory of Lisse, Laurens Koster, Soliel d'Or, Tazetta, Grand Monarque, Campernelle, White Lady,* and old stock acquired from gardens of my friends' grandmothers. If grown well and given care, most *Narcissus* will do well here. But they have to be fed each spring after flowering as our soil is not fertile enough to produce good blooms otherwise.

NOTES ON PYROLIRION FLAVA

GEORGE H. HAMOR, *Dominican Republic*

To persons interested in the smaller ornamental amaryllids, *Pyrolirion flava* offers some interesting features, not the least of which is its large and highly decorative flower.

In May, 1942, there arrived from Peru six medium sized bulbs of *Pyrolirion,* described as "*Z. flava* or one of its varieties." Two of the bulbs flowered six days after planting, but the cultural requirements were unknown and through bad luck, or perhaps poor judgment, the conditions provided were unsuited and for several months the survival of the plants was doubtful. By way of trial and error the necessities of the species were worked out at last and since then there has been a good deal of increase.

No exact tests have been carried out to determine the optimum conditions for growing the plant, but a soil fairly fertile and around the neutral point is perfectly satisfactory; its limits of tolerance above and below that point are not known definitely but the range is probably fairly wide. The soil should be at least fairly light and perfect drainage must be provided; the bulbs will decay if kept too wet. Preparation should be rather deep as the fleshy roots have a way of growing straight downward.

Here, at sea level in about 18 degrees north latitude, the species thrives in full sun and dislikes more than a very light shade. Native to a region of pronounced dry and rainy seasons, by preference it should be given growing conditions approximating those of its native habitat. We have an abundance of water for sprinkling together with the type of yard men who have difficulty remembering what to water and what to leave dry. The result has been to give *P. flava* most of the time the treatment of a tropical evergreen but unlike many *Zephyranthes* species —*carinata, citrina, insularum, rosea,* etc.—which remain green the year around if watered, *Z. flava* possesses little adaptability in that respect. To the contrary, after a certain period of growth the foliage dies down and the bulb goes into a dormant condition in spite of any amount of watering. Bulbs have been kept out of the ground nine months without appreciable deterioration, and when planted after a long rest period flower almost immediately.

Bulblets have been sent to a few correspondents in the U. S. A. and experiences there check perfectly with the assumptions that may be made by considering the habitat of the plant. It is definitely tropical or subtropical and cannot be expected to stand any degree of frost, nor is it likely to survive in heavy soil kept constantly wet by rain and fog during the colder months even though the temperatures do not drop close to the freezing point. In regions having that kind of winter weather the bulbs should be treated as Gladioli, or better still kept planted in fairly deep containers, allowed to dry out completely at the end of the growing season, left in the containers with the soil and moved inside.

A complete description of the species is left to the skilled botanists but for those who may be interested in the general features the following will suffice.

Bulbs with light brown or grayish tunic, to 1¼ in. diameter and 1 in. high, neck short, stoloniferous; leaves to 7 or 8, light grayish-green (gray tint more pronounced in alkaline soils), 10 in. long and ⅜ in. wide; scape on strong plants to 15 in.; flower trumpet-shaped, bright orange-yellow, 3½ in. diameter; ovary sessile, no seeds. Attempts at hand pollination have failed here as have attempts to cross with other species.

PROTECTING WRITING ON GARDEN LABELS

J. S. Cooley, *Maryland*

All gardeners know how disconcerting it is to be unable to find the name of a plant because the writing on the label is effaced or the label is lost. Durable metal labels are expensive and are probably unobtainable at the present time. Most of the recommendations for preserving labels are so complicated or expensive that people fail to use them. The writing on wooden labels, even painted ones, may soon become illegible if it is exposed to the weather. The writer has found that by placing the face of the label against another label or against a larger stake, the writing remains legible for at least 3 years, while without such protection from the weather, the writing may not be legible for as long as one year.

Wooden stakes and labels may rot or be destroyed by termites in a surprisingly short time. Marking stakes, that are not used to write on, may be protected against decay by treating them with crankcase oil. Decay of labels may be delayed by soaking them in a concentrated solution of copper sulfate. Heart cypress and Redwood stakes usually last for years without any treatment.

No matter what type of labels one uses it is wise to have something to fall back on in case the writing becomes effaced or something should happen to the label. This may be accomplished by making a chart or map of all important plantings. Care should be exercised to have the chart tied in with some permanent object, in which case even a very crude chart may be very useful in locating a variety. The chart should always be put in a garden book or where other garden data are recorded so that one can always locate the map, even though the pages of the book may be too small for as elaborate a map as one would like. When plants are set in rows, as in a nursery, mapping is easy and a very effective supplement to labels.

AMARYLLIS ON ASCENSION ISLAND

EDITH BAUER STROUT, *California*

Flowers seem so plentiful in most places of the world that I have wondered in times past if they were more appreciated in desert spots when there were only one or two available. I know they are appreciated and it is certainly surprising to find them on an ash heap, as I did when I visited Ascension Island, in the middle of the South Atlantic Ocean.

This island is one of the new creations, volcanic, with not a bit of vegetation on the lower slopes of the island. The high peak, Green Mountains, reaches up into the Trade Winds, and as a result gets some moisture from the clouds, mostly dew. When the island was used as a Naval Station to guard St. Helena when Napoleon was sent there, a "farm" was started on the top of the mountain to supply green vegetables, and support some cows.

Englishmen are noted for their love of flowers, and to be stationed on this barren island must have been a very trying experience. Sometime during the past, someone who loved *Amaryllis* brought two of them to the island, and they have flourished and multiplied ever since. Now there are many of these two varieties raised on top of the mountain to furnish bright bouquets for the homes on the barren beach. When I came there in late April, they were in full bloom, and I was amazed to see stalks of *Johnsonii* with 6 to 7 bells all open at once, and I've been an avid *Amaryllis* fan ever since. The other *Amaryllis* is an *A. belladonna* Linn. [non Ait. ex Herb. (syn. *A. equistris; Hippeastrum equestre*)] hybrid, with very pointed petals, salmon colored with white star in the throat. They are planted in free soil, bulbs covered to the necks, and of course heavily fertilized with cow manure. All the soil is volcanic ash with humus added, and on the top where they grow there is little full sun, a cloud usually covering the peak itself. Though grown over two thousand feet high, it is never really cold up there though due to the fog, sometimes chilly. But here they thrive and bloom to bring joy to the hearts of people far from home.

MY EXPERIENCES WITH DAFFODILS

ELEANOR D. BENNERS, *Texas*

To begin with, mine is the garden of an amateur (in Dallas, Texas) who is interested in many garden subjects. No hybridization of daffodils has been attempted, though admission is made that such work has had its appeal; six years from seed to flower did not encourage that interest, since time has been at a premium for some years with me.

It was a very warm day in the late daffodil season of 1935 when a visiting daffodil specialist said to me, "I am afraid that your garden is going to prove too sunny." She, just out from California en route to her home in Michigan, was perhaps justified in that assumption. Panic seized me; but undaunted enthusiasm returned, without diminution; for,

as has been said, only women try to do the impossible, even under proven (?) impossible conditions. "Too sunny"—the heat was undeniably discouraging for the moment, and was an annual prospect; but surely, I thought, something could and must be done to obviate its intensity. Fortunately the house and trees on the west throw their shadows in the afternoon, and the protection of hedges and flowering shrubs has been of further assistance, and therefore the daffodil venture continues.

In commenting upon the gardening interest that had just begun to sweep the country at that time, a well-known Texas jurist facetiously said, "— it is a mild form of insanity, incurable, but not fatal." We might change the wording of that thought somewhat and say rather that "gardening is a progressive, pleasant disease; an insidious one, awaiting only a right germ to bring on an attack; acute and incurable, but never fatal." So it was that fifteen or more years ago there burst upon my vision a hitherto unobserved and neglected clump of daffodils in full bloom, looking like nothing so much as a flight of white butterflies, as the scapes swayed to and fro in the early morning breeze. At once I succumbed to the spell of their beauty, and knew that another cycle of new and specialized garden interest had begun.

In 1929 some fortunate chance impelled membership in a plant society; I was at once interested in some of the daffodils so beautifully illustrated in the journal furnished, which I determined must be found for my garden. I knew that to be successful with them, I had to learn how others succeeded in the same line. I sent for advertised lists and pored over each as it came. How well I recall the first specialized list from the late Mr. Franklin B. Mead. What a thrill and what shock was mine as I read the descriptions—and noted his prices! Alas! before I could decide which were *musts*, he passed on. Soon I knew of other specialists. I felt that the first thing necessary for success was to start out with good bulbs and that the best would probably be found in a specialist's planting.

While bulbs were gradually being acquired, a few each year, the study of narcissi continued. Much was being written on the subject at the time, and having known of Mr. Sydney B. Mitchell's work with irises, and his early hybridization of daffodils, when *From a Sunset Garden* came out, the acquisition of this book served a double, or I should say, a manifold purpose, in that, aside from other subjects, a veritable mine of interesting information was found in the chapter on daffodils.

As interest grew, more specific knowledge of the botanical relationships of the daffodil was sought. To this end *The Narcissus* by Mr. E. A. Bowles, an English authority, was read. In the meantime a little monthly magazine put out by the Garden Club of Virginia came to me, and I learned much of different varieties of daffodils exhibited at the Alexandria Shows. That was when the late Mrs. Harris was chairman of the Narcissus Group. Her suggestions as to varieties were most valuable. All this time my collection was growing, little by little, and I read avidly everything I could find on the subject.

So much for the background of an experience which I believe to have been entirely new in this locality at the time. This is not to say that daffodils (commonly referred to as "Jonquils") were unknown in Texas. Many of the very old varieties probably came out in covered wagons and have grown on under the handicaps of wind and weather, but feebly, and those that survived have apparently long since been forgotten as to name. For instance, I was the lucky recipient of a box of small bulbs sent from Northeast Texas. The sender said: "I've no idea what these are. They've been in this garden forever." They were, I found when blooming time came around, of all things—*N. gracilis!* A precious little thing of ineffable sweetness that had found the right conditions of soil and moisture in that corner of Texas. I have found them very exacting in these requirements. Have you lilies of the valley or myosotis, then plant *N. gracilis* with them. I am hoping that I can make them at home in my garden for a long and indefinite stay.

The soil of this fifty year old garden is naturally heavy and black, but much additional soil of a different texture has continually been brought in as was thought needful. The surface drainage of the lot is plentiful, but bulbous and rhizomatous materials need, in addition, adequate drainage underneath, so that no water may stand around the bulb or bulbs. In this connection it has been found better to have planting positions properly prepared in advance of planting time. This is not only easier, but makes for better planting by reason of giving the soil time to settle after deep digging (for drainage) and the addition of sand, rotted fertilizer, either dairy or cotton seed meal (or hulls), with a liberal sprinkling of ashes, preferably from hard wood. The fertilizer as above, should be mixed in well beneath the approximate depth of the planted bulb and in the surface soil a liberal sprinkling of equal parts of bone meal and superphosphate should be worked in.

When the actual planting time (September 15-October 15) arrives, a two inch base of sharp sand is placed under bulb or bulbs and they are surrounded by sand also so that no possible contact of bulbs with any kind of fertilizer may occur. The bulbs are planted generally about six inches deep, depending upon the size of the bulb, and after filling in the soil, water is applied, so that settling of the top soil may be accomplished as soon as possible. Afterwards no further watering is needed, except perhaps after growth has started, if it be very dry and the winter rains have not started. Another light sprinkling of equal parts of bone meal and superphosphate to the entire planting may be added the last of December or the first of January. My bulbs remain in the ground without lifting and storing—this is the method of an ordinary gardener, one without professional help of any kind. The number is many, and strength is unequal to the task of lifting, storing (in dry sand) and labeling.

Whence do all these bulbs come? From California, Oregon, Washington State, Ohio, Michigan, Maryland, Virginia, Tennessee and Ireland. Amazingly the long jump from Ireland to Texas was successful for the larger number, produced very good bloom the first year down. I believe that *Brunswick* was the least friendly to this change, and next

Nelly. A much prized addition to my collection came in 1937 when I was the grateful recipient of a box of fine bulbs sent by Mr. B. Y. Morrison from his garden in suburban Washington. From these various sources, in extremes of distance, there has been little appreciable difference in the size of bulbs. All good bulbs, the large round ones, give on an average two fine blooms, and the double-nose bulbs sometimes produce three. Occasionally bulbs from the Northwest have been larger and have produced larger blooms the first year down. That distinction does not always hold for succeeding years. Some from any section may fail to bloom the second year, though fine healthy foliage is produced. This failure I have attributed to a bulb not being acclimated.

I have made no attempt at listing varieties—there are too many. They have been acquired gradually over the years, a very few of each at a time—never more than one, two or rarely three. A variety's natural increase makes for a reasonable restraint in the number bought.

I have seen no indication of disease amongst my bulbs, unless it be a sometimes twisted foliage noticeable in the lovely *N. triandrus* and *N. Tazetta* cross, *Silver Chimes*. Casualties occur in every planting and I've had my share, some unavoidable, others that were the result of careless work or forgotten positions. My husband, as fond of the garden as I, often turns up a handful or more of bulbs when trying to find space for some herbaceous favorite, and exclaims, "the garden is *pizen* with bulbs!", replaces them as is—and they may or may not be seen again.

On the whole, I should say emphatically that selected early and properly planted in well prepared, semi-shaded soil, there is no reason why daffodils may not be well grown in Texas, and in numbers.

CULTURE OF PAMIANTHE PERUVIANA

W. M. James, *California*

Pamianthe peruviana has proved too tender to grow out of doors in Southern California. It took a plant growing in the open ground at Santa Barbara about three years to die and one at Ojai about the same length of time.

The illustration (Plate 283) shows a plant which was grown in a Cattleya house in Santa Barbara. The flowers were hand pollinated and set seed readily. The seed germinated very well and the seedlings were easy to handle as long as they were in the orchid house.

When the seedlings were about one year old, the Cattleyas were sold, and the house dismantled and rebuilt into a smaller one with no heat. Under these conditions, both the seedlings and the parent plant died in about two years. The plant made one attempt to flower in the new house, but there was only two small blossoms which barely got out of the neck of the bulb. This flower was probably initiated in the warm house.

The flower is very attractive and well worth growing. It will probably never be found to any extent in Southern California because there are so few glass houses which are kept warm enough.

Pamianthe peruviana.
Photo by W. M. James

Plate 283

The plant is a little different in appearance than most of the amaryllids of its type which we are accustomed to seeing in this section. There is scarcely any swelling at the base of the leaves, so that there is no large bulb as in *Amaryllis.* The base of the bulb grows on top of the ground so that only the roots are covered. The parent plant grew vigorously in a mixture of sandy loam and humus. The root system is strong growing and probably needs more room than is given to an *Amaryllis* bulb with comparable leaf surface.

NOTES ON CRINUMS

A. C. Delkin, *California*

Crinums have been my hobby for over a decade, and I have acquired all species and hybrids of this genus that I found in trade catalogs. Some were not suited to this location. A few very tender species have been kept in the greenhouse in winter for my place is not a frostproof location. However, the larger bulbs, such as *Crinum asiaticum,* are too difficult to move around on account of the huge size they attain.

The species and hybrids that are hardy out of doors without protection, even when planted at a very shallow depth, are—

Species. Crinum bulbispermum, white and pink varieties; three kinds of the Milk-and-Wine-Lily type, *C. Kirkii, C. erubescens, C. campanulatum,* and *C. Moorei.*

Hybrids. Powellii album; Cecil Houdyshel, White Queen, Ellen Bosanquet, and *Louis Bosanquet.*

One of the best, and beautiful of all the crinums, easiest to grow and most rapid multiplier by offsets, is *Powellii album.* One large bulb planted at a shallow depth, and well watered in my sandy soil will produce 12 or more offsets in a year. They will not bloom if planted deeply Large bulbs planted at a shallow depth will average three bloom scapes each per year. My collection contains over 5,000 clumps of this clone. They are a beautiful sight when in bloom. When I decorate with them most people refer to them as Easter Lilies. This is also my wife's favorite cut flower for it is beautiful and long-lasting.

I have several thousand *Crinodonna (Amarcrinum)* bulbs which produce flowers varying from almost white to deep pink. They make excellent cut flowers.

White Queen (Burbank) is a fine subject. It is however slow to increase by offsets, but does set seeds. *Ellen Bosanquet,* an unusual wine red, is an important member of my collection, as is also *Cecil Houdyshel,* an excellent pink.

CULTURE OF AMMOCHARIS AND CYBISTETES

L. S. Hannibal, *California*

Several years ago the writer received several bulbs of *Ammocharis.* At the time little factual information could be found regarding their culture, and although the bulbs occasionally put out a leaf stub, they did not seem especially happy in their pot. Eventually the timely article by

Milne-Redhead and Schweickerdt turned up (Journ. Linn. Soc. Bot. Vol. L11 Pages 159-197) and from the information that they give it is apparent that these plants are a winter growing—summer resting type. However, since they are usually located in areas of scant rainfall the leaf growth only appears when conditions are favorable. With a warm dry spell the leaves soon dry up, but with the next rain the stumps begin regrowth and may last for a period of several weeks to three months.

Translated into central California conditions we soon found that leaf growth came during the fall and again in the spring—the optimum conditions being when the nights held between 50-60° F. When planted

Fig. 151. *Cybistetes longifolia.* Photo by Perry Coppens.

in a raised outdoor bed containing considerable sand and gravel for drainage the plants soon become established. The partial shade of a deciduous tree seemed conducive to better summer foliage on the bulbs, a condition which Mr. James first called to our attention, but with the slightest frost in winter the foliage promptly dies back, only to start regrowth with a few warm days.

The first species we had was *Ammocharis heterostyla;* this had been introduced into our Florida trial garden as *Crinum ammocharides* (A

208) by the Lady Muriel Jex-Blake. It is an extremely local type found only in the immediate area of Mt. Elgon in Kenya Colony. The U. S. D. A. also has imported a number of the same bulbs and some small stocks are now available at several sources. Mr. James featured a picture of a clump in flower in HERBERTIA Vol. 10, page 157. This bulb sends up two scapes each fall. The flowers are quite interesting, resembling a dwarf *Crinum asiaticum,* but are not spectacular.

Later we obtained some small bulbs of *Ammocharis coccinea* and *A. coranica.* According to Milne-Redhead *coccinea* is a misnomer and both plants should be considered *coranica.* This plant is found only in the immediate Cape area and seems quite variable in color or form. Its culture is identical to that for *A. Heterostyla* and the plants appear about equally hardy.

Cybistetes longifolia was received under the old name of *Ammocharis falcata.* Its foliage differs only very slightly from that of *Ammocharis*—the leaves are a bit wider and do not tend to hug the ground so closely, but are so similar that under normal conditions only a person especially acquainted with these plants can segregate the two without seeing the flowers. The separate genera proposed by Milne-Redhead for these two bulbs make a distinction based on flower structures—that of *Ammocharis* having actinomorphic or ray formed segments, while the other is zygomorphic or bilaterally symmetrical.

A NONPARASITIC LEAF SPOT OF THE DAYLILY

J. S. COOLEY, *Senior Pathologist*
Division of Fruit and Vegetable Crops and Diseases
Bureau of Plant Industry, Soils, and Agricultural Engineering
Agricultural Research Administration
U. S. Department of Agriculture

In the summer of 1942 a seedling daylily *(Hemerocallis)* growing at the Plant Industry Station at Beltsville, Maryland attracted the writer's attention because of the abundance of leaf spots. This plant showed severe leaf spotting in May. As the season advanced a similar leaf spot was observed on many of the named varieties at the Plant Industry Station and also in the plantings of named varieties of several growers in the vicinity. From conversation with daylily growers in other parts of the country it was learned that a leaf spot apparently similar to this one occurs in other sections. Some varieties show considerable spotting and others very little or none.

The spots (Fig. 152) are quite variable in size and shape, the diameter ranging from one millimeter to more than a centimeter. The margin is usually, but not always definite. In color the spots vary from a greenish yellow in the early stages to a reddish brown as they become older. Russet Spot is proposed as an appropriate name.

In October 1942, a species of *Vermicularia* was isolated from the older spots. *Vermicularia liliacearum* West., has been reported as occurring on dead or dying leaves and bloom scapes of the Hemerocallis.

As the spots occurred in definite patterns on living foliage, and the *Vermicularia* was found fruiting abundantly on old lesions it seemed important to test the fungus for pathogenicity by artificial inoculation.

Following this observation, a few plants of the susceptible seedlings were lifted, thoroughly washed, stripped of all foliage and potted for

Fig. 152. Showing abundance of russet spot on upper and lower sides of daylily leaves.

greenhouse study and inoculation experiments. When new foliage appeared, inoculations were made, but leaf spots developed as abundantly on the uninoculated check plants as on the inoculated ones. Attempts to recover the fungus from any of the spots on inoculated plants gave

negative results. Furthermore, culturing necrotic tissue from leaf spots on both the inoculated and uninoculated plants failed to yield a fungus. In the summer of 1943 and again in 1944 isolations from the margins of young leaf spots were attempted but all gave negative results. A microscopic examination of the necrotic tissue of leaf spots showed no fungus filaments or bacteria present. The evidence thus indicates that the spotting is not caused by a pathogen.

Russet Spot of *Hemerocallis* does not appear to have increased in prevalence during the three seasons of observation. In fact, it was more abundant in 1942 than in any subsequent year, and in 1944 it was of very rare occurrence. This spotting may be associated with some nutritional condition but it does not have the characteristics that nutritional disturbances usually show. At any rate, the evidence presented here does not suggest that this is a contagious leaf spot disease.

MY FAVORITE DAYLILIES

George Gilmer, *Virginia*

I have been growing daylilies for about fifteen years and now have more than one hundred and fifty varieties, most of which have been introduced in the last twenty years. Some twenty-five should be discarded. But it is hard to throw out an old friendly plant, which would be treasured if it were the only daylily in my garden, just because some hard working hybridizer has developed a better one.

This article is about the best of my old and new daylilies. A few are not included because of poor foliage, some fade considerably in the sun, a few increase slowly, a few bloom sparingly, and a few form such dense clumps that the plants are too starved to produce good plants unless frequently divided. The following should please the most critical.

Old Varieties

Gold Dust is the first to bloom. It does well in considerable shade.

Apricot is a little later and larger, cadmium yellow. It is a good and really early bloomer.

Ophir is orange yellow, tall trumpet shape, large and fragrant.

Fulva Maculata is similar to the common roadside lily, but later and much larger. It is very vigorous forming large compact masses with little chance for weeds.

Late Varieties

Chengtu blooms freely in August, coppery orange and carmine. It resists dryness; foliage is almost evergreen. It spreads by underground runners and does not form dense clumps. Distinctly different in matter of growth and foliage. If you like it try also *Hankow*.

August Pioneer is a free bloomer with small flower, chrome orange with reddish flush.

Dorothy McDade is light yellow and perhaps the best of the late varieties.

Midseason Yellows

There are more fine midseason yellows than any other class.

Annis Victoria is good, orange, lasting foliage.

Dauntless has wide petals, orange and a touch of pink.

Duchess of Windsor has wide petals, light orange with touch of pink; foliage good until late autumn. None more beautiful.

Lidice, orange with touch of red. Good

Majestic, handsome, large orange.

Mrs. B. F. Bonner, fine light yellow.

Patricia, wide petals, yellow, fragrant. It needs considerable sun to do well.

Princess, large light yellow.

Queen of Gonzeles, orange.

Queen Wilhelmina, orange.

Wau-Bun, early midseason orange with long twisted petals. Fine variety. If you like it try also *Taruga,* similar in pattern but light yellow.

Theodore Mead, fine yellow with interesting shape.

Midseason Pinks

Bertram H. Farr veined, peach pink, beautiful large flower, early midseason.

Corinne Robinson, good light pink, increases freely.

Emberglow, beautiful pink with good foliage lasting into November, increases rapidly.

Helen Wheeler fine pink, but increases slowly.

Sweetbriar, good pink.

Tara, good dark pink, free bloomer.

Midseason Reds

Granada, good red with wide petals.

Indian Chief, large orange red with good foliage until late November.

Matador, tall red near flame, distinctive.

Peony Red, good foliage late in the fall.

Persian Princess, dark red.

Port, small red flowers that hold color in the sun.

Purple Waters, not purple but as near purple as any I have. Lovely flower.

Red Bird, good bright red with lasting foliage.

Russell Wolfe, fine red, but fades some.

San Juan, fine red with wide petals.

Victory Taierhchwang, wine red with lasting foliage.

Vulcan, maroon, has bud shoots on bloom stems that grow to blooming size plants second season if stuck in ground.

War Path, good late red.

Wekiwa, velvety red, good.

Midseason Blends

Aladdin is the first daylily to bloom, golden yellow with brown eye.

Mikado, the favorite "eye" daylily, orange with red eye. Plant is below average in vigor.

Caballero, vermillion red and golden yellow.

Carnival, fine red with foliage lasting a month after freezing weather.

Dr. Stout, red and gold, is one of the best.

George Kelso, bicolor, prominent garden effect, increases rapidly.

Mayor Starzynski, orange, red, long blooming season, increases rapidly.

Rajah, orange and red, vigorous, tall, and good.

Victory Montevideo, orange and rusty red, one of the best.

DAYLILY TRIALS IN NORTH CAROLINA [1]

Elizabeth Lawrence, *North Carolina*

In March 1944 Dr. Traub sent me twenty-nine of his daylily seedlings to try in my garden in order to see how they thrive in this part of the country. I put them in a row in the cutting garden, and six of them bloomed the first year. Two died, *Helen Wheeler* and *John Blazer.* This year all of the others with the exception of *Elaine* bloomed. They bloomed from the tenth of May to the tenth of July. The blooming dates were a little earlier than those for daylilies bred in the North. This year *Amaryllis, Lemona* and *Florham* began to bloom May thirty-first and *Bay State* on June twentieth. *Russel Wolfe,* the latest of Dr. Traub's, began to bloom June tenth. Thus the two groups make a nice long season.

The first of the seedlings to bloom (May 10) was *Victory Montevideo.* This is a very gay red one with well branched floriferous stalks, but it is not outstanding in the group except for its season. It comes at a time in my garden when daylilies, especially reds, are scarce and are much needed. The time when spring flowers are on the wane or faded, and summer flowers have not come.

The spring of 1945 has been a peculiar season as to bloom, but I was interested to see that of the six of these daylilies that bloomed the

[1] The clones under trial are *Peony Red, Helen Wheeler, Carnival, Fire Red, Elaine, Granada, La Tulipe, San Juan, Mayor Starzynski, Victory Montevideo, Emberglow, Indian Chief, Victory Taierhchwang, Dr. Stout, Lidice, Wekiwa, Fred Howard, Theodore Mead, John Blaser, Corinne Robinson, George Kelso, Mildred Orpet, Russell Wolfe, Queen Wilhelmina, Reba Cooper, Rouge Vermilion, Golden Glow, Duchess of Windsor,* and no. 704. The clones not mentioned in this report will be included in future reports.

first year the dates for the second year were not very different. Two bloomed on the same date each year.

Victor Taierhchwang is the best grower and bloomer of the group. There were five stalks this year with thirty or more flowers to a stalk. It began to bloom the first day of June, and bloomed until the end of the month. The stalks were forty-two inches tall. The flowers were dark, a mixture of Brazil and Morocco reds with a bright chrome throat and distinct yellow midribs. They were comparatively small with narrow, fluted and recurved petals. This is one of my favorites for I am very partial to the bright dark colors, and much prefer a mass of color to a few large flowers.

Three others made four stalks—An enormous bicolor (No. 704) three feet tall and not branched, *La Tulipe*, and *Reba Cooper* with not more than fourteen flowers to a stalk. *Reba Cooper* is an ochraceous salmon with a tawny tinge, and a well defined triangular halo (or semi-halo) of dragon's blood red. Last year it bloomed on May fifteenth, and this year on May twenty-first.

Carnival is another of my favorites. There were three branched stalks three feet tall, with as many as twenty-three flowers to a stalk. The flowers were large—the segments four and a half inches long—and bright. As with most of these lovely shimmering daylilies that change in every light and from day to day according to the amount of heat and sunlight, the color cannot be found in Ridgway, nor can it be accurately described. It is somewhere between Nopal red and Pompeian red with a quivering iridescent sheen. This is an outstanding daylily on all counts, size, brilliance and number of blooms.

The *Duchess of Windsor* bloomed on May the ninth in 1944, and on June the third in 1945. I rather suspect that the difference is due not to the erratic season but to the gambols of my Springer pup who loves to plunge through a clump of daylilies when the dew is on them. This is a short stemmed variety (thirty-two inches) with a few large flowers of a pale amber color that is not in Ridgway. The throat is a deeper yellow, and there is a very faint halo. The flowers were large and of a good substance, and I am sure it will prove (puppy willing) a valuable early bloomer.

Golden Glow is a very fine light cadmium self of good form and substance. It began to bloom early in June.

La Tulipe, one of the most floriferous and colorful of the group, is one of the later ones, blooming from June the second to July the eighth, with four well-branched stalks of medium height and up to twenty-eight flowers to a stalk. The large, flaring wide-petaled flowers were near Ridgway's garnet brown and of a sparkling brilliance, with a difference in tone between the outer and inner segments. The throat is yellow and deep green. *La Tulipe*, *Russel Wolfe* and *San Juan* were the three of the seedlings still blooming on July the first. *Russel Wolfe* is the tallest of all, with stalks over four feet, well branched and with large flaring flowers. The segments were 4½ inches long—the inner ones an inch wide and the outer ones narrower. The inner segments are madder brown to Pompian red, the outer ones dragon's blood red. *San Juan* bloomed

from May thirty-first to July sixth, exactly five weeks. This is one of the handsomest of Dr. Traub's seedlings. It is tall, to 45 inches, with large dark, faintly scented flowers of a most unusual color. Checked against Ridgway they were between garnet and maroon one day, and almost pure ox-blood on another, but you cannot check the purple lights nor the deep bloom of the petals like the bloom on a purple plum. This year *San Juan* had but one stalk and that not much branched. I hope it will bloom better another season, but even as it is, it is one of the best.

Peony Red is to me the most interesting of all because of its rare color. It made a very weak clump with only one stalk, thirty inches tall, and few flowered. The flowers were small but prettily formed. The first opened on the second of June and they lasted well through the month. According to Ridgway the color is somewhere between ox-blood and Vandyke red, but this does not give any idea of the dark, rich violet tone that makes it a distinct color from any daylily that I have ever seen. It is a self with a green and yellow throat, narrow ruffled petals and a slightly darker, barely noticeable halo.

The single stalk of *Lidice* bore more flowers than any other variety of this group—fifty-eight flowers to the one stalk. The flowers were rather small with an evenly spread fulvous dust over the deep chrome petals. I think I am going to like this very much as a garden plant. It began to bloom the twenty-fourth of May, and bloomed until about the end of June.

Theodore Mead is a very large cadmium yellow itself with inner segments four and a half inches long and outer segments shorter and narrow. The characteristic feature is the shape of the flowers. They are more rectangular than square. This one bloomed May the twenty-fourth.

Indian Chief produces a very large flower with segments 5¼ inches long. The stalk is forty-two inches tall, and not much branched. The flowers are English red with a semi-halo of a deeper tone, a deep chrome throat and a central ridge of deep chrome on each petal.

DAYLILIES IN THE ADIRONDACKS

Stanley E. Saxton, *New York*

Almost thirty years ago my father first broke soil for a little vegetable garden beside the summer cottage he had built on the forested shore of lovely Mount Arab lake in the Adirondacks. This soil was mostly light, dry wood-dust or leaf mold, spongy when wet, powdery when dry. Little would grow in it, excepting an occasional hardy variety of bush bean, summer squash or lettuce. Year by year persistent tillage improved it until, by the time I began to build my own place, father's little garden was beginning to produce fairly well.

Having cleared and walled up a garden plot beside my own cottage, I went through a similar period of soil development to reach a point where I might have a few flowers. It was some time before I could even get Annuals to grow, and so, when I suggested to an elderly friend who had a large garden in New Jersey, that I was going to try perennials,

I was warned that it would be a waste of time since nothing would survive the Mount Arab winters. This warning made my determination even stronger and I began to plant all the old standbys I could obtain.

For some time my losses were discouraging. Roses planted in the spring would bloom the first summer, then dry up and die, or rot over the winter. Iris dwindled away in a couple of years; peonies tried hard but remained weak and spindly. The only plants which flourished were woodland natives such as cyprepedium, aquilegias, *Dianthus barbatus* or digitalis.

When we first came to the lake my Father had planted in the front yard a plant of *Hemerocallis flava*. This had prospered and grown into a large clump. I had noticed it in other nearby yards so knew it would grow. One day I saw a large clump of *H. flulva Europa* along the road. I dug a few roots and planted them in a rather poor spot where they took hold and flourished. Enthused by this success, I obtained all the literature I could on the new Hemerocallis hybrids then being introduced by Mr. Betscher and Dr. Stout. Many of these were purchased and, as they were introduced, newer hybrids were added until now I have about a hundred named clones, including the best from Betscher, Stout, Sass, Wheeler, Hayward, Norton, Traub and others, as well as quite a few numbered hybrids which I am testing, and several hundred seedlings.

The reaction of these hemerocallis hybrids to climatic and cultural conditions at Mount Arab has been most variable and extremely interesting. For most of the winter a good covering of snow can be expected and so, although frost injury to the crowns and outright winter killing has occurred, cold injury is not as serious as it might be in more exposed places. The real test seems to be the ability of a clone to build up to flowering, give a good display, replenish itself and increase in the extremely short season. I might say that the average season is from May 15th to September 15th although in a good year frost may hold off until later. About four months of growing may be expected.

The early flowering varieties such as *Dr. Regal, Minor, Aureole* and *Sovereign,* many of which produce their flowering buds the previous year, seem to grow well and flower regularly. Their bloom period is in June which gives them three months to recover and prepare for the long winter as well as form new buds. I was interested to observe that the Manitoba Hardy Plant Nursery of Dropmore, Canada listed only these early varieties. Mr. F. L. Skinner, the owner, advised me that only these kinds flowered well under his extremely cold conditions and short season.

With the mid-season hybrids, my experience has been that generally those which flower earliest have the best chance of producing a good display and making worthwhile increase. The late bloomers seem unable to recover from the long winter and then grow rapidly enough to produce flowers before the autumn frosts. *Mrs. Wyman* bloomed beautifully the first year from a spring planting. It has come up each year since then but has never again flowered. The same is true of *August Pioneer* and most of the hybrids which have *H. multiflora* in their parentage. The *fulva* varieties seem to be good growers. *Margaret Perry* is almost a weed, small roots taking hold in the poorest spots and increasing rapidly.

I have had flowers on this variety as late as October 12th. *Rosalind* is excellent, increasing at a rapid rate; *Maculata* is outstandingly large and brilliant; *Chengtu* is the weakest grower of the *fulva* types and does not always flower well.

The species, *H. aurantiaca,* and many of its progeny are tender and sometimes winter kill. *George Yeld, Sir Michael Foster* and *Cinnabar* are in this class.

Some of the named varieties with the most colorful and beautiful flowers seem just able to keep going, each year sending up one bloom stalk from a single fan of leaves, increasing very slowly or not at all. I find this is true of many of the varieties from the south as well as some of Mr. Sass's hybrids. In the latter case I attribute this to the likelihood that *H. aurantiaca* is in the immediate parentage. This may account for other instances of lack of vigor.

The hybrids from Dr. Stout tend to be better growers than most. For example I have a plant of *Theron* obtained at the same time as a plant of Mr. Wheeler's purple, F-56-4. At the end of two growing seasons *Theron* had seven leaf fans with six flower stalks; F-56-4 had but one leaf fan and one bloom stalk. However, I think its flower is more beautiful than the flower of *Theron;* still the latter seems by far the best grower for my conditions. Similar comparisons could be made in numerous instances. Oddly enough, however, this ability to flower well and increase is not necessarily associated with cold hardiness. The variety *Red Bird* has often been mentioned as lacking in hardiness. With me it has grown rapidly and given excellent increase. I have had *Cabellero* since its introduction. Each alternate year the crown has been destroyed by freezing. In spite of this it has each time recovered and given average increase and good flowering the following season. *Patricia* grows very slowly, and Dr. Stout says he has withdrawn *Charmaine* because it is tender. *B. H. Farr,* the result of a cross between these two, seems perfectly hardy and one of my best growers. This would indicate that selections might be made from the progeny of tender parents which would perform well under adverse conditions. Perhaps some of the plants which are being discarded by southern growers because they do not have the evergreen habit would be ideal under conditions such as mine. On the other hand, northern growers might well send outstandingly beautiful flower types, which grow badly in the north, to Florida or California for tests. It seems obvious that eventually selections will have to be made in each color and type class for individuals adapted to the growing conditions of different sections of the country. The best red or pink for Florida would undoubtedly be a different plant than the best one for Canada.

Another type of plant which should prove valuable in the north is the recurrent bloomer of the warmer sections. This would only flower once each year but its ability to prepare for another blooming in a short period should give it the vigor necessary to overcome the handicap of a short season of growth. I found that my greatest success with delphineum comes from the Pacific strain, which in many gardens blooms two and three times each season. Although I only had one blooming, the

plants seemed able to develop and increase each year. Recurrent blooming hemerocallis should respond in a similar manner it would seem.

As my own seedlings have come into bloom, it has become increasingly evident that my selections will be based on the factors of vigor and growth under Mount Arab conditions. So far I have had no seedlings which flowered in less than three years from planting. At three years most have only one leaf fan; a few have as many as three. These more rapid growers will be observed and used in future hybridization. Plants with more numerous flowers are also desirable and this feature is being sought. Color is not a primary problem since the crossing of modern hybrids reproduces a wide range of colors and types. However, it would seem desirable to cross highly colored types on the early-flowering hybrids to produce a race of brightly colored early bloomers for cold regions. This has been done and the results will be observed with great interest.

It is hoped that after some of the newer hybrids have been more carefully observed some evaluations may be made to help those whose growing problem is similar to that described here.

METHODS OF PACKING DAYLILIES FOR SHIPPING

J. S. Cooley [1]

Daylily plants are probably much more tolerant of abuse in shipment than most plants but they may be retarded very appreciably in their growth by excessive drying out in shipment. No experimental data are known to have been reported on the shipment of daylily plants or on holding them under shipping conditions when packed in different ways. Some experiments are here reported wherein daylilies were given different packing conditions and held for 10 days to 14 days to simulate shipment under severe conditions.

The experiment consisted of 3 tests. In one the freshly dug plants were left in an open building for 2 weeks; in another they were held part of the time at 90°F. during a 10 day period; in the third they were held continuously at 90° for 10 days with some modifications in the wrapping. The same general conclusions can be drawn from all the tests so the first test is typical of all of them and is here reported.

The following packing procedures were employed: The tops of the plants were cut off to within 5 or 6 inches of the roots. The plants having wrapping treatments were bundled and the roots and tops completely wrapped, the paper being folded over at the ends to prevent loss of moisture where a waterproof paper was used.

Plants of the variety *Dr. Stout* were arranged in 5 comparable lots of 6 plants each. Lot 1 was planted as soon as dug and divided. The

[1] Senior pathologist, Division of Fruit & Vegetable Crops & Diseases, Bureau of Plant Industry, Soils, and Agricultural Engineering, Agricultural Research Administration. U. S. Department of Agriculture.

other 4 lots were given the following treatment: Lot 2, not wrapped: Lot 3, wrapped in 2 sheets of newspaper then cardboard rolled around it and wrapped in heavy kraft paper and tied as for shipment. Lot 4 was wrapped in a waterproof paper such as is used by nurserymen to wrap plants and was then given the cardboard and kraft paper wrap just as lot 3. Lot 5 was wrapped in a thin coating of sphagnum moss which had been wet and the excessive moisture squeezed out, then wrapped in waterproof paper, cardboard, and kraft paper like lot 4. All these lots were held in a well-ventilated non-heated building having temperatures about the same as shade temperatures outdoors. The experiment was started August 15 and concluded on August 29. The average maximum temperature at a nearby weather station for the period was 81.4°F. and the average minimum was 58.9°F., which was cooler than usual for the locality and time of year. The holding test was concluded after 2 weeks, when the following record was made: The plants of lot 1 which had no "shipping" treatment, i.e., were planted immediately, had 3 new leaves, 4 to 8 inches long. In lot 2 which had no wrapping the plants were wilted and flaccid with no new roots or tops starting. The plants in lot 3 were showing slight new root formation but no leaf growth, the roots being flaccid but better than lot 2. In lot 4, where waterproof paper alone was used, the new root growth was greater than in any other lot. Some etiolated leaves were starting and the outer leaves were sloughing off, but there was no evidence of impaired life of the crown. The plants of lot 5, where damp sphagnum and waterproof paper were used, showed more rotting of the outer leaves and slightly more leaf growth but less root growth than lot 4. The roots of lots 4 and 5 were turgid and in good condition to grow. All things considered the plants in lot 4, which were completely wrapped in waterproof paper, were in the best condition to start growth immediately. At the conclusion of the holding test the plants were set out and watered.

The records taken 1 and 2 months after planting showed that the plants that had not been wrapped and those that had been wrapped in newspaper had dried out enough to cause slow starting and poor growth. On the other hand the plants wrapped in waterproof paper had been sufficiently protected from drying out so that they seemed to be in as good condition 1 or 2 months after planting as those planted out immediately. The observations here reported indicate that drying of the crowns impairs rapid starting and growth. The maintenance of the turgor of the roots and especially of the crown seems to be much more important than prevention of the sloughing of the outer leaves. The emphasis, therefore, in wrapping and packing should be placed on the maintenance of good root turgor. The complete wrapping of the whole plant—roots and top—in a waterproof paper without added packing material appears to be an effective and practical method of maintaining good turgor during shipment. By this method there was no evidence of any harmful effect from smothering either when inspected after the "shipping" test or 2 months after planting.

6. HARVESTING, STORAGE AND FORCING

CONCERNING ACCELERATED AND OPTIMUM FLOWERING IN AMARYLLIS

IDA LUYTEN, *Wageningen, The Netherlands*

When we started our experiments with *Amaryllis* (syn. *Hippeastrum)* in 1933 little or nothing was known about the influence of temperatures on the flowering-percentage, the number of flower-stalks (scapes) per bulb, the number of opening flowers per inflorescence and the time of flowering.

For the experiments we used groups of bulbs produced by the vegetative method *(Luyten* 1926, 1935, 1936). These groups consisted of uniform bulbs of the same age which in successive years had been subjected during the resting period to special treatments. Before discussing the experiments, a technique is given for raising large bulbs.

In our country *Amaryllis* culture is always a hothouse-culture. The bulbs are planted either in beds directly on the bench, or in pots. We always raise them in pots. After the resting period they are repotted; at the bottom a potsherd is placed for good drainage. The roots are spared. As potting soil 1/3 part pulverized peat, 1/3 part old decomposed cowdung and 1/3 part garden soil is taken, and for each M^3 soil 10 kg. Thomas papslack is added. Two-thirds of the bulb is above the soil of the pot, each bulb is surrounded with old cowdung. After this they are sunk into the bedding of nutritive soil to enable the bulbs, planted in pots, to enlarge their root systems. When pots are sunken, care is taken, that the neck of the bulbs are below the level of the soil, which prevents the settling of mealy bugs between the upper-part of the scales. Five times during the year fertilizer is added—2 kg. superphosphate, 1½ kg. magnesium-potassium sulphate and 1kg. ammonium sulphate for each 10 M^2. Much air, light and moisture is needed. A few times each day water has to be sprayed between the leaves as soon as the leaves appear. During the winter months the bedding has to be heated from 16° to 20° C. at the level of the bulb, in summer from 21° to 24° C. In our experiments the air temperature in the hothouse varied from 17° to 24° C. in winter; and from 20° to 27° C. in April until August. *Hayward* 1938 draws attention to the fact that the pH of the soil should be between 7 to 7.4; it is not allowed to decrease to 6. Should the circumference of the bulb fall below 20 cm. then there is little chance of flowering. In this case such bulbs need a hot water treatment.

Amaryllis have a long flower forming period—from about February to October *(Blaauw* 1931). Three inflorescences can be formed during this time under favourable conditions—each time after the formation of a fourth leaf the terminal growing point is changed into an inflor-

escence. The lateral growing point which is situated in the axil of the last leaf which completely encircles the stem takes care of the continuation of the axis. This axis starts again with the formation of leaves.

The time during which the bulbs are kept dry is used for temperature treatments. After 1930 no more water was given after August 14th and in the 2nd week of September the bulbs were exposed to a special temperature. The storing of the bulbs has to be considered as a preparation to produce flower-stalks later on at times chosen by us. In 1933 groups of bulbs not only were exposed to 23° C. (as advised by bulbgrowers) but also to 27°, 20° and 17° (37 groups,—843 bulbs). The entire groups of nos. 65 and 67 remained at 23°, the other numbers however were divided between 1, 2 or 3 temperatures, depending on the number of bulbs. It was shown that 23° is not a favorable storing temperature. Nos. 1 and 20 were the only numbers of the 61 groups which reacted rather favorably to 23° C. All the other numbers gave either always a low flowering percentage or the flowering percentage fell off or the flowering percentage fluctuated. The 27° treatment did not give a single flower-stalk. However as soon as the bulbs were stored at 20° and 17° the flowering percentage increased. In 1934/35 the numbers kept at 23°, 20° and 17° were again exposed to the same temperature, the ones kept at 27° were then exposed to 17°. The bulbs stored at 27° in 1933/34 flowered in 1934/35 with a much higher percentage than the bulbs exposed to 17° and 20° after storage at 23°. Probably 27° had a retarding effect on the inflorescences initiated in the bulb (which ought to have flowered in 1934/35) causing these inflorescences to remain stationary; 23° has no retarding effect, on the contrary, it accelerated flowering which shows that this temperature promoted growth. Probably the inflorescences which ought to have flowered in 1934 developed too soon at 23° causing them to dry up. The inflorescences of bulbs stored at 27° apparently checked in their growth don't dry up. They flowered after a favorable storage temperature (20° or 17°) in 1934/35.

Still another group treated at 23° was stored at 15° the next year. After 2 years the flowering percentage is almost the same as that for 20° and 17°. Summarizing *the effect of 17° and 20° on the flowering of the first inflorescence* we can say that no great differences are to be found between these 2 temperatures but that the experiments suggest that although sometimes the flowering percentage at both temperatures is almost equal, in general a higher percentage is found at 17°. After treatment with 20° hardly ever all bulbs flower, but at 17° in several cases 100 per cent flower. Flowering is less at 15° than at 20°.

The shooting of the 2nd flower-stalk is also influenced by the temperature. The 23° temperature very seldom shows a 2nd flower-stalk, but 17° and 20° do it far oftener whereas 17° yields higher figures than 20°.

Very rarely all flowers which are initiated in the inflorescence come to development. In the experiments mentioned above the highest number is 5, sometimes 2, the average is 3 or 4. These figures however do not suggest an influence of a special temperature. The flowering i. e.

the opening of the 1st flower in the nos. 57, 65, 67 and 72 is scattered over the months of January, February, March and April. The months are divided into 4 weeks; the flowers of the last 2 or 3 days of the month are added to those of the 4th week. Neither in this process can we detect a special influence of the storing temperatures: However one gets the impression that after storage at 23° the spreading is wider.

After the causes for good flowering had been determined, experiments followed to advance the flowering date in order to be able to cut flower-stalks at Christmas and New Year. Very little is known concerning the forcing of *Amaryllis*. Postponement of flowering is possible by storing the bulbs at low temperature, which postpones flowering until desired. *Amaryllis* bulbs can be stored at 3.3°—7.2° C. from February until July *(Heaton* 1934), 4 weeks after they are potted, the bulbs flower abundantly at an average temperature of 27°. However because of this postponement flowering only occurs after the normal flowering-period.

Accelerating is possible either by shortening the time required for a cycle (storage, growth, dying off) which normally takes a year, or by advancing of flowering date within the normal year cycle by special treatment. By the first treatment flowers are obtained earlier and earlier and at last at such an early date—in the middle of the summer —that the stalks have no market because of the large supply of other flowers. Therefore the best method for accelerating flowering is the one which maintains the cycle of a year but which allows flowering to occur in a special period—at the time of the best market for flower-stalks. We tried to obtain this first by taking up part of the time for storage of the bulbs at 20°, 17° or 15° by 23° or 9° or 13°; and second, by planting the bulbs earlier. Experiments show that late planting results in somewhat later flowering at 15° and 17° but also causes suppression of flower-stalks (See also Heaton 1937.). Therefore for accelerating flowering it is desirable to plant the bulbs immediately after the temperature treatment and not to wait until the buds are visible. Soon after planting the inflorescences will appear.

Treatment at 9° or 13° shows no accelerating effect as in the case of tulip, hyacinth and daffodil, in contrast with most of the bulbous plants. Hayward (1935) indicates also that low temperatures (1°, 6° and 7.2° C.) are not apt to advance the blooming date of *Amaryllis*. It so severely affected the bulbs, that they did not bloom at all. However 23° following a treatment of 15° and 17° results in much earlier flowering. This treatment was based on the principle that the inflorescences first have to develop inside the bulb at 15°, 17° and 20° before allowing the higher temperature to accelerate the emergence. Not only the flowering is advanced but the spread is also narrowed. Formerly the bulbs flowered in January, February and March, now flowering occurs in December and the beginning of January. Treatment at 23° for 4 weeks has therefore an accelerating and regulating influence on the appearance of flower-stalks. It also shows that 4½ weeks at 20° preceding 23° suppresses many flower-stalks; 6½ weeks at 20° causes more inflorescences

to appear, but a lengthening of this storage-temperature causes the flowering to occur too late. So 20° is not suitable for early flowering. However 4½ weeks at 15° or 4½ weeks at 17° preceding 23° will cause flowering for most varieties before Christmas and New Year. Under these conditions some varieties produce many second flower-stalks, others fewer. The second flower-stalks appear always a little later than the first.

For early flowering—for Christmas and New Year—the following is advised: after the middle of August no more water is given; about September the bulbs are pulled up. Care is taken that the temperature of 15° or 17° is supplied not later than September 10th; 15° may cause even somewhat earlier flowering. The bulbs are subjected to this temperature for 4½ weeks (until October 13th), then they are subjected to 23° during 4 weeks (until November 10th) and are then planted as soon as possible in beds or in pots in a hot bed the temperature of which at the height of the lower side of the bulb is kept at 20° as much as possible. The hothouse is kept at 17°—24° C. All or a major part of the bulbs treated in this way will flower before Christmas. Only a few varieties are a little slower and flower after New Year.

If forced flowering is not wanted, for abundant flowering the following treatment of the bulbs is recommended: no more water is to be given after the end of September and the bulbs are then pulled up. In the middle of October the bulbs are stored at 15°, 17° or 20°, and in the middle of January they are planted again in the way mentioned above. In this way flowering will occur in February and March. If flowering is desired a little earlier the bulbs should be exposed to the indicated temperature a few weeks earlier and planted earlier accordingly—17° yields the largest number of flower-stalks.

Laboratorium voor Plantenphysiologisch Onderzoek

Wageningen, November 1945.

Literature Cited

Blaauw, A. H. 1931. Orgaanvorming en periodiciteit van Hippeastrum hybridum. Comm. No. 32 v. h. Laboratorium voor Plantenphysiologisch Onderzoek te Wageningen en Verh. Kon. Akad. v. Wet, A'dam. Afd. Nat. Dl. 29. No. 1. (with a summary: Formation and periodicity of the organs in Hippeastrum hybridum.)

Hayward, W. 1935. Storage and forcing Amaryllis Yearb. Americ. Amar. Soc. 1935 p. 147.

Hayward, W. 1938. Hybrid Amaryllis culture in pots Herbertia 1938 p. 170.

Heaton, I. W. 1934. Forcing hybrid Amaryllis Yearb. Americ. Amar. Soc. 1934.

Heaton, I. W. 1937. Harvesting, storage and forcing Hybrid Amaryllis Herbertia 1937.

Luyten, I. 1926. Vegetative cultivation of Hippeastrum. Comm. No. 20 of the Laboratorium voor Plantenphysiologisch Onderzoek to Wageningen and Proc. Kon. Akad. v. Wet. A'dam Vol. 29, No. 7, 1926.

Luyten, I. 1935. Vegetative propagation of Hippeastrums HERBERTIA (Yearb. of the Amaryllis Soc.) 1935 p. 115.
Luyten, I. 1936. Het voortkweeken van Hippeasstrum langs vegetatieven weg II. Comm. 46 of the Laboratorium voor Plantenphysiologisch Onderzoek te Wageningen and Proc. Kon. Akad. v. Wet. A'dam. Vol. 39, No. 2. (with a summary: Vegetative cultivation of Hippeastrums, II).
Luyten, I. 1946. Over goeden en vervroegden bloei van Hippeastrum. Comm. 70 of the Laboratorium voor Plantenphysiologisch Onderzoek te Wageningen and Meded. van de Landbouwhoogeschool 1946 (with summary: Concerning good and accelerated flowering of Hippeastrum).
Traub, H. P. 1935. Blaauw's morphology of organs and Periodicity in Hippeastrum. Yearbook American Amaryllis Soc. 1935.

POSTSCRIPT.—The term "papslack" may not be generally understood in America, and the word "meal" should be substituted for it (on page 156). The abbreviations, "M^3" and "M^2" (on page 156) signify "cubic meter" and "square meter" respectively.—*Ida Luyten.*

7. THE AMERICAN PLANT LIFE SOCIETY

I. AMARYLLIS SECTION

W. M. JAMES, *Chairman* WYNDHAM HAYWARD, *Vice-Chairman*

1. WILLIAM HERBERT MEDALISTS

*Mr. Henry H. Nehrling, *Fla.*
*Mr. Theodore L. Mead, *Fla.*
*Mr. Arthington Worsley, *Eng.*
Mr. Ernst H. Krelage, *Holland*
Mr. Cecil Houdyshel, *Calif.*
Maj. Albert Pam, *Eng.*
Mr. Pierre S. du Pont, *Del.*
Mr. Jan de Graaff, *Oregon*
Mr. Fred H. Howard, *Calif.*
Mr. Sydney Percy-Lancaster, *India*
Dr. J. Hutchinson, *Eng.*
*Mr. Carl Purdy, *Calif.*
Dr. A. B. Stout, *N. Y.*
Mr. H. W. Pugsley, *Eng.* L
Mr. W. M. James, *Calif.*
Prof. Dr. A. Fernandes, *Portugal*
Miss Elizabeth Lawrence, *N. C.*
Dr. Henry A. Jones, *Md.*
Mr. R. G. Huey, *Ky.*

* Deceased.

2. CORRESPONDING FELLOWS

Antilles—Dr. H. C. Gray, *Atkins Institution, Cienfuegos, Cuba*
Argentina—Sr. Jose F. Molfino, *Buenos Aires*
Australia—Mr. Fred M. Danks, *Canterbury, Victoria*
Brazil—Sr. Joao Dierberger, *Sao Paulo*
Canada—Mr. John S. Lotan, *Hull, Quebec*
Central America—Mr. Alan Kelso, *Punto Arenas, Costa Rica*
Palestine—Mr. Tsevi Ginsburg, *Emek Hefer*
Holland—Mr. Ernst H. Krelage, *Haarlem*
India—Mr. Sydney Percy-Lancaster, *Alipur, Calcutta*
Kenya Colony, East Africa—The Lady Muriel Jex-Blake, *Nairibo*
Union of South Africa—Mr. R. A. Dyer, *Pretoria*
Venezuela—Dr. H. Pittier, *Caracas.*

3. SPECIAL COMMITTEES

DAYLILY (HEMEROCALLIS) COMMITTEE—Mr. Elmer A. Claar, *Chairman, 617 Thornwood Lane, Northfield, Ill.*

Mr. Robert Schreiner, *Minnesota*
Mr. J. Marion Shull, *Maryland*
Dr. Hamilton P. Traub, *Maryland*
Mr. R. W. Wheeler, *Florida*
Dr. I. S. Cooley, *Maryland*
Dr. V. T. Stoutemyer, *Maryland*
Mr. David F. Hall, *Illinois*
Mr. Wyndham Hayward, *Florida*
Mr. Donald B. Milliken, *California*
Prof. J. B. S. Norton, *Maryland*

[Members of the Hemerocallis Jury are *ex-officio* members of the Daylily Committee]

REGISTRAR OF DAYLILY NAMES—Prof. J. B. S. Norton, *4922 40th Place, Hyattsville, Maryland*

[Correspondence about priority of Daylily names should be sent directly to Prof. Norton, but a self-addressed, stamped envelope should be enclosed if a reply is expected.]

DAYLILY JURY (For evaluating Daylilies)—Prof. L. H. MacDaniels, *Chairman, Cornell University, Ithaca, N. Y.*

Those in charge of Official Cooperating Trial Gardens are *ex-officio* members of the Daylily Jury.

[Reports from official trial gardens, indicated below, should be made directly to Prof. MacDaniels, by Aug. 1 in each year in order to be included in annual summary for HERBERTIA.]

OFFICIAL COOPERATIVE DAYLILY TRIAL GARDENS

Prof. John V. Watkins, in charge of Daylily Trial Garden, College of Agriculture, University of Florida, Gainesville, Fla.

Dr. Paul L. Sandahl, Supt., in charge of Daylily Trial Garden, Dept. of Parks & Public Property, City of Des Moines, Iowa.

Prof. Ira S. Nelson, in charge of Daylily Trial Garden, Dept. of Horticulture, Southwestern Louisiana Institute Lafayette, La.

Dr. Raymond C. Allen, in charge of Daylily Trial Garden, Dept. of Agriculture, Cornell University, Ithaca, N. Y.

Dr. S. H. Yarnell, in charge of Daylily Trial Garden, Division of Horticulture, Texas Agric. Expt. Sta., College Station, Texas.

Mr. Chas. E. Hammersley, 714 Majestic Building, Milwaukee, Wisc., in charge of Daylily Trial Garden, Milwaukee City and County Parks.

Note.—Introducers of new daylily clones should send plants directly to the Trial Gardens for testing. As soon as practical each trial garden will publish, in HERBERTIA, lists of the 10, 25, 50 and 100 best daylilies, on the basis of the clones tested, for the climatic region in which it is located.

AMARYLLIS COMMITTEE—..... *Chairman*
Col. Russell S. Wolfe, *South Carolina*
Mr. R. W. Wheeler, *Florida*
Mr. A. C. Buller, *South Africa*
Supt. R. G. Huey, *Kentucky*
Dr. J. C. Du Puis, *Florida*
Mr. Cecil Houdyshel, *California*
Mr. George W. Arbukel, *New Jersey*
Mr. Hermon Brown, *California*

NARCISSUS COMMITTEE—Mr. Sydney B. Mitchell, *Calif., Chairman*
Mr. Arno H. Bowers, *Assoc. Chairman*
Mr. Edwin C. Powell, *Maryland*
Mr. Jan de Graaff, *Oregon*
Mr. Fred M. Danks, *Australia*
Mr. Guy Wilson, *North Ireland*
Mr. Kenyon L. Reynolds, *California*
Dr. Edgar Anderson, *Missouri*
Mr. S. Stillman Berry, *California*
Mr. Frank Reinelt, *California*
Mr. Lionel Richardson, *North Ireland*
Mr. E. A. Bowles, *England*

ALSTROEMERID COMMITTEE—Mr. H. L. Stinson, *Chairman, Seattle, Wash.*
Mr. W. M. James, *California*
Mr. Mulford B. Foster, *Florida*
Mr. John F. Ruckman, *Pennsylvania*

ALLIEAE COMMITTEE—Sgt. Bernard Harkness, *Chairman, Moravia, N. Y.*
Dr. V. T. Stoutemyer, *Maryland*
Mr. F. Cleveland Morgan, *Quebec*
Mr. Claude A. Barr, *South Dakota*
Prof. A. I. Vvedensky, *U. S. S. R.*
Dr. Henry A. Jones, *Maryland*
Mr. F. L. Skinner, *Manitoba*
Mr. William T. Stearn, *England*
Miss Elizabeth Lawrence, *North Carolina*

4. DATA CARD FOR HEMEROCALLIS

When describing daylily clones, all breeders and growers are requested to use the Official Data Card for Hemerocallis, devised by the eminent artist and horticulturist, J. Marion Shull, and fully described in HERBERTIA, Vol. 7, 1940. These cards should not only be used in describing new clones but also for the description of all older clones grown in the various climatic regions.

These cards are available at present in the 3 inch by 5 inch size at the nominal price of $1.25 per hundred, to pay for printing, handling

and postage. Make checks payable to the AMERICAN PLANT LIFE SOCIETY, and send orders to—

Mr. E. Frederick Smith, Asst. Sec'y.-Treas.,
The American Plant Life Society,
Box 2398, Stanford University P. O., Calif.

5. SCORE CARDS FOR HYBRID AMARYLLIS AND HEMEROCALLIS

(a) *Hybrid Amaryllis.* For classification of flower types and score card for Hybrid Amaryllis see HERBERTIA, Volume 5, pages 141 to 145, 1938.

(b) *Hemerocallis Score Card.* For the official score card for Hemerocallis see HERBERTIA, Volume 7, page 126, 1940.

II. PUBLICATIONS OF THE AMERICAN PLANT LIFE SOCIETY

(1) HERBERTIA, THE YEAR BOOK DEVOTED TO THE AMARYLLIDS (AMARYLLIS FAMILY).

A complete file of HERBERTIA, the year book of Amaryllis Section of the American Plant Life Society, is indispensable to all who are interested in Amaryllids. A limited number of copies of the following are still available:—

Volume 1 (1934). DEDICATED TO HENRY NEHRLING. Containing the biography of Henry Nehrling, and many valuable articles on amaryllids; with a portrait of Henry Nehrling and 16 other illustrations; a total of 101 pages.

Volume 2 (1935). DEDICATED TO THEODORE L. MEAD. Containing the autobiography of Theodore L. Mead, and many excellent articles on varieties, breeding, propagation, and culture of amaryllids; with portraits of Theodore L. Mead and David Griffith and 18 other illustrations; a total of 151 pages.

Volume 3 (1936). DEDICATED TO ARTHINGTON WORSLEY. Containing the autobiography of Arlington Worsley, and important articles on description, genetics and breeding, physiology of reproduction, and amaryllid culture; with 3 portraits of Arlington Worsley, one color ture; with 33 plates and 2 figures; a total of 218 pages.

Volume 4 (1937). FIRST BRITISH EDITION. DEDICATED TO WILLIAM HERBERT. Containing the biography of William Herbert; the reprint of Herbert's essay, on Crosses and Hybrid Intermixtures in Vegetables; Dr. Darlington's essay, The Early Hybridizers and the Origins of Genetics, and many important articles on description; cytology, genetics and breeding; physiology of reproduction, and amaryllid culture; with two portraits, forty-four other plates and three figures; a total of 280 pages.

Volume 5 (1938). FIRST NETHERLANDS EDITION. DEDICATED TO ERNST H. KRELAGE. Containing the autobiography of Ernst H. Krelage; the history of amaryllid culture in Holland by Ernst H. Krelage, Dr.

Uphoff's important article in which the name *Hippeastrum* is rejected; a revision of the tribes of the Amaryllidaceae; and the species of Amaryllis; outstanding articles on forcing amaryllids by Dr. Grainger and Prof. Dr. van Slogteren; and many other articles on description, cytology, genetics and breeding; physiology of reproduction, and amaryllid culture; with 33 plates and 2 figures; a ttotal of 218 pages.

Volume 6 (1939). Dedicated to the Union of South Africa, and containing articles on South African amaryllids, including the history of botanical exploration for amaryllids in South Africa, the distribution of South African amaryllids in relation to rainfall, and a review of the genus *Agapanthus* by Frances M. Leighton; a review of the Genus *Cyrtanthus,* with many excellent line drawings, by Dr. R. A. Dyer; other articles—*Zephyranthes* of the West Indies by Dr. Hume; the Tribe *Gilliesieae* by Dr. Hutchinson; rating of daylilies for garden value by Mr. Kelso; daffodil articles by Jan de Graaff, and many other items on description, cytology, breeding, propagation, and amaryllid culture; with 44 plates and 10 figures; a total of 258 pages.

Volume 7 (1940). Dedicated to Latin America, and featuring articles on Latin American amaryllids; biographies of Drs. Philippi and Holmberg; report by Dr. Goodspeed on the amaryllids collected by the Univ. of Calif., Second Andean Expedition; reports on the flowering of the "Blue Amaryllis," *A. procera;* and many other important articles on the description, propagation, breeding, culture, harvesting and storage of amaryllids. Of special interest are the important articles on the description, breeding and culture of daylilies by noted authorities. With 45 illustrations—30 plates and 15 figures—and a total of 242 pages.

Volume 8 (1941). First Daylily Edition. The first extensive symposium on the daylily, containing biographies of George Yeld, Amos Perry, Hans Sass, and Paul Cook, and important articles on daylily evaluation, breeding, propagation and culture. Also important articles on *Narcissus* and other amaryllids. Thirty-eight illustrations—27 plates and 11 figures—and a total of 185 pages.

Volume 9 (1942). First Alstroemerid Edition. Dedicated to Harry L. Stinson, the outstanding authority on this plant group, who contributes a summary of his work on Alstroemerid taxonomy, breeding, propagation and culture. This volume contains the autobiography of Prof. Dr. Abilio Fernandes, the Check-List of Amaryllids by Major Pam, and a review of the species of *Crinum* by Dr. Uphof, and also many important articles on daylilies, *Narcissus, Cyrtanthus,* hybrid *Amaryllis, Ixiolirion* and other amaryllids. Thirty-five illustrations—17 plates and 18 figures—and a total of 243 pages.

Volume 10 (1943). 10th Anniversary Edition. Dedicated to Elizabeth Lawrence, the outstanding authority on the use of amaryllids in the garden, who contributes a summary of her work in this field. This volume contains the review of *Agapanthus* and *Tulbaghia,* by Dr. Uphof; an article on *Brunsvigia rosea* and hybrids by Mr. Hannibal; a symposium on *Narcissus* breeding by Messrs. Powell, Reinelt, Berry, and Reynolds; a review of amaryllid chromosomes by Dr. Flory; articles on hybrid amaryllis, daylilies, and many other important articles on amaryl-

lids. Forty-one illustrations—12 plates and 29 text figures—and a total of 205 pages.

Volume 11 (1944). First Allieae Edition. Dedicated to Dr. Henry A. Jones, the eminent American authority on the onion. This is one of the most outstanding issues up to the present for its record making contributions on the systematics of *Allium* by British authorities, and on onion breeding, propagation, and culture by American authorities. It contains Mr. Airy Shaw's translation of Vvedensky's Alliums of the Soviet Union; Stearn's essay on the onion in the Old World and other articles; and articles on onion breeding, propagation and culture by Dr. Jones and his colleagues. There are also important contributions on ornamental Alliums for North America, and Allieae of North America. There are excellent articles on hybrid *Amaryllis*, Daylilies and various other amaryllids. Forty-three illustrations—25 plates and 18 text figures—and a total of 369 pages.

Volume 12 (1945). First Educational Edition. Dedicated to Supt. R. C. Huey, a pioneer in the use of amaryllids as an educational tool. This volume contains a brief autobiography by Supt. Huey, and an article by him on the use of amaryllids in teaching plant science; the announcement by Mulford B. Foster of the reintroduction of the sweet-scented *Alstroemeria caryophyllaea,* and an article by Harry L. Stinson on the true *Alstroemeria Ligtu.* This issue also contains an article on the origin of *Tapeinanthus humilis* by A. & R. Fernandes; important articles on *Narcissus* breeding; *Leucocoryne* and related genera; articles on various other amaryllids, including valuable contributions on *Hemerocallis* description and appreciation, breeding, culture, and packing daylily plants for shipping. Twenty-four illustrations—15 plates and 10 text figures—a total of 180 pages.

The prices of the above described volumes are based on the available supply:

Volume 1, 1934, supply exhausted.
Volume 2, 1935, supply exhausted.
Volume 3, 1936, supply exhausted.
Volume 4, 1937, supply exhausted.
Volume 5, 1938, supply exhausted.
Volume 6, 1939, $3.50 each, postpaid.
Volume 7, 1940, $3.50 each, postpaid.
Volume 8, 1941, $3.50 each, postpaid.
Volume 9, 1942, $3.50 each, postpaid.
Volume 10, 1943, $3.50 each, postpaid.
Volume 11, 1944, $4.50 each, postpaid.
Volume 12, 1945, $3.50 each, postpaid.

Herbertia in sets postpaid to members:
Vols. 1, 2, 3, 4, 5, 6, 7, 8, 9, 10—$35.00, postpaid.
(These prices supercede all quotations made prior to 1947)

Make checks payable to the AMERICAN PLANT LIFE SOCIETY, and send orders to—

Mr. E. Frederick Smith, Asst. Sec'y.-Treas.,
The American Plant Life Society,
Box 2398, Stanford University P. O., Calif.

(2) PLANT LIFE, THE PERIODICAL DEVOTED TO PLANT LIFE IN GENERAL.

Vol. 1, No. 1. Symposium on Narcissus breeding by various authorities. 27 pages. $1.00 postpaid.

Vol. 1, Nos. 2 & 3. First Bromeliaceae Edition. Profusely illustrated symposium on the bromels by Dr. Lyman B. Smith, Mulford B. and Racine Foster, David Barry, Jr., and Ladislaus Cutak. 78 pages. $2.00 postpaid.

Make checks payable to the AMERICAN PLANT LIFE SOCIETY, and send orders to—

Mr. E. Frederick Smith, Asst. Sec'y.-Treas.,
The American Plant Life Society,
Box 2398, Stanford University P. O., Calif.

[ERRATA, continued from page 7.]

CORRIGENDA FOR HERBERTIA, VOL. 11 (1944) 1946

[Messrs. H. K. Airy Shaw and W. T. Stearn have forwarded the following list of corrigenda.]

NOTES ON THE GENUS ALLIUM

Page	*Line*	*For*	*Read*
3	18 up	Stream	Stearn
11	14 up	(locules)	(loculus)
13	1 down	*Zwibel*	Zwiebel
	2 up	leek	*leek*
14	9-10 up	*agulosum*	*angulosum*
14	7 down	neck	reek
15	8 up	groeste	frösste
18	22 up	from	form
19	16 up	Tourney	Toűrnay
19	6 up	Stephen	Stephan
19	1 up	Dumortire's	Dumortier's
20	9 down	Schoenoprasum	Schoenoprasa
20	11 up	syn. sect. *Melamprason*	syn.sect. *Kaloprasum* C. Koch (1849), sect. *Melamprason* [delete line 8 up and word 'sect.' on line 9 up]
20	7 up	*MOLY* Endl. (1836)	MOLIUM G.Don ex Koch (1837)
20	5 up	*Stemon, Molia*	*stemon* § *Molia*
20	1 up, footnote	see Dumortier	see Endlicher, Fl,Poson. 147 (1830); Dumortier (1830)
21	6 down	(1836)	(1830)
21	14 down	*Schoenoprason*	*Schoenoprasum*
21	18 down	*Rhynschoprason*	*Rhynchoprason*
21	11 up	G. Don ex Koch	Endlicher
21	10 up	(1837)	(1830)
27	5 down	ovary, var. *bulbilliferum*	umbel,var.*bulbiferum*
28	23 down	*extraordinarily*	*extraordinarily*
29	22 up	superceded	superseded
30	11 up	and have	have
31	9 up	*Schrader Scorodopra-*	*Schrader, Scorodopra-*
32	13 down	or	and

THE FLORISTIC REGIONS OF THE U. S. S. R.

45	10 up	Khive	Khiva
46	1 down	Kela	Kola
46	18 up	1944	1946
46	13 up	Trtysh	Irtysh
46	12 up	Kolyina	Kolyma

Page	*Line*	*For*	*Read*
46	12 up	Tobel	Tobol
46	6 up	Zembla	Zemlya
47	12 down	чук.	Чук.
47	17 down	Ladoga-	Ladogo-
47	19 down	Volzhsky-	Volzhsko-
47	22 down	Volzhske-	Volshsko
48	12 down	Yack.	Удск.
48	24 down	-Altai	-Alai
49	10 down	(Persia and Afghanistan)	Persia and Afghanistan.
49	3 up	all by	all, by
52	20 down	*Borszczowii*	*Borszczowi*
53	1 down	Dzungara-	Dzungaro-
54	11 up	Pamir-Alai	*Pamir-Alai*
55	15 down	heavenly *shan*	heavenly, *shan*
57	16 down	analyzed	analysed
57	1 up	*Coloscordum*	*Caloscordum*
58	15 down	*funchiaefolium*	*funckiifolium*
58	16 down	*caput-medusae*	*caput-Medusae*
58	21 up	*Microdictyon*	*microdictyon*
58	11 up	*funchiaefolium Hand.*—Mazz.	*funckiifolium* Hand.-Mazz.
58	6 up	Hand.—Mazz.	Hand.-Mazz.
58	1 up	*Caput-Medusae*	*caput-Medusae*
59	1 down	syn.	syn.
59	17 down	Tien-Shan	Tien Shan
59	15 up	*Macrosphatha*	*Macrospatha*
59	12 up	the most of	most of the
60	1 down	*victorialis*	*Victorialis*
60	2 down	*funckiaefolium*	*funckiifolium*
60	3 down	*Hand.-Mozz.*	Hand.-Mazz.
60	4 down	*Caput-Medusae*	*caput-Medusae*
61	8 down	261	260
61	11 up	d	d(terminal)
62	2 down	Horti.	Horti
62	4 down	Kaulbart Oster-	Kaulbars Osten-
62	5 down	list is	list (to be published later) is
63	1 down	Osttuerkische	Osttűrkische
63	6 down	Locornum	Locorum

THE GENUS ALLIUM IN THE USSR

65	11 down	enthrusted	entrusted
65	11 up	in Russian.	in Russian.—*W.T.S.*]
65	10 up	Certain	[Certain
66	20 down	*seravschanicum*	—*seravschanicum*
66	4 up	*sypsodictyum*	*gypsodictyum*
66	2 up	l.c.	loc. cit.

Page	*Line*	*For*	*Read*
67	1 & 2 down	l.c.	loc. cit.
68	7 up	Obschest.	Obshchest.
69	19 down	*Ophioscordon*	Ophioscorodon
72	4 down	coriaecous	coriaceous
72	10 down	Fliaments	filaments
72	16 up	A. *Alexandrae*	*A.Alexandrae*
73	4 up	Turcz.	Turch.
75	3 down	Turcz.	Turch.
76	10 up	Roem.et.Schult.	Roem. et Schult.
79	5 down	Turcz.	Turch.
80	13 down	concial	conical
81	5 up	Vved.	(Regel) Vved.
82	9 down	aëriel	aërial
82	10 down	never ex-	never
82	9 up	*Borzczowi*	*Borszczowi*
84	13 up	*sphaerocephlon*	*sphaerocephalon*
85	12 up	canpanulate	campanulate
88	3 up	*callidictyum*	*callidictyon*
89	20 down	s. 1.)	sensu lato)
89	1 up	s. s.	sensu stricto
93	12 up	Regel	(Regel) Regel
97	8 down	Ovary	Umbel
97	18 down	(M.Bied.)	(M.Bieb.)
98	5 up	*microdictyum*	*microdictyon*
98	2 up	Kom., 1.c.	Kom., l. c.
99	18 up	*microdictyum*	*microdictyon*
99	7 up	*dictyum*	*dictyon*
100	1 down	*Gen.Pl.*	*Fl. Poson.* (1830) 147, *Gen. Pl.*
100	2 down	*Ophioscordon*	*Ophioscorodon*
100	18 up	RHIZIRDIUM	RHIZIRIDEUM
100	11 up	(Vved.,comb.nov.	Vved. comb. n.
100	9 up	almost	more than
102	9-10 up	range Uzankhmat	range, Uzun Akhmat
106	11 up	Dzung—Tarb.	Dzung.—Tarb.
107	19 down	Ang—Sayan	Ang.—Sayan
109	3 down	Arm.—Krud.	Arm.—Kurd.
110	2-7 up	Tien-Shan	Tien Shan
110	6 up	Kara-Tau	Kara Tau
111	22 down	2.	23.
118	25-26 up	*A. Chinense* Don	*A. chinense* G. Don.
118	20 up	*A.odorum Linné,*	*A. odorum* Linné,
123	24 down	Dzung—Tarb.	Dzung.—Tarb.
124	20 down	Dzung—Tarb.	Dzung.—Tarb.
125	17 down	*Prezewalskii*	*Przewalskii*
132	4 up	Khodzaha	Khodzha
135	13 down	var.*e*	var. ϵ
135	16 up	var,*d*	var. δ

Page	*Line*	*For*	*Read*
136	21 down	var g	var. *y*
137	13 down	var *b*	var. *β*
141	3 down	(*c* 4mm.)	(*c.* 4mm.),
143	2 up	Dzung—Kashg.	Dzung.—Kashg.
143	1 up	Oland	Oeland
145	10 up	exerted	exserted
148	14 down	perianth-segments.	perianth-segments, subulate
148	2 up	words "ones and"	words "and distinctly broader than in the outer ones"
149	18 up	(Boissier) Halácsy	*(Boissier) Halácsy*
149	17 up	*Boissier*	Boissier
150	15 down	*Rhiziridium*	*Rhizirideum*
150	5-6 up	a form is prevalent, transitional	there is present a form transitional
152	17 up	straite	striate
154	11 down	*G. Don.*	*G. Don,*
154	12 down	*Sequierianum*	*Seguierianum*
171	22 down	Prokhaladnoye	Prokhladnove
173	4 up	Pam.-Al. Zera	Pam.—Al. (Zera
176	21 down	Alm Ata	Alma Ata
176	21 up	spp. 143-225	spp. 143-175
177	23 down	Kyzl-Kum	Kyzyl Kum
178	2 down	Kyzye Kum	Kyzyl Kum
180	10 down	Kyzyl-Kum	Kyzyl Kum
181	1 down	Endemic	Endemic (recorded, however, by Feinburn in Palest. Journ. Bot. (Jerusalem) III (1943) 16 from Amanus Mts and Iraquian Kurdistan—*W.T,S.*)
181	25 down	Endemic	Endemic (recorded, however, by Handel—Mazzetti (1914) from Iraq, by Nabelek (1929) from Turkey and by Gombault (1938) from Syria —*W.T.S.*)
182	12 up	Mén.	Mém.
	8 up	Stev.l.c.	Steven, l. c.
183	21 up	Shinshkin	Shishkin
184	5 down	Fomin.	Fomin
185	7 up	ex Ilyin	*ex Ilyin*
	2 up	SPHAEROCEPHALUM	*sphaerocephalum*
	1 up	"SPHAEROCEPHALON	*sphaerocephalon*
187	3 down	Kislovodsk, Akinfiev	Kislovodsk, *Akinfiev*
187	16 up	excerted	exserted

Page	*Line*	*For*	*Read*
188	7 down	Grosshein	Grossheim
189	15 up	it with *A.ponticum*	*A. ponticum* with it
191	5 up	*I distinguished*	I have distinguished
192	17 up	ex Grossheim	*ex Grossheim*
195	between 22 & 23 down		

Insert. Section (8). MOLIUM *G. Don,* Mon. (1827) 72—Bulb solitary, devoid of a rhizome, spherical or ovoid. Leaf-sheaths usually subterranean. Leaves always flat. Pedicels without bracteoles. Perianth-segments with a single nerve. Filaments entire or with teeth; teeth short or long, but never exceeding the anther. Seeds angular. [Spp. 177-225.]

195	8 up	-Bickerstein	*—Bieberstein*
195	6 up	-Bickerstein	—Bieberstein
198	12 up	*(Regel)* Regel	*(Regel)Regel*
199	9 down	ARIODES	AROIDES
200	13 up	*Schulter*	*Schultes*
202	22 up	Scabrid	scabrid
206	20 up	204. SUWOROWI	204. A. SUWOROWI
206	18 up	sub.*A.*	sub *A.*
211	2 up	Report Sp.	Repert. Sp.
212	14 down	(1c.Gartenfl.	(Ic.: G'artenfl.
213	12 down	Abh.Munch. Acad.	Abhandl. Math. Phys. Bay. Akad. Műnchen
213	14 down	(1c. Bot. Mag.	(Ic.: Bot. Mag.
214	15 down	Lipsky can	Lipsky [restored to specific rank by Vvedensky in Schreder, Fl. Uzbek. I (1941) 465–*W.T.S.*] can
215	13 up	Tamerlanova's gate	Tamerlane Gate
215	2 up	Afgahanistan	Afghanistan
216	7 up	Section 8. Caloscordum	Section 9. CALOSCORDUM
217	16 down	Section 9.	Section 10.

KEY TO THE ALLIUMS OF EUROPE

219	10 down	Willkomm.	Willkomm,
219	16 down	Couthino	Coutinho
219	13 up	*victorialis*	*Victorialis*
219	4 up	(3.3mm)	[3.3 mm.]
219	2 up	(i.e.coiled)	[i. e. coiled]
220	4 down	Tenéo	Tineo
220	6 down	(i.e. entirely white)	[i. e. entirely white]
220	9 down	(white)	[white]
220	16 down	(i.e.not mounted on a rhizome)	[i. e. not mounted on a rhizome]
221	23 down	*Cyr.*	Cyr.

Page	*Line*	*For*	*Read*
221	26 down	Cluss.	Guss.
221	15 up	(i.e. round in section)	[i. e. round in section]
221	3 up	Griesb.	Griseb.
222	2 down	Heuff)	Heuff.)
222	14 up	Griesb.et Schlenk.)	Griseb. et Schenk)
	10 up	(i.e. tailed)	[i. e. tailed]
222	9 up	(loose	[i. e. loose
222	8 up	tions)	tions]
222	7 up	(Stamens	stamens
223	4 down	"varigated	variegated
223	4 down	yellow and hoary	yellow, pruinose and waxy
223	9 down	Panc.	Panč.
223	19 down	*Boiss.*	Boiss.
223	12 up	*Panc*	Panč.
223	12 up	Panc.	Panč.
223	5 up	(i.e. without bulbils)	[i. e. without bulbils]
224	14 down	acuteolate- scabrid	aculeolate—scabrid
224	19 down	*margariaceum*	*margaritaceum*
224	17 up	Vary.	Vayr.
225	4 up	Couthino	Coutinho
225	4 up	Briqurt	Briquet
225	2 up	Halacsy (1940)	Halácsy (1904)

NOMENCLATURE AND SYNONYMY OF ALLIUM ODORUM

227	11 down	F.l.	*Fl.*
228	3 up	the Dutch East Indies and India;	and the Dutch East Indies;
229	8 down	*fareto*	*farcto*
230	1-2 down	Siberia Uralensi	Sibiria uralensi
232	2 down	(-*A.*	(=*A.*
233	4 up	*cepa*	*Cepa*
235	1 down	*Herbarium Botaniska*	*Herbarium, Botaniska*
237	15 down	albus scapus	albus. Scapus
237	17 up	*Mon.* 33	*Mon.* 133
237	15 up	*nerinifolium*	*neriniflorum*
238	4 down	redicalia	radicalia
238	6 down	violaceaus: Umbella	violaceus: *umbella*
238	24 down	(1853)	(1852)
238	20 down	Siberia	Sibiria
238	18 up	Redoute	Redouté
238	17 up	Kew-Gawler	Ker—Gawler
238	11-13 up		

REMOVE Butomissa * * * (1895) and transfer to between lines 8 and 9 up.

238	7 up	Redoute	Redouté
238	7 up	*tuberosum*) Mongolia	*tuberosum*) ; Mongolia
239	15 down	*nerinifolium*	*neriniflorum*

Page	*Line*	*For*	*Read*
239	19 down	33	133
239	21 down	Mikino	Makino
239	13 up	Amoer.	Amoen.
240	3 down	*A. sinicum Noronha*	*A. sinicum* Noronha
	5 down	*A.tuberosum Roxburgh*	*A. tuberosum* Roxburgh
	14 up	Teresaki	Terasaki

PAGE 241

DELETE lines 3-7 and SUBSTITUTE:—

Type-locality:—"Kiang Sou (d'Argy)" (H. Léveillé).
? *A.jaluanum* Nakai in Bot. Mag. Tokyo *27*. 214 (1913).
Type-locality:—"Corea sept.: Flum. Jalu" (T. Nakai).
A. yesoense Nakai in Bot. Mag. Tokyo *36*. 117 (1922) fide Nemoto, Nippon Shokubutso Soran Hoi 1051 (1936).
Type-locality:—"Yeso: in araneis Zenibako, prov. Ishikari" (T. Nakai).

241	12 down	Teresaki	Terasaki
241	20 down	India (Assam) and Nepal; it is cultivated	India (Kəshmir, Nepal, Assam); it is or has been cultivated
241	15 up	fibrous-tuniced	fibrous-tunicked
241	11-12	inter alia	*inter alia*
241	11 up	bulb-tunics linear	bulb-tunics, linear
241	6 up	*Rendle*	Rendle
241	5 up	Lévéillés'	Léveillé's
241	3 up	*jalvanum*	*J'aluanum*
242	15 down	311 (1938)	311 (1838)
242	15 down	*Janka*	Janka
242	16 down	Petrop	Petrop.
242	17 down	*tataricum typicum*	*tataricum α typicum*
242	23 up	Schulties	Schultes
242	11 up	-Sea	—See
242	2 up	Gorenk:	Gorenki
243	4 down	Lipcky	Lipsky
243	5 down	Turkestanaka	"Turkestanskaya
	6 down	Antropol; Etongraf..	Antropol. i Etonograf
243	13 down	Povov	Popov
244	4 up	Tobel	Tobol
245	1 down	*Vved.*	Vved.
245	6 down	broad.channelled.	broad, channelled.

On page 243 the Key-contrast 4B (line 7 up) should be aligned with 4A (on line 12 up) and all subsequent lines correspondingly indented to line 19 down on p. 244.

On p. 244 the Key-contrast 10B (line 2 up) should be aligned with 10A (line 12 up) and all subsequent lines correspondingly indented down to end of Key.

On p. 245 the Key-contrast 13B (line 9 down) should be aligned with 13A (line 4 down) and all subsequent lines correspondingly indented down to end of Key.

AMARYLLID GENERA AND SPECIES

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

Allium Cepa L., clon *perutile*, Stearn, cultivar, Gard. Chron. Sept. 4, 1943, pp. 86-88.

Plants perennial, cespitose, glabrous, evergreen, edible, rarely flowering; bulbs clustered, narrow, ovate-oblong, 1.5-2.5 cm. thick, the outer scales thin, brown, the subexterior ones mostly red; leaves suberect, distichous, mostly 5 or 6, linear, hollow, semi-cylindric, upwardly lightly channelled, rounded below, glaucous, up to 40 cm. long and 9 mm. broad, 5 mm. thick; flowering stem fistulose-inflated in the lower part, exceeding the leaves, 40-55 cm. long, up to 1.5 cm. thick; umbels many-flowered, subhemispheric, 2.5-3.5 cm. broad, the green pedicels up to 2 cm. long; expanded flower 8-10 mm. in diameter; perianth segments white with a green dorsal line, acutish, about 4 mm. long, scarcely 2 mm. broad, the outer narrowly ovate, the inner narrowly ovate-oblong; stamens exserted; filaments white, about 5 mm. long, the outer simply subulate, the inner broadly expanded at base; anthers greenish-yellow; ovary depressed globose, white; style white, up to 4 mm. long. Cultivated in English gardens for culinary uses. Type in the Kew Herbarium.

[ALLIUMS — INDIA, continued from page 84.]

lar, the inner with the base broadly auricled, sometimes shortly dentate on each side; anthers ellipsoid, about 1 mm. long. Ovary subglobose, with 2 ovules in each chamber; style included, scarcely 3 mm. long.

Near *A. sikkimense* Baker but distinguished by the smaller, less campanulate flowers, with the alternate stamens broad-shouldered and often toothed.

Hab.; Tibet; Karo La Pass, about 16,500 ft. (Walton, July 1904); near Maku La (Younghusband, July-Aug., 1903 no. 178); Kara La, 15 miles from Lhassa (Dungboo, Aug. 13, 1878).

8. THE BUYER'S GUIDE

When writing to advertisers do not forget to mention HERBERTIA, the year book devoted to the amaryllids.

DuPUIS BULB GARDEN

6043 N. E. 2nd Avenue, Miami, Florida

PRICE LIST

HYBRID AMARYLLIS, Large bulbs, all blooming size, description of flowers are of my individual garden interpretation.

No. 1. Medium flower, delicate crimson. (Prolific).
No. 2. Medium robust flower, margin of petals deep crimson half to one inch border, white and crimson stripe to center.
No. 3. Medium to robust flower, almost white, a very few crimson stripes.
No. 4. Robust flower, white and crimson stripe almost uniform from near border of petals to center of flower.
No. 5. Robust flower, golden orange, occasional whitish mottled specks irregularly distributed.
No. 6. Very robust flower, solid crimson, slightly greenish white center.
No. 7. Medium flower, velvety red petals, white line in center of petals receding to center, (rare).
No. 8. Robust flower, velvety red (exquisite).
No. 9. Robust flower, petals solid red, sprinkled or freckled with white dots, submerged whitish stripes.
No. 10. Robust flower, velvety orchid red, slightly sprinkled white greenish center, (rare and lovely).
No. 11. Robust flower, dainty peach orchid with tendency of white receding to center of flower, (very rare).
No. 12. Medium to robust. Bright red with greenish to white center.

PRICES OF INDIVIDUALS No. 1 to 12

Single Bulbs, $1.50 each
Half dozen bulbs, $7.50. Dozen bulbs, $12.00
(Quantity limited)

MIXED COLORS — FIELD RUN

In filling mixed color orders, your order will contain several varieties and patterns of color, all blooming size bulbs, and flowers from these bulbs will be beautiful and lovely.

Blooming size bulbs
6″-8″ cirm.—per hundred $22.50
Large size bulbs
8″-9″ cirm.—per hundred 27.50
Jumbo size bulbs
10″-14″ cirm.—per hundred 30.25

(Fifty at the hundred rate, all quotations F.O.B. Miami, Florida)

TERMS: Remit with Order, by Post Office or Express Money Order, Draft or Registered Letter. (All orders accepted subject to prior sale).

ORDERS WILL BE BOOKED upon receipt of 25% of total amount of order, and shipped promptly upon receipt of full amount of order during the regular fall and winter shipping season, unless otherwise requested.

We grow all of our own bulbs and have a large stock to select from. Instructions for planting and method of culture will be supplied upon special request.

DuPUIS BULB GARDEN

6043 N. E. 2nd Avenue, Miami, Florida

J. G. DuPUIS, M.D., Owner